DBM
Deutsches Bergbau-Museum Bochum

LWL-Industriemuseum
Westfälisches Landesmuseum für Industriekultur

International Conference

BIG STUFF '07

Beyond Conservation – Industrial Heritage Management

Bochum and Hattingen, 9.9. – 14.9.2007

In cooperation with:

VDR Verband der Restauratoren

ICOMOS.Deutschland
Deutsches Nationalkomitee von ICOMOS

VEREINIGUNG DER LANDESDENKMALPFLEGER IN DER BUNDESREPUBLIK DEUTSCHLAND

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Preface

Over the past 20 years or so increasing numbers of industrial sites have been declared as monuments. Because of their architecture, size and huge complexity, they were never intended to survive for eternity. For this reason they exceed all the dimensions and aspects of monument conservation that have been practised to date.
Long-term experience on working with these sites has shown that emergency measures – e.g. “ageing” or “controlled decay” – determined by restricted resources have only a limited value.
In most cases nowadays, current budgets do not allow for thorough conservation and the scheduled high-level maintenance of all aspects of an industrial monument site. Therefore a never-ending chain of unscheduled, corrective maintenance measures – sometimes urgent, last-minute actions – has to be executed.
Insufficient financial means for the rapid conservation of an entire site often result in a decision to abandon large parts of a heritage site.
In the coming years we have to develop appropriate methods to deal with large industrial monuments. On one and the same site we may be faced with a variety of different maintenance and safety levels over an extended period of time. These can range from very basic to very high level maintenance, as a result of which unsupervised visitors are able to tour the site as a “heritage trail.”
Action-planning and monitoring are the keywords behind a practical maintenance strategy.
The BigStuff07 International Conference is devoted to a global, interdisciplinary approach dealing with the following issues:
Tailoring our understanding of large projects: planning actions with respect to large industrial sites

1. Site management - risks and opportunities
2. Repair and conservation: irreconcilable contradictions?
3. Entrusted to our care: what does this mean?
4. Pathways through heritage sites: necessary and encumbering
5. "Restored to working glory" - to work or not to work?
6. Conservation of “buried treasure”: gathering and preserving technical, working knowledge from past generations
7. Vocational training on-the-job? The education of “interpreters”

The conference will bring together the multifaceted national efforts with regard to the preservation of industrial heritage and facilitate an international exchange of experiences.
Secondly, we hope to establish a common network of different professionals (scientists, engineers, architects, restorers, craftsmen, museologists and historians), for the mutual exchange of expertise in the material preservation of technological heritage monuments, especially objects from a variety of different industrial eras.

Wishing you a warm welcome in Bochum and Hattingen,

Dr. Stefan Brueggerhoff, German Mining Museum Bochum
Kornelius Goetz, Bureau for Restoration Advice, Oettingen
Norbert Tempel, Westphalian Museum of Industrie, Dortmund

Final conference programme

Field trips

9th of September 2007 (Sunday), 4 pm – 10 pm
[“Tag des Offenen Denkmals / Monument day” in Germany]
Excursion to four objects representing industrial heritage in the Ruhr district: ship lift Henrichenburg (with museum harbour, shipyard and collection of vessels), machine hall of colliery Zollern II/IV, illuminated colliery and coke-making plant Zollverein (World Heritage Site) and at least the illuminated former ironworks site in Duisburg Meiderich.

10th of September 2007 (Monday): 10 am – 5 (or 6) pm
Because of a great number of interested participants we have to divide this excursion into two alternative trips. There will be a final division at the meeting point:

Tour A - Visit of ThyssenKrupp Steel in Duisburg: Bus trip to Duisburg, short view on the old part of Duisburg river port, which has been recreated for cultural and business purposes. Then we will visit ThyssenKrupp Steel in Duisburg. ThyssenKrupp is the major German steel producer with main and most modern steelworks in Duisburg. This visit will give the chance to see and feel the difference between a producing factory and an industrial heritage site.

Tour B - Mixed tour with visit of former coal mine and ‘Hüttenwerke Krupp Mannesmann’ in Duisburg’: Bus trip to the former Nightingale colliery situated in the Muttental valley (Witten). It is a witness of early coal mining in the Ruhr region, first mentioned in 1714. We will visit this branch of the LWL-Industrial Museum .Afterwards we will drive to Duisburg-Huckingen and visit the smelting works Krupp Mannesmann. Also here you will get the chance to see and feel the difference between a producing factory and an industrial heritage site.

Evening:
7.30 pm: Come-together in the restaurant of DBM “Foerderturm” (for those already arrived in Bochum)

Conference

11th of September 2007 (Tuesday):

Conference location: Deutsches Bergbau-Museum Bochum (DBM)

8.30 am Registration of participants

9.30 am **Welcoming**
Rainer Slotta, Director of DBM
Oliver Wittke, Minister responsible for industrial heritage (Ministry of Building and Traffic of North Rhine-Westphalia)
Wolfgang Kirsch, Director of regional authority in Westphalia-Lippe (LWL)
Kornelius Götz, President of the association of German restorers (VDR)

10.15 am Short introduction into the conference
BigStuff 2007
Stefan Brueggerhoff, DBM

10.30 am Topic 1: Tailoring our understanding of large projects:
action planning for large industrial sites (with 4 contributions)
Large technology project plan – fundamental considerations
Alison Wain, Australian War Memorial (Australia)

11.00 am **Action plan for industrial monuments – a German attempt to improve the management of large sites**
Kornelius Goetz, Bureau for restoration advice (Germany)

11.30 am **Chance Denkmal - An innovative sales practice for listed buildings**
Joachim Schares, Montan-Grundstücksgesellschaft mbH

12.00 am **Understanding in big projects**
Kate Clark, Heritage Lottery Fund (UK)

Discussion

0.45 pm Lunch break in the DBM restaurant

2.00 pm Topic 2: Site management: On risks and chances
Monuments of modern iron & steel production – an overview on preservation attempts
Rolf Hoehmann, Bureau for industrial archaeology (Germany)

2.30 pm Topic 3: Repair and conservation: Irreconcilable opponents? (with 2 contributions)
Coatings for Industrial Heritage Surfaces– between the poles of aesthetics and durability
Stefan Brueggerhoff, DBM (Germany)

3.00 pm **Preventative conservation of large scale industrial objects – the Victorian steamship Great Britain**
Shane Casey, Naylor Conservation (UK)

3.30 pm Topic 4: Entrusted to our care: What does it mean?
Running an Industrial World Heritage site:
A prominent example - Ironbridge Gorge
David Dehaan, Ironbridge Gorge Museum Trust (UK)

Discussion

Coffee break

4.45 pm Topic 5: Pathways through heritage - Necessary and encumbering
Tracing history by pathways
Ulrike Laufer, Torsten Seifert, Zollverein Foundation (Germany)

5.15 pm Topic 6: "Restored to working glory" - To work or not to work?
Operating objects – ethical and philosophical aspects
David Hallam, National Museum of Australia (Australia)

5.45 pm Topic 7: Conservation of “buried treasures”
Actual attempts: gathering and preserving technical, working knowledge from past generations
Gabriele Wohlauf, Deutsches Technikmuseum Berlin (Deutschland)

6.15 pm Topic 8: Training and education
Training of Volunteers in Aviation Heritage conservation - a chance for Big Stuff
Brian Barker, Imperial War Museum (UK)

Discussion

7.00 pm End of first day lecture programme

8.00 -10.30 pm Reception of the DBM:

Greeting by the mayor of Bochum Dr. Ottilie Scholz

Evening lecture:
The coal is leaving - industrial landscapes will stay
Hans Peter Noll, Montan-Grundstücksgesellschaft mbH

Cosy get-together (refreshment will be served)

12th of September 2007 (Wednesday):

Conference location (forenoon): Deutsches Bergbau-Museum Bochum (DBM)

8.30 am Reports on the situation of industrial heritage preservation in different countries
The ICOM_CC_metals working group: sub group 'IECO'
and the bibliography of engineering and industrial objects conservation
David Hallam, National Museum of Australia (Australia)

9.00 am **Country report: Greece**
Athanasios Chatsigogas, TICCIH Greece

9.30 am **Country report: Czech Republic**
Milos Matej, Czech agency for monument preservation, department Ostrava

10.00 am **Country report: Belgium**
Patrick Viaene, Foundation for the industrial and scientific heritage (SIWE)

Discussion
Coffee break

11.15 am **Country report: Japan**
Shunsuke Nakayama, Tokyo National Research Institute of Cultural Properties

11.45 am **Country report: United States of America**
Scott See, Michigan Technological University

Discussion

0.30 pm Lunch break in the DBM restaurant

1.30 pm Bus transfer from DBM to Henrichshuette, Hattingen

Conference location (afternoon): Henrichshuette, Hattingen (WIM)

2.00 pm **Welcoming**
Dirk Zache, Director of the Westfälisches Industriemuseum (WIM)
IBA (Internationale Bauausstellung) Emscherpark – a successful attempt in Germany
*Axel Foeh*l, LVR Rhenish agency for monument preservation (Germany)

2:00 - 7:30 pm **Dariusz Kantor – women in mining**
Photographs from the coal washery 2002 - 2004, Upper Silesia/Poland

2.00 – 7.30 pm C**ompany exhibition**
Presentation of services and equipment for the preservation and operating of technical and industrial heritage

Exhibiting companies

- *Arctron Engineering Services for 3D Surveying and Archeology*
- *bluelemon Interactive GmbH*
- *Conrads Lacke (Coating Systems)*
- *Dießner Concept-Team*
- *Eyeled, mobile competence*

- *Halbe-Rahmen GmbH*
- *Klartext Verlag GmbH*
- *IndustrieKultur, Industrial Heritage Magazine*
- *MBA –Design & Display Produkt GmbH*
- *Siemens Building Technologies GmbH & Co. oHG*
- *Sennheiser*
- *Adlib Museumssoftware*
- *Dariusz Kantor, Essay, Photography*

4.30 – 7.30 pm **Lectures of company representatives**

- *Siemens:* Performance Based Solutiones – Putting energy savings back into your facilities (Hülsebusch, R.)
- *Sennheiser:* Optimized service – by using modern Audio (Hilbig, N.)
- *MBA Design & Display:* Flexible Exhibition Desing with modular walls (Militzer, M.)
- *Bluelemon Interactive:* Interactive media displays as an essential element in industrial museums (Syndicus, R.)
- *Halbe-Rahmen:* Halbe Protect – framing art protection against varying air humidity (Eckel, C.)
- *ArcTron:* High Resolution 3D-Recording and Virtual Presentation of Existing Conditions (Schaich, M.)
- *Eyeled:* The meaningfull use of mobile multi-media visitor information systems in buildings and outdoor areas (Blanchebarbe, M.)
- *adlib:* Managing information about big and small stuff with Adlib Museum (Bulle, K.)
- *Conrads Lacke.* Individual coating solutions from an individual coatings manufacturer (Conrads, M.)

3.00 – 5.00 pm **Guided tours through the former blast furnace plant Henrichshuette**
with special regard to the preservation measures

6.00 – 7.30 pm **Poster presentations**
Discussions with coffee and cakes

Posters:

- *Duggan, E.*: Flight or Fancy? The Conservation of the Supermarine S.6b
- *Hann, P.*: Preservation of a hangar gate in Werneuchen, Brandenburg
- *Huang, C.-C.*: Representation and restoration of Taiwan's textile industrial arts and crafts - Tompkins Knitting Machine
- *McDonald, S.*: An historic airfield as a museum

7.30 pm Conference Diner at the restaurant ‚Henrichs’
Greeting by the mayor of Hattingen Dr. Dagmar Goch

10.30 pm Bus transfer back to Bochum City and DBM

13th of September 2007 (Thursday):

Conference location: Henrichshuette, Hattingen (WIM)

8.30 am Bus transfer from DBM to the Henrichshuette

9.15 am Workshop 1 to 4 (parallel) referring to the topics of first days lecture programme

Workshop 1:
Tailoring our understanding of large projects: action planning for large industrial sites

- *Niederhagemann, S.*: Optimizing the rehabilitation work of Malakofftower Prosper II
- *Rufinoni, M., Vasques, A.:* Recovery and preservation of industrial historical sites in Sao Paulo: new uses, new challenges
- *Sæland, F.*: A recording experience
- *Maspoli, R.*, Ramello, M.: Preservation, increase in value and transformation of urban industrial heritage. Turin case

Workshop 2:
Site management: On risks and chances

- *Tempel, N.*: "Hidden Treasures" - Investigation and Treatment of Hazardous Substances in Industrial Monuments
- *Santi, V.:* Are we just 'hooking up' to machines a no-life-expectations patient? The challenges of cultural significance conservation when physical fabric preservation is an ever-postponed goal.
- *Schleper, Th.:* Discovering the sites of the Rhenish Industry Museum

Workshop 3:
Repair and conservation: Irreconcilable opponents?

- *Böcker, A., Reck, C.*: Restoring large concrete storage buildings at the world heritage site Völklingen ironworks
- *Conrads, M.*: Coating systems for industrial monuments – demands and options
- *Mottner, P.*: New coating materials and strategies for the preservation of iron / steel industrial cultural heritage: The CONSIST project

Workshop 4:
Entrusted to our care: What does it mean?

- *Keller-Kempas, R.*: Conservation of motor vehicles as witnesses of the history
- *Kuisle, A.*: Communication – our new challenge?
- *Brechtken, R.:* Krupp: a cast steel manufactory as archaeological resource

11.00 am Coffee break: opportunity to discuss with poster presenters and exhibiting companies

11.30 am Continuation of workshops 1 to 4 (parallel)

1.00 pm Lunch break in the restaurant of the Henrichshuette

2.30 pm Workshop 5 to 8 (parallel) referring to the topics of first days lecture programme

Workshop 5:
Pathways through heritage: Necessary and encumbering

- *Smokvina, M.*.: The Torpedo testing Station in Rijeka, Reconstruction and chances for Musealisation

- *Perez Ocejo, J. R.., Valerdi, M. Chr., Oliver, J. S., Sotelo, E.*: Two series of machines in the new five storey lobby of the Old Wheat Mill of Huexotitla in the city of Puebla, Mexico
- *Stiens, C..:* 'Die Industriedenkmal-Stiftung' – New life for closed down sites

Workshop 6:
"Restored to working glory": To work or not to work?

- *Chatsigogas, A..*: "The challenge of converting the Tsalapatas factory to a roof-tile and brickworks-museum and a multifunctional centre"
- *Lagerqvist, B.*: Fengersfors Works - musealisation to working order as instrument for regional development
- *Porter, J.*: Operating very large stationary steam engines under museum conditions

Workshop 7:
Conservation of "buried treasures" – technical and working knowledge of past generations

- *Farrenkopf, M.*: Time witnesses of German coking plants: An interview project of the historian circle of the VDKF
- *Fournier, D.*: Arthez Ferrarie: BigStuff of Four Centuries - Evocation of working glory

Workshop 8:

Presentations of exhibiting companies (repetition of company lectures from the 12th)

- *Siemens:* Performance Based Solutiones – Putting energy savings back into your facilities (Hülsebusch, R.)
- *Sennheiser:* Optimized service – by using modern Audio (Hilbig, N.)
- *MBA Design & Display:* Flexible Exhibition Desing with modular walls (Militzer, M.)
- *Bluelemon Interactive:* Interactive media displays as an essential element in industrial museums (Syndicus, R.)
- *Halbe-Rahmen:* Halbe Protect – framing art protection against varying air humidity (Eckel, C.)
- *ArcTron:* High Resolution 3D-Recording and Virtual Presentation of Existing Conditions (Schaich, M.)
- *Eyeled:* The meaningfull use of mobile multi-media visitor information systems in buildings and outdoor areas (Blanchebarbe, M.)
- *adlib:* Managing information about big and small stuff with Adlib Museum (Bulle, K.)

4.30 pm Coffee break: opportunity to discuss with poster presenters and exhibiting companies

5.00 pm Continuation of workshops 5 to 8 (parallel)

6.30 pm End of the workshops

7.00 pm Bus transfer back to Bochum and to the conference hotels

evening: to ones own disposal
(some tourist events may be offered: e.g. Starlight Express musical)

14th of September 2007 (Friday):
Conference location: Deutsches Bergbau-Museum Bochum (DBM)

9.00 am	**Panel discussion referring to the results of the workshops** Summary of each workshop as an impulse for common discussions in the plenum discussion: Will BigStuff be a conferences series?
12.00 am	End of the conference
2.00 – 5.00pm	Guided tours through the Deutsches Bergbau Museum, as an offer for those participants, who will not leave on Friday afternoon

Invited Lectures

Large technology projects - success and sustainability

Alison Wain
Australian War Memorial

Creating a successful and sustainable large technology project means asking some hard questions. What does your public find interesting about your object? What resources do you have for the project, now and in the future? How can you maximise the benefit you get out of the project? This article suggests some ways of answering these questions before you have made any costly and irreversible decisions.

Introduction

Large technology projects are usually started with such fanfare and enthusiasm, yet so often end up as expensive white elephants, struggling for visitors or languishing unfinished in a corner of the workshop. They sound so good when they are on the drawing board: the trouble is, on the drawing board they are nice and flat – they fit in a filing cabinet, don't leak, don't rust and don't cost money.

On of the big issues I see with large technology is that there are some very standard ways of dealing with it, basic assumptions about the way it "should" be restored, maintained, used and displayed. The most common ones seem to be:

- People will be interested in it
- We need to make it work
- We need to strip it, rebuild it and repaint it
- It's a one-off cost
- Everything will be finished by date X

Most of the time I think these assumptions are just plain wrong, and the successful projects are the ones where people have asked the hard questions BEFORE deciding how to use their large technology objects. So let's look at these assumptions in more detail.

Assumption 1: People will be interested in it.

Will they? Have you asked them?

What is most important about the object to you and your collection? It was used by a particular person? It demonstrates a particular type of technology? It provides evidence of a particular event?

What is important to other people about the object? This may not be the same thing that interests you! Many large technology objects were mostly used by adult men, but most museum visits are made by families and schools. Keeping these visitors interested means helping women and children relate to the technology, so information on individual people who used it and the effect it had on families and society may get more repeat visits than discussions of horsepower and torque.

Large technology items have long, complex lives. While this is often a challenge – if you decide to restore an object to one period you inevitably destroy evidence of other periods (Fig 1.) – it is also an opportunity; different aspects of the object's manufacture and history can be used to interest different types of people and to link the object to different themes and displays (Fig 2).

(Fig 1: This M113A1 Armoured Personnel Carrier and Light Reconnaissance Vehicle has seen service in Vietnam, Rwanda and East Timor. All its service periods are significant, but repainting it for display

in its Vietnam or UN colours would destroy all the paint and evidence of use from its East Timor service.)
This is important because the more familiar people are with an object, the more they seem to become fond of it, as it becomes part of their own personal history. Having a depth and variety of information about the object, going beyond just the wood or metal structure, allows you to build a package of information which can be tailored quickly and efficiently to different outputs – brochures, web features, event publicity, education programs and even linkages with other museums. The more exposure you can give it, the more you can build a profile for your object, and – if you can get it right - the more people's interest will grow.
(Figs 2a and 2b: The wooden wings of the Memorial's Albatros D.Va fighter aircraft provide information not only on the early use of aircraft in war, but also on the materials, construction and repair techniques in use at the time (note the bound and glued repair in 2a), the beginnings of mass production (note the rib numbering system in 2b), and even a connection to the individual people who made the aircraft (note the signed certification panel in 2a).)

Assumption 2: We need to make it work
Do people really want to see technology objects working? Well – to some extent yes; operating objects are a huge drawcard and really help people to understand what a machine does. But one machine can often tell this story better than ten. One operating machine is a focus; people usually stop to watch it for a considerable time. Ten machines are more distracting – people tend to walk past all of them and then just keep walking, without having really engaged with any of them.
Also – how often are you really going to use them? In your galleries, with fixed operating times, they may get used regularly. If they only come out for special events, how many special events do you have each year? The Memorial spent a lot of resources developing a fleet of operating objects, before realising that there weren't that many events each year which needed them, and if they weren't used at events they needed to be exercised regularly to keep them in good condition. This used lots of resources but had a really minimal impact on public programs.

Assumption 3: We need to strip it, repaint it and rebuild it
Hmm you could also translate this sentence as " We need to remove all the grease, filters, gaskets, repairs, dents and stains which demonstrate how this object was used and maintained. Then we need to remove all the paint which demonstrates what it really looked like and what sort of paint was available and popular at the time. Then we need to make new bits which don't have any of this information in them and put it all back together and say we have something that is more original than when we started." The sad fact is that most restored objects contain more information about the skills and materials used in the restoration than in the original manufacture and use of the machine.
But – I hear you say – it's corroding and dirty and the paint is all faded!
Well – yes and maybe no. Too often large technology is "preserved" by being sandblasted and repainted. Key information on paints, lubricants, manufacturing marks, use and wear marks and a hundred other small details is swept away as rubbish on the floor and lost forever.
· Corrosion is big a problem if the object is stored outside, but usually a minor problem indoors. Corrosion may date from before you got the object – in your museum environment the object may be quite stable, or just require cleaning and wax coating to protect it from dust and hands.

· Some dirt will be from when it was in use, particularly oil and soot stains and stuff in hard-to-reach places like underneath. Can you leave the dirt that it acquired in its service life and explain why it is there? Visitors find objects that look used much more believable than ones which look as though they just left the factory.

The paint may be faded but it stills holds lots of information (Fig 3). Use rubbings to work out original colours and patterns, leave well-adhered paint where it is and do the minimum inpainting/overpainting to help your visitors understand the object.

(Figs 3a and 3b: The original paint on the Memorial's Hawker Sea Fury FB.11 Fighter Bomber was retained under new paint which recreated its appearance when it was still in service. In a shaft of raking light one day, rocket markings in the original paint on the outside of the cockpit became visible as proud areas under the new paint. These confirmed the aircraft's service history, which before had been in some doubt.)

The Burra Charter[1] has an excellent maxim: conservation should involve "changing as much as necessary but as little as possible". To work out what you <u>really</u> need to do to your object, try listing all your tasks under the following headings:

For stability
For safety
For handling/operation
For aesthetics

You DO have to do the tasks to make the object stable and safe. But you DON'T have to do the things that only change its appearance, and you DON'T need to do the tasks that would make it operational (unless you <u>are</u> actually going to operate it).

At the Memorial we have found this to be a very powerful way of clarifying what is essential (Figs 4a and b), what is desirable if you have the resources, and what has been put in because... er...well, actually we didn't really think about it that much.

(Figs 4a and 4b: Initial plans for the restoration of the Lancaster Bomber "G for George" included $30,000 for the engines to be overhauled by Rolls Royce engineers. At an energetic round-table discussion however, we realised that we weren't intending to operate the engines, full dismantling would remove all evidence of WW2 assembly and maintenance practices, and what we had initially thought was corrosion in the engines was just coolant precipitates. So we left the engines intact, flushed and inhibited the interior spaces and saved ourselves $30,000 and a lot of history.)

Assumption 4: It's a one-off cost

Is it?? Sit down and imagine what will be happening to your object (and your funding) in 2, 5, 10 and 20 years.

At the start of a large technology project enthusiasm is often matched by money – grants are awarded to set the object or site up as a heritage resource. However few governments or private sponsors are interested in putting money into general maintenance, and money to do a big overhaul on an object is unlikely to become available more than, say, once a generation. So by and large, future costs for objects must be met by future income.

Firstly you need to estimate the annual costs for maintaining the object. For static objects the costs will mainly be "tender loving care" – regular inspection, dusting, lubrication and pest control. This sounds simple, but you need to make sure your display design gives you enough access to do your maintenance, that you have equipment like scissor lifts to get to the difficult bits and crucially that you have

someone responsible who makes sure the maintenance happens. For running objects there will also be exercising, servicing, periodic repair (say an average of two repair jobs a year), fuel, and training, licences and insurance for the people who operate it.
Secondly, every 5-10 years you need to add in time and money to manage slow, cumulative change - renew coatings or inhibitors that are past their use-by date, reassess whether working objects are still safe and reliable, train new people to repair and run them.
Thirdly, you need to look at the long term plan for your organisation. You want to keep your objects in good condition, because in 10-20 years you will probably be looking at renewing displays or improving your site, not re-restoring objects you restored earlier. However you may be able to treat really big objects or collections in stages, perhaps coinciding with staged plans for your site. This way you may be able to get new funding and new corporate enthusiasm for each stage.

Assumption 5: Everything will be finished by date X
And pigs can fly! Large technology projects generally take months or even years to achieve, while management, sponsors and government departments all tend to change their budgets, their deadlines and their minds on a much shorter timescale. This means that as the project progresses you may face unexpected treatment problems, drastically reduced deadlines/budgets or major changes in the aims of the project. How do you cope and stay sane?
At the Memorial we have found that the Stability, Safety, Handling/Operation and Aesthetics headings can help here, as they make it easy to see what will be affected if you cut some parts of the project out. You also need to check exactly what needs to be achieved for what reason and when – for instance what is absolutely essential for the grand opening of the display and what could be done quietly after the opening?
Another solution can be to change your approach to a problem. For instance, stabilising corrosion by applying protective coatings takes workshop space, lots of time and expensive materials and may need to be repeated every few years. Can you address the root of the problem instead and make the object's environment less corrosive? This will have the benefit of preserving any other objects in the same space.
But the most important thing of all is to get your managers and sponsors to understand what you are doing and to share in your enthusiasm. If they don't think what you are doing is worthwhile the project will be cut quicker than you can say "knife". And getting these people interested goes right back to the first point – finding a way to help them make a personal connection to the technology. And the more you know about what makes the object special and unique, the more of its history you have found and preserved, the better your chance of finding the angle that gets them hooked.

References:

1. The Burra Charter (The Australia ICOMOS charter for places of cultural significance), 1999, http://www.nsw.nationaltrust.org.au/burracharter.html

Action plan for industrial monuments – a German attempt to improve the management of large sites

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Keywords: industrial sites, maintenance strategy, preservation, heritage-protected industrial sites, action plan, clients, interdisciplinary approach

Industrial sites are increasingly being turned into monuments, both as a result of deindustrialization and because they give identity to a region and symbolize the industrialized era; sometimes, however, it is simply a matter of saving the cost of an environmental clean-up!

The usual problems associated with the maintenance of a monument are dramatically exceeded in both character and complexity with industrial sites, because they often involve a huge physical expanse and a complex structure with a complicated range of diverse materials. Moreover, they are often laden with toxic substances and they were never designed to last for centuries.

Shortly before shutting down, a great deal of wear and tear occurs at industrial sites for economic reasons. Between shutting down and acknowledgment of the site as a monument, several years of vandalism normally occur. Both scenarios might be avoided if only the heritage status of the site were to be identified in a more timely fashion…

After becoming a cultural heritage site, there are often very limited financial resources available – insufficient to cover the costs of proper maintenance. At the same time, access is a high priority for the public authorities. Maintenance and public access are thus forced into an unholy alliance. The owners of industrial monuments feel pressured to solve all of these problems at the same time. Estimating the scope of a project develops slowly; frequently it is only applicable to a limited part of the entire complex. In some cases it is deemed necessary to sacrifice the greater parts of the site in order to “save the rest”.

With this in mind, a maintenance strategy, in line with practical experience, should be developed for the preservation of heritage-protected industrial sites. The plan of action should follow four basic

principles: First, the main focus should be the unity of the site, buildings and equipment; secondly, maintenance should be based on priorities; third, an action plan should make possible an assessment of related expenses and time-frames; and fourth, the defined goals of the project should be achieved before maintenance measures are introduced.

Our action will be based on an interdisciplinary approach. Members of our working group will cover experience from documentation and inventory, structural analysis, corrosion protection and material science, clean-up of former waste deposits, conservation and restoration, practical application on monuments and, last but not least, client needs.

As examples we will discuss several industrial sites at the Rhine-Ruhr Area: The blast furnaces of the Henrichshuette at Hattingen and Meiderich / Duisburg as well as the coking plants at Zollverein / Essen and Hansa / Dortmund. These sites show a wide range of different maintenance-related questions. Right now, most of them have not been sufficiently resolved.

The clients can benefit from the plan because they can guide and shape the long-range development of the site in both qualitative and quantitative terms. By virtue of its model character, the plan can also be adapted to other large objects without any problems.

“Chance Denkmal” – An innovative sales practice for listed buildings

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As a part of the RAG Immobilien GmbH, the real estate branch of the RAG group, the Montan-Grundstücksgesellschaft mbH (MGG), owns and administers 115 industrial heritage buildings in the Ruhr and Saar regions of Germany. Many of these buildings are listed monuments with a considerable relevance for both the local and regional identity and, moreover, displaying exceptional architectural and urban design quality. The collieries, coking plants and former headquarters with their winding towers, pithead baths, gatehouses and halls in which the miners received their weekly pay bear witness to the industrial past of the communities. Having lost the purposes they were originally designed for, many of these buildings are currently not used and thus wait for developers and investors with new ideas to put them back into use.
With “Chance Denkmal”, MGG designed and implemented a new sales practice to quicker let entrepreneurs put their ideas into practice in industrial heritage buildings: 22 objects – both individual buildings and ensembles – had been selected to be assigned according to two tender and one competition procedures.

- The first tender procedure offered smaller scale buildings, linked to explicit use options, to real estate end users.

- The second tender procedure was addressed to real estate professionals. It dealt with larger buildings respectively complex ensembles which are suitable for different use options and/or combinations among these.

- The third procedure, the “Chance Denkmal Award”, was looking for the most innovative ideas and future use concepts for exceptional heritage buildings. These buildings were not sold to the highest bid, but awarded to the best concept in order to support its implementation.

Started in June 2006, ”Chance Denkmal“ was completed in December 2006. To promote the project, MGG wrote to 6.000 developers, estate agents and architects and informed the public by means of press conferences, publications and advertisements. All 22 objects were presented to the interested parties during a kick-off event and several site visits. The interested parties where given four months of time to put together their use concepts and bids and to organise their finance.
The result of “Chance Denkmal” is worth looking at:

- In the context of the tender procedures, seven buildings could be sold by today. Moreover, additional 10 buildings are currently subject of negotiations.

- Within the competition procedure, the Zunft AG was awarded the first prize for its both conceptionally and economically convincing vision to develop the 1959 built so-called “Kammgebäude” of the former coking plant Zollverein in Essen-Katernberg into the Zunft[viertel] Zollverein, a communicative quarter incorporating manufactures, studios, regional handcrafts, retailing and gastronomy. The Zunft[viertel] is themed around topics such as wood, textile, design, metal, jewellery, leather, porcelain and glas, providing quality products for daily use. The “hall of manufactures” is joined by smaller studios ideal for tailor-made clothing, shoemakers, design products and cabinet makers. The concept is completed by a market for quality food and wellness and healthcare services. The concept covers 11.000 sqm of floorspace with the architectural design being elaborated by Koschany + Zimmer KZA from Essen.

Evaluation and future prospects

Selling one third of those objects formerly tagged “not marketable”, Cance Denkmal proved to be a successful sales practice for listed buildings. With 10 more buildings still under negotiation, more sales are likely to come in the near future.

Because of this success, MGG is working on the continuation of “Chance Denkmal”. Here, the time frame for the objects’ availability and their potential use options play a major role. To further increase the practice’s success, the scale and the regional setting of priorities together with the required scope of documents to be handed in are currently assessed.

Big Stuff – Big Difference – understanding the archaeology, significance and impact of industrial heritage projects

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Introduction

Any project to conserve an industrial site needs to start by understanding what is there and why it is important. And ideally it should end with another kind of understanding - understanding the economic and social impact and benefits that the project has delivered. Yet too often the first is seen as a luxury, and by the time the project is completed everyone has forgotten about the second. But unless we understand what matters about a site we cannot conserve it properly. And if we do not bother to understand the impact and benefits of heritage projects, how can we make the case for further investment? This paper will explore the role of understanding in the conservation of industrial heritage.

Informed conservation

In the first part of the paper I will look why it matters to understand industrial sites and how that understanding can inform conservation decisions. The City of Adelaide for example is a historic ship whose current future is uncertain and there are proposals to cut it up and put part of it in a museum. But the only way of knowing whether that is the right decision is to understand the ship – what it is, what survives and, most importantly why it is important.

In another example, the Free Bridge was a 1922 listed concrete bridge across the Ironbridge Gorge. But there was a decision to make – was it better to demolish the bridge and build a new one on the site, or protect the bridge and build a new one which would destroy the famous view through the Ironbridge. Following extensive research and archaeological evaluation we decided that the bridge was not important enough.

In contrast, Newdale was a complex of industrial buildings built in the 1750s. The coal board wanted to demolish them and a decision was made without enough information. We were allowed to undertake archaeological research, and the more we learnt about the importance of the buildings, the more we realised that a bad decision had been made. These were hugely important survivals from Abraham Darby's industrial works.

These examples show why it is important to understand sites before decisions are made and not afterwards. This is even more important for industrial sites as people so often assume they are not important or that it "will all be in the documents". It is vital to understand their pattern of construction, evolution and use, the role of machinery and how they worked.

Heritage values

But more importantly – that understanding needs to lead to some sense of value – what is important and why. The Australian Burra charter has lead the way by showing how values can contribute to conservation decisions, and in the UK at the moment we are looking at ways of incorporating this into conservation. Industrial sites pose special problems in dealing with values – as they are so often recent and hold difficult memories for people. Yet this is why it is so important to understand their value.

Economic and social values

There are other values to heritage – in particular economic and social values. For the past 5 years I have been working with the Heritage Lottery Fund in the UK who have given more than £630 million to hundreds of projects to conserve the industrial heritage. That includes more than 50 locomotives, 70 ships and boats and 140 inland waterway projects, as well as funding to each of the UK's eight industrial heritage sites.

HLF has been evaluating the impact and benefits of that funding to industrial sites. In particular it has looked at the impact on people, and what difference it has made to their lives.

For example, the Fund has looked at enjoyment and what visitors get out of visiting heritage sites, the benefits that they get from participating in heritage projects, and also the economic impact of heritage projects. Using examples of industrial heritage such as Chatham Dockyard, the Anderton Boatlift and the National Coalmining Museum for England, I will show what kind of difference industrial heritage projects can make to people and to the economy.

Ultimately, however, there are limits to what heritage can do – by itself investing in heritage projects cannot overcome long term economic problems, such as that found in the former coalmining regions of the UK. But heritage projects can generate value for the public in different ways – including making a difference to the quality of life.

Conclusion

It is essential to understand the value of heritage – both at the beginning of a project in order to inform decisions, and afterwards to understand what kind of difference heritage can make. In England we

had a conference entitled Capturing the Public Value of Heritage (the papers are at www.hlf.org.uk) which showed that people value heritage in many different ways. As industrial archaeologists we often have trouble in getting people (even colleagues) to understand the value of industrial heritage and so we are used to having to make a special case. But as a result, I think we have something to teach the rest of the heritage world.

Yet there are still challenges. Sites like Chatterley Whitfield Colliery in the West Midlands which is the best preserved colliery in the UK nevertheless remains a problem, with a lot of local skepticism about preserving it. The site is too big to become a museum, and too expensive to simply be conserved with private sector funding. There is still a long way to go before we can convince people of the value and benefits of saving.

THE INDUSTRIAL HERITAGE OF MODERN IRON- AND STEELMAKING IN EUROPE: PRESERVATION BEFORE EXTINCTION

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Summary:

The preservation of modern large scale 20th-century ironmaking plants in Europe is developing in an amazing way – recently protected modern blast furnace works in Portugal, Spain, Italy, France, Luxembourg and the Czech Republic are favourably completing the already well known examples in Russia, Poland and Germany. Blast furnaces as monuments of industry seem to become a fashion, although measures for long time protection and conservation are just in their first experimental stages and have to be developed further.
On the other hand, the protection of technical processes like steel-making, either in Bessemer-, Thomas-, Siemens-Martin, Oxygen- or electric furnaces has not developed on the same scale. Also the first continuous casting machines, large format rolling mills and the remains of other related manufacturing processes have not been preserved as monuments of this fast changing and rapidly vanishing industry. The smaller examples of these works are just in the last stages of their production- and economic-life cycle, so the protection of at least one specific example of each type becomes an urgent matter. The scale of these works and the problems of their protection and conservation however demand a coordinated European approach.

A. Monuments of industrial pig-iron production:
The first preservation success in the iron producing industries had been the well known Sloss furnaces in Birmingham/Alabama in the USA and in Nishni Tagil in the Urals. The two blast furnaces with related installations in Sloss are owned by the town of Birmingham and are open to the public since 1983. The similar plant in Nishni Tagil is part of the museum of the local steel making complex and adhering town and became known in the West only after the liberalisation in Russia since 1990. Lesser known examples of early conservation are the Higashida furnace No. 1 in Yawata in Japan, dating from 1901 and restored in 1973 to become incorporated in a „Memorial Park“, and the small Starachowice furnace in Poland, owned formerly by the museum of the STAR-truck building company and now in the care of the regional conservation office. A recent surprising discovery is the „Parque Fundidora“ in Monterrey in Mexico, which uses the site of the former pig-iron and casting plant. The blast furnace No.3 is part of this recreational park and open-air museum.
In the last years many countries in Europe preserve blast furnace plants as protected monuments or plan to do so. In eastern France one blast furnace with cowpers, blowing engine and coke batteries of the Uckange plant is under protection. Future plans include the partial conservation for cultural and museological purposes. The two very large blast furnaces of the Belval plant in Southern Luxemburg belong now to a state-owned fund, that is to restore them as monuments of the industrial history of Luxemburg. This plant shall also

become the centerpiece of a new development area for offices and living quarters. In Sagunto in Spain a single isolated blast furnace has been renovated for a total of 1.1. Million Euros. It is the last reminder of the once important Altos Hornos Mediterraneo – Blast Furnaces of the Mediterranean. The site of this large plant is today a seaside industrial development. Of two blast furnaces saved for some years in Bilbao in northern Spain, only one will survive, receiving money now for stabilizing and conservation. The only blast furnace of Portugal in Seixal, near Lisbon, was blown out in 2001. Plans for its protection as part of the ECO-Museum Seixal are in discussion. Parts of the former ILVA works in Bagnoli, at the bay of Naples, will be included in a town rehabilitation scheme. The ore and coal staithes are already used as a public promenade, whilst the preservation of the surviving blast furnace and the oxygen steel plant is not yet sure.
In the Czech Republic an outstanding example are the Vitkovice integrated Iron Works in Ostrava/Moravia. The Hlubina coal mine, the coke plant and three blast furnaces are protected monuments and in course of renovation, which should be finished in about six years. Other parts of the large area will be used for new industrial development.
Germany plays an important role in the conservation of blast furnaces. Following the examples set by Neunkirchen, Voelklingen, Duisburg-Meiderich and Hattingen, two more plants are now protected or at least scheduled to be protected. Two blast furnaces in Dortmund-Hoerde´s Phoenix-West plant survived the closure and partial dismantling and the transfer to China. Again the area around the furnaces and their associated installations is to become the center for a new industrial development. The structural framing of one of the furnaces is now being examined for new uses and additions. The small furnace of the Maxhuette in Bavaria could play an important role in a monument with a complete production line from raw iron to the final sales product, which will be discussed later.
There are now 16 large and modern industrial blast furnaces conserved in Germany, a nearly inflationary number. They have different sizes, but follow the standard pattern of the steel-cladded furnace with refractory bricks and independent scaffolding for maintainance and charging stages. Differences lie in the charging systems: While most of the furnaces use skip inclines, the Maxhütte used a bucket system with vertical elevator and Völklingen a complex suspended monorail system with powered skips. Also only Völklingen keeps the original sintering plant with four bands, a pioneer installation developed by the Lurgi company on the basis of the Dwight-Lloyd-process.

B. Conservation and reconstruction policies

Experience of the last twenty years shows a certain similarity in the saving, conservation and use of blast furnaces plants as monuments. After the end of production there is mostly some time of non-activity, with neglect or in the worst case cannibalisation and vandalisation of the plants. Some of the above mentioned examples still remain at this stage, others are kept well protected, but with no further conservation activities. In the second stage, after political discussions and final acceptance, the raising of funds and developing of long term plans, first activities for serious conservation and restoration works start. Some examples like Yawata, Sagunto and Hattingen were professionally rebuilt in a short time as monuments and museum-pieces, mostly in a „like new“-look. Other examples follow a different approach, as executed in Sloss, Nishni Tagil,

Völklingen, Duisburg-Meiderich and Vitkovice: In a long-term program, step by step conservation and repair works are executed if and when necessary, either by jobless workers schemes or on demand by professionals. Both approaches can lead to different results, the second seems to be more „monument-sensible“ and is sometimes cheaper.

C. Adaptive Reuse

Most raw iron plants are situated on vast sites with plenty of open spaces, so large areas can easily be reused. The names Memorial Park Yawata, Landscape Park Duisburg and parque fundidora Monterrey give already an impression of the ongoing, but now public use as industrial landscape. Similar plans exist for Bagnoli. Workshops and administration buildings may easily be reused, as can be seen in Duisburg, where nearly all buildings have new occupants and users. But adapting complex technical structures and aggregates, like the blast furnace itself and his related machinery is nearly impossible. In the examples of Dortmund and Belval, adaptive reuse is very dense and intensive. Large areas of these sites will be built up with new, so called future industries, like laboratories, development centers and offices. The blast furnaces will only remain as historic islands confronting a modern neighbourhood. The sites of Voelklingen, Hattingen, Nishni Tagil and Starchowice are purely museums of their own. Voelklingen as a World Heritage Site demands the greatest efforts in authenticity and conservation.

D. Monuments of industrial steel production

The development of modern steel production went from puddling furnaces to Bessemer and Thomas converters, Siemens-Martin furnaces, oxygen converters and electric furnaces. Nearly two thirds of the steel worldwide is produced in oxygen-blowing-processes, the other third mostly in electric furnaces using scrap iron and steel.

Only some puddling furnaces have survived. The reerected one in Blists Hill Open Air Museum near Ironbridge can be used. Bessemer and Thomas converters might still survive in production in eastern Europe. The last chance to protect a complete Thomas plant in the west was missed as late as in 1995 in Unterwellenborn in Eastern Germany. Some converters survive as isolated objects in museums or as open air monuments. Also Siemens-Martin furnaces might still be producing in Eastern Europe, in Russia, the Ucraine and Roumania (Huneodora), but their future fate is of course uncertain. The Brandenburg steel works near Berlin, erected after the Second World War consisted of an impressive line of 12 large SM-Furnaces. One of these today survives in the original building and forms the center of an Industrial Museum.

The modern Oxygen-blowing-process, developed and introduced in Linz and Donawitz in Austria since the year 1952 („LD-process“), was able to substitute most of the former steel production methods. Although relatively new, only little remains of the pioneering installations. The hall of the first LD-plant was dismantled in the spring of 2000, only one of the 30 ton-converters was transferred to the Vienna Technical Museum. One oxygen-converter is still remaining in place in the Bagnoli plant in Italy.

The preservation of modern steel-producing-plants in Germany has not been finally successful. Four sites were in discussion:

1. The combined Oxygen- and Electric Furnace steel work in Hattingen. Although an ideal addition to the already existing museum with its blast furnace, this plant has been scrapped.
2. The large scale oxygen-steelwork in Dortmund-Hoerde, formerly Hoesch´s Phoenix-East plant, was documented and evaluated as technical monument, but was due to political and economical reasons dismantled and sold to China.
3. The two electric furnaces of the Guthoffnungshuette Oberhausen-Ost were discussed as part of a theme park, as attraction for the nearby giant „CentrO“ merchandise market, but have been dismantled recently..
4. The steelworks of the closed Maxhuette in Sulzbach-Rosenberg in Bavaria would have been ideal for protection and display. Its small size (three 60 tons converters), location in a full production line and special technique (bottom blowing) makes it especially valuable.

All these plants also featured modern continuous casting machines – one of the most important innovations in the steel production of the last 40 years. The caster in Hattingen, built 1967, was one of the oldest of its kind in the world.

E. Monuments of rolling mills

Informations about older rolling mills in Europe are scarce. Complete industrial rolling mills preserved in situ are very rare. Again Blists Hill features a translocated small working mill beneath the puddling furnace. Parts like frames and rolls are collected in several industrial museums all over Europe, for example in Fond de Gras in Luxemburg, in Gyöngyös in Hungary, in Sweden e.a. Three old rolling mill streets are still in use in Völklingen, dating partly from the beginning of the 20th century. The Maxhütte in Sulzbach also used its older lines until the end of production in 2002.

Many early rolling mills were driven by extremely powerful steam engines. Many of these engines are preserved and translocated to different places. But two are still working in Völklingen: One is a double-compound-three-cylinder engine with a maximum output of 14.200 hp and another double-compound-two-cylinder machine with 8.300 hp. Maxhütte in Sulzbach used until 2002 two double-compound-two-cylinder engines from 1911 and 1913 with a maximum output of 14.660 hp, which still remain in their original place.

F. Conclusion

Monuments of raw iron production, especially blast furnaces, are spread all over Europe. Curiously neither England nor Sweden, once the most important iron producing countries in Europe, possess industrial-sized and complete blast furnaces as monuments. Germany has the largest number and probably now the most experience in the conservation and renovation of blast furnaces plants. Missing parts in a complete documentation of the iron and steel industry are the steel production with its various methods and the adjoining processes like casting and rolling of slabs, profiles and sheets. Chances for conserving such industries still exist, partly in Germany and other West European countries and possibly in eastern Europe. But the political and economic changes in the Eastern countries make conservation projects of this scale very improbable. A survey of the existing plants of historical interest has yet to be carried out.

Even in more wealthy countries, like Germany, the conservation and protection of important examples is not always possible. The Maxhuette in Sulzbach-Rosenberg could be the ideal object for a linear presentation of all processes,

beginning with the raw iron production in a blast furnace, mixing of the iron in a 1.200 tons mixer, reducing to steel in three modified oxygen-bottom-blowing converters, pouring into a continuous caster and rolling of rails and profiles in a mill, driven by steam engines from 1911, all very compact on a small site. The small size of all installations would be very favourable to conservation and reconstruction measures. But problems with the owners, the state bodies, political and also economical difficulties leave the protection of this site uncertain, although Maxhuette already is a listed monument.
Informations about valuable objects in this field should be spread in conferences or for example in the TICCIH-Bulletin. Exchange of experiences in the documentation, evaluation and conservation of large industrial monuments should develop further. After the opening of the eastern European countries, more informations about their once secretive industries must be collected and published.

Sources:

The standard book on blast furnace sites still is Rainer Slottas Volume 5 of the series „Technische Denkmäler in der Bundesrepublik Deutschland“, published by Deutsches Bergbaumuseum Bochum 1988. Naturally by now, it needs actualisation.

I would like to thank many people who gave me informations, especially Mr. Toncour and Mr. Rudack of the Verein Deutscher Eisenhuettenleute („Association of German iron smelters“) in Duesseldorf. Their worldwide data-base of the iron- and steel industry is a very valuable tool.

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Coatings for Industrial Heritage Surfaces– between the poles of aesthetics and durability

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Introduction

In Germany, outstanding basic industrial sites are increasingly being classified as monuments, as part of the progressive process of de-industrialisation. Some of these monuments, like the Zollverein Mining Complex in Essen, the Völklinger Hütte and the Rammelsberg mine in Goslar, have even been inscribed as world cultural heritage sites. It was never foreseen, however, that industrial sites should have a permanent life. Thus the wish to preserve the architectural evidence of the industrial age and to present it to the general public has given rise to new challenges, especially in the area of restoration and conservation. One of the major challenges is how to treat iron and steel components which have been exposed to the vagaries of the weather and are therefore at risk from heavy corrosion. This paper will present a brief outline of the conception and results of research to date on the assessment of coating systems.

Research approaches to transparent corrosion protection

Standard concepts on repairing major industrial sites consist of drastic measures to clean and treat corroded metal surfaces. These range from a complete removal of the old coatings and layers of corrosion to exposing naked metal surfaces, and their subsequent coating with a multilayered pigmented paint system. The processes have been technically matured and generally established. That said, they fundamentally change the appearance of the treated surface and lead – as intended – to a new surface (with a high potential for protecting the metal beneath from renewed corrosion). Starting from a conservation point of view, some may consider that there should be limits to such measures when working on monument objects. But we have to differentiate different cases. In the times of industrial operation many surfaces had a regular coating of protective paint, as was foreseen and implemented as a method of protection. These areas may be protected in the same way when the object changes to the monument state. For other areas of industrial monuments, where the "original" surface (as it appeared in its historical working context) has to be preserved in addition to effective corrosion protection, there exists a wish for "transparent" conservation.

A series of comprehensive studies has been made on the use of transparent coating materials, in two major research projects: These are 1) ”Korrosionsschutz für umweltgeschädigte Industriedenkmäler aus Eisen und Stahl” (1996 - 1999) and 2) „A comparison of conservation materials and strategies for sustainable exploitation of industrial heritage made of iron and steel - CONSIST“ (2005 – 2008). Alongside standard commercial, purely organic products (oils, waxes, transparent paints) a new group of materials has moved to the centre of research interests of DBM. At the Fraunhofer Institute for Silicate Research in Würzburg: namely, inorganic-organic hybrid polymers (ORMOCERe[1], Mottner 2006) were developed and tested for coating purposes together with the DBM. Studies have been divided into two major areas: time accelerated laboratory tests and field trials on selected objects.

[1] Marke der Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V., München

Laboratory studies

Accelerated tests in laboratories are a good way of selecting suitable polymer coating materials from a huge range of possible products. Special sheet-metal samples, part of which have been artificially corroded in advance and treated with diverse transparent protective materials are deliberately exposed to simulated industrial and condensation atmospheres in climate chambers. Routine evaluations are then used to assess what remains of the coatings and the amount of new corrosion. Other additional major sources of knowledge included in the studies are the appearance of the coating and the remaining transparency. In the future it is intended to devote further investment to methods of electrochemical impedance spectroscopy and optical image analysis systems.

Laboratory tests have shown that one of the most important decisive factors in coating iron and steel surfaces is the thickness of the layers of the conservation material. Thin coating layers are not sufficient to provide an effective protection from corrosion on steel samples e.g. in the case of a single coating of wax (this is also standard with other materials), but also in coatings of only ~ 10 µm, as achieved by a single application of spray or a manual application with a paint brush of low viscous ORMOCERs. It has been shown that an increase in the amount of the material used (a higher concentration in the solution, plus several applications equals a thicker layer of coating) is a decisive parameter for effective protection. Applying transparent inorganic pigments like glass tinsel can raise the level of thickness, and thereby the effectiveness of the protection. All in all, laboratory tests have yielded the following basic conclusions:

- The anticorrosive waxes which were tested are just as effective in protecting metals as transparent lacquers. Indeed, a few of them are even somewhat superior. This statement must be qualified because there have been no simulations of exposure to sunlight or continual rainfall. Both these realistic factors might lead to different evaluations.
- When comparing wax to lacquer, results have shown that the optical appearance of wax – a matt, unobtrusive surface – is superior.
- It is not possible to establish a pecking order in the case of anticorrosive waxes (waxes with added corrosion inhibitors), since the differences in quality are so slight, and are dependent on the test and the type of substrata.
- If we compare ORMOCERs with standard preferred lacquers (polyurethane systems), there are scarcely any differences.

Test surfaces on objects

All the promising products were subsequently tested on surfaces on model objects like the disused blast furnace site at the Henrichshütte steel works in Hattingen and the mineral processing plant at the Rammelsberg ore mine in Goslar. The main location for the studies has been the Henrichshütte. After almost 10 years exposure we are currently in a position to make the following summary (Conrads 2006):

- Transparent coatings are in no way a magic solution to the problem of protecting industrial monuments.
- All materials change the appearance of surfaces, even when they are transparent. A glossy appearance on services is an undesired side effect which can be quickly reduced by waxing.
- Transparent coating materials provide a temporary protection, even if periods of exposure are much shorter than with standard care systems.

- A careful, individual pre-treatment of surfaces(e.g. by a restorer) is very important, and may be decisive in terms of the durability of the coating. That said, because of the expense involved, such a procedure is very hard to implement when dealing with large areas on industrial monuments.
- The level of exposure to the weather concerning the areas to be protected is an important, if not to say decisive criterion when selecting coatings.
- In protected areas, waxes can easily compete with lacquers, the more so because they are much easier to "repair". When using waxes, those containing additional corrosion inhibitors are clearly more efficient than pure wax mixtures.
- Where surfaces are exposed to direct rainfall and strong sunshine, however, waxes deteriorate much more rapidly than paints.
- When talking about paints, at the moment the most durable coatings are polyurethane systems and ORMOCERs.
- The problem of lacquer systems (above all polyurethane) lies in the difficulty of removing them once more from the background, should this become necessary; and also in the subsequent re-treatment of the surface.
- Thus transparent coatings demand a high measure of responsibility from those responsible for the objects in order: a) to make the correct selection; and b) when considering the necessary conservation measures to be taken, right at the very start of operations.

Looking to the future

The performed studies have provided a good basis for assessing the various transparent coatings in respect of their suitability for protecting steel surfaces on listed buildings from corrosion. At the moment further studies are being conducted in a research project named CONSIST, in order to be able to judge the range of potential uses of transparent coatings. Here, beside the simple evaluation of the effectiveness and durability of the protection, the main features under consideration are the aesthetic aspect, their ability for further treatment, and the costs of the specific conservation measures. The use of pigmented systems with suitably matching colouring for rust areas is also being evaluated. It is only possible to provide a reliable result for the use of transparent coatings, when all these features have been considered.

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Preventative conservation of large scale industrial objects – the Victorian steamship *Great Britain*

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Keywords: wrought iron; chlorides; historic ships; preventative conservation; dehumidification; conservation management plan; macro-conservation

Introduction

The Victorian steamship Great Britain is one of the world's most significant historic vessels. The ship is notable as being the first ship to combine innovations that are now commonplace, such as a metal hull, engine, and screw propeller. When she was built, she was the largest ship in the world, and she later went on to become famous in the Australian emigrant trade and as a troopship in the Crimean War. In 1970, after great effort and expense, her rusting wrought iron hulk was salvaged from the Falkland Islands in a dramatic rescue and towed across the Atlantic to her original 'birthplace' in Bristol.

There, she was opened to the public, and a program of restoration was started. The approach followed was typical of that found with most historic ships, namely, to bring her back to one defined period in her life, disregarding other periods, and to treat preservation of the ship in the same manner as a modern, working ship. Thus, if an iron hull plate was badly corroded, it was cut out and replaced with modern steel plate. If electricity was needed on the ship, a hole was cut through the hull to run the cabling. The process of gradual replacement of corroded original elements of the ship's hull saw a dramatic loss in original material over the years and the distinction between what was original and what was new was in danger of becoming blurred.

After 30 years of this treatment - scraping rust, sandblasting, and painting - the ship was still visibly and rapidly corroding. Visitor numbers fell, and with them, revenue for maintenance. In common with many historic ships and industrial objects, the ship was in a downward cycle, with the root cause being the difficulty and cost of conservation. Eura's conservators estimated in 1998 that the vessel could eventually suffer a total structural failure and collapse within about 20 years.

In 1998, however, the UK's Heritage Lottery Fund provided support to commission a conservation-based approach to future management of ship. The work that followed lasted 6 years, and cost over 19 million Euros.

Initial conservation research

The scope of the conservation work was established by a Conservation Plan. This plan was in two elements: Part 1 identified the surviving fabric within the ship and dockyard, and evaluated the cultural significance of each element. It then laid out a number of conservation policies which were designed to retain the significance identified in the evaluation. Part

2 evaluated the condition of the ship and gave options for preserving the ship.

After establishing a documentary and nomenclature system within the ship, which allowed individual parts of the ship to be identified and described with precision, conservators from Eura Conservation mapped the extent of corrosion within the hull of the ship, and the level of chlorides within corrosion products. A high level of chloride contamination was evident in the lower hull, suggesting similar contamination within the parent metal. The upper exterior of the hull was photogrammetrically recorded, and an electronic survey of the entire hull and drydock allowed creation of a three dimensional CAD model, which was later to used to support the engineering and architectural support work.

The mix of corrosion products, acting in combination with high relative humidity in the ship's drydock and soluble chloride acting as an electrolyte, produced an active electro-chemical corrosion sequence. To prevent the corrosion, at least one of the agents of decay would have to be removed or negated. A range of options was investigated to achieve this, including aqueous washing, alkaline sulphite treatment; sodium hydroxide treatment; alkali washes; electrolysis; hydrogen reduction; inhibitors; cathodic protection; and desiccation. These were assessed according to their ability to fulfill the following criteria:

1. Long term retention of original material from the ship's working life;
2. Minimal intervention and reversibility of treatment;
3. Cost: This was assessed in terms of the estimated magnitude of the capital equipment required, the running costs, and the maintenance effort required;
4. Effectiveness of treatment in halting corrosion;
5. Effect of treatment on accessibility and presentation of the vessel to the public

The only options that allowed for long life expectancy were those that controlled the ship's environment. Drying the environment around the hull was the only feasible alternative within those options. It was to prove to be a technically challenging task that involved constructing an envelope around the ship and controlling the relative humidity within the space.

Experimentation

In order to make judgements on the design and operation of the controlled storage space around the hull, conservation scientists from Cardiff University experimentally examined the iron corrosion process, to establish the corrosion reactions that would occur as the metal dried, and to determine the effect of relative humidity on these reactions. Corrosion products known to exist in the hull were synthesised, and experiments were conducted in low humidity environments to examine the effects of these materials on pure iron powder in a climatic chamber. Analysis revealed the presence of three main corrosion products. At very low relative humidity levels β-FeOOH was found, becoming active above 15 percent RH, and also forming as a by-product of other corrosion processes. Extrapolation from survey data indicated however, that little of this product was likely to be present in the ship.

At 19% RH it was found that $FeCl_{2.2}H_2O$ dihydrate ferrous chloride took over as the most stable form of hydrate, but this form did not corrode the

test samples. By contrast, tetrahydrate ferrous chloride ($FeCl_{2.4}H_2O$) was the most stable form of hydrate at 22% RH. Because there is extra water in the tetrahydrate, it supports electrolytic corrosion and corrodes iron in contact with it. Consequently, slow corrosion occurred at 25% RH and rapid corrosion at 30%.
The conservation team thus recognised that to prevent the tetrahydrate from corroding the ship's iron, relative humidity had to be lowered to 20% so that the only the dihydrate would form.

The conservation design
Whilst conservation scientists were addressing the chemistry of corrosion, a team of architects and engineers was designing the controlled environment around the hull. This was determined by a range of financial, technical, and aesthetic considerations. Various structures were considered that would entirely encase the hull. The solution was instead to construct a horizontal water-covered glass plate around the hull, creating a seal at the ship's waterline. This plate extends from the hull to the edge of the drydock, and created a controlled environment within the ship and below the glass on the exterior of the hull.
The plate is constructed from169 laminated glass panels, each weighing around 400kg, supported by horizontal steel joists and glass beams. The surface area of around 1000 square metres is covered in 50mm of continuously flowing water, which keeps the surface clean and the temperature cool, while also giving visitors the impression that the ship is afloat. Within the drydock and within the ship local desiccation of the hull iron occurs by means of two gas-operated dehumidifiers which feed dehydrated air over the surface.
The design of the glass plate incorporated stair and elevator access, to allow visitors to descend 'beneath the water' to walk alongside the submerged hull. In addition to dessicating the hull, the dehumidification machinery thus also had to cater for moisture load from visitors, and the fresh air they need. The dehumidifiers also deal with door opening, water leakage into the dry dock, and leakage through the hull.

Treatment of the upper external hull
Sampling of chlorides from the upper external hull above the waterline demonstrated that there was little contamination in this area. The decision was therefore made that the upper hull could be adequately cleaned by mechanical methods and protected by a painted coating system.
Two approaches were adopted for cleaning. 80 percent of the upper hull was robust enough to be hydro-blasted with pure water at up to 2500 bar, cleaning the iron to SA2.5. This standard was that which was necessary to guarantee paint adhesion. The remaining 20% was too fragile for hydro-blasting, and was instead cleaned at 8 bar using a 'vacublast' and garnet powder choice. The metal was coated with a two-part zinc-rich wet application epoxy primer, a mid coat of two-part epoxy, and a two-part conservation-grade urethane sheen finish. This system combined the good chemical resistance of epoxy resins with the UV resistance of polyurethanes.

Hull strengthening system

Within the hull, finite element analysis revealed weakening of the frames and deck beams. The solution was to bridge gaps in the structure using new steel frame splints. These were attached to the hull using a hierarchy of intervention - existing bolt and rivet holes were used in preference, then stainless clamping systems. No iron could be cut or welded without written permission, and every element introduced into the ship was to be completely reversible. Where these supports and splints are visible to the public, they are left on open display but are painted a different colour to distinguish them from the original structure. The same hierarchy was used for all construction work in and around the dock and its buildings. The hierarchy gave contractors an agreed set of rules within which they could work, and assured the ship's owners that no historic or culturally significant material would be destroyed.

Applicability of current work to other objects

As with all conservation work, that performed on the *Great Britain* had to balance cost, technical feasibility, visitor access and aesthetics. While the costs of sustaining the controlled environment are high, the conservation work has, however, provided a period of time in which the ship's corrosion has been slowed dramatically.

The corrosion research findings attained to date have already been disseminated in conservation science literature. The results should be applicable to storage of iron in museums around the world, and will give museums information on how to store artefacts at a specific humidity and how to care for them if conditions change.

The creation of a large external controlled environment, and the non-destructive ship structural strengthening splint system are both applicable to other large scale projects dealing with historic objects of an equivalent level of significance.

Perhaps the most important legacy of the project was the successful application of conservation management planning. This gave the ship's conservators confidence in identifying original ship fabric, and assessing each element's historical and cultural significance. It established a clear way of determining the merit of different conservation and maintenance strategies, such that priorities could be established and scarce financial and human resources could be directed where they were most needed. It also recognised that the conservation work had to be accompanied by creation of a sustainable visitor attraction, which would generate sufficient revenue to fund future maintenance. Without the guidance provided by the conservation management plan, the ship would not have been saved.

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Abstract

Running an Industrial World Heritage Site: A prominent example – Ironbridge Gorge.

Ironbridge in the heart of England is universally recognised as the birthplace of the Industrial Revolution, especially in ironmaking. The peak of invention and activity lasted only around 100 years from 1709 to 1810, after which the area began to decline when raw materials were worked out and further developments favoured regions with better communications, especially those that could be reached by rail. A few large factories survived through into the 20th century, but most of the remains of the earlier period had fallen into decay. Fortunately there was little economic growth to replace it so it survived, and 40 years ago in 1967 the Ironbridge Gorge Museum Trust was set up to restore, preserve and interpret the remains of what later was to become the first industrial World Heritage Site – the Ironbridge Gorge.

Ironbridge in 1801

Derelict Tile Factory, 1970s

Restored China factory, 1984

The Museum is not funded by local, regional or national government. Instead, the Trust is a private organisation that covers 75% of its daily running costs by getting visitors to pay for admission and buying souvenirs. The rest comes from grants that can vary from year to year. In 1968 a government endowment of 5.5million €uros provided a revenue stream from the interest that could only be used for ongoing maintenance of the key monuments, with 1.5million of it made available for a major conservation programme in the 1990s. But historic monuments are expensive to restore and often after the work is done there is little visible on the surface to show for it. Old factories are also much more expensive to look after than modern buildings, but we have had considerable success over the years in raising money for large restoration projects. In almost all cases these funds are only for capital works. The hard part is covering the running costs. The trick, however, is to interpret these industrial sites in a way that attracts and excites visitors and we welcome around 300,000 of them each year. We have to find ways that make historical processes interesting to today's visitors, in subjects that are outside their everyday experience.

An 1832 blast furnace, (left) derelict in 1963, (centre) as part of the Museum in 1980, and (right) being conserved in 1993

With 200 staff and 150 volunteers today the Trust manages 34 historic sites spread over an area of 1500 hectares (6 square miles). Within these sites are 7 blast furnaces ranging from the 17th to the 19th century, and 4 complete factories covering the manufacture of cast iron, wall and floor tiles, porcelain, and clay tobacco pipes. There is also an Open Air Museum with mines, brickworks and the world's only producing wrought iron works. The paper looks at some of the key challenges there are when industrial processes are demonstrated using original equipment.

Blists Hill. Colliery winding engine demonstrated in steam on a daily basis.

Blists Hill Wrought iron rolling mill

We all know that the demonstrating of historic machinery is an inherently destructive process, but agree that this is acceptable because of the enhanced educational value, as long as a type sample is preserved somewhere in the country. The trouble is that there is still no national database of all machinery 'in captivity', so what may have been an ordinary every-day survivor in the 1960s could have become the only one of its kind today – and one that is being used, maintained, repaired, and thereby altered. Preserved working locomotives are the obvious example, where during their working life every part has been replaced so that nothing of the original remains. Further work has to be done to create reliable lists of *unaltered* machines. Currently this type of information can only be gathered by consulting widely with one's colleagues – and that required a considerable amount of accumulated experience that only comes with time. A UK national maritime register of historic ships is being compiled, and in the past we have undertaken a listing of Social & Industrial History collections in our region, but it does not cover the whole country.

A working machine helps us not only explain the conditions people used to work in, but also the status of the engineer, the way our lives changed with the availability of cheap goods, the wages they earned and their position in society. In short, the history of technology is also the history of people, and people are often far more interesting than a piece of machinery. To an ever declining number of older visitors the working engine reminds them of their early years, but to many younger ones we have to go back to basics and even explain what that black stuff is they are burning in the boiler. So the working machine is the key that opens the door on a fascinating past. Nowadays you can still go underground in 'museum' mines, which are vividly brought to life by ex-miners. But what will happen in 20 years time when the current generation of retired miners are too old? Will we have any engineers who know how to look after the old machines?

Let's take a closer look at one example. Throughout the 19th century wrought iron was an important material. The last working factory closed down in 1976 and the Ironbridge Gorge Museum acquired much of the equipment and re-erected it at the Blists Hill open air museum. We invited the recently-retired workmen to train a new generation in the largely manual process, passing on their trade secrets that were only shared as part of a long apprenticeship. The process is dramatic and visually exciting, and of great interest to visitors standing a safe distance away on the viewing platform. But wrought iron has little market value when steel is less than a tenth of the cost. Our hope was that we could make this special material for conservation purposes, for the restoration of 18th and 19th century decorative metalwork. But the furnaces eat money!

Blists Hill Wrought Ironworks

When they were rolling metal on a daily basis the workmen got a feel for quality, were able to make a consistently good product, often through an acquired knowledge of the correct colour and shape of the flame, and how the material felt. That's repeatable where you can run a historic process on a daily basis, but the demand for this very expensive material is relatively small, so the rolling mills are only operated once a month. The equipment is heated up from cold, run for a few hours, and allowed to cool down. As a result the furnaces expand and contract when they used to be kept alight for months on end. This causes failures that are expensive to repair and adds to the commercial cost of the material. We no longer puddle iron from scratch. Instead we re-roll scrap anchor chains, but that means we do not control the original quality. The conservation blacksmith who buys this expensive material deserves a quality product, but manufacture on this small scale means the demonstrators never gain the cumulative experience that is so important.

How can we solve this dilemma? Firstly we need to know there is a reasonable demand. Then we need to train a new generation of people to maintain the equipment and another team to work the metal. Only if there is continuous production can there be controllable quality. But only if there is sufficient demand can we have sufficient production. The one staff member who has the relevant experience is now too old to do the physical work. He can only describe and direct the process. He can't do the job himself. To save a working process like this we need a lot of money, reliable machinery and the skill of specialist craftsmen. If that investment is not found soon the process will be lost and the restoration of historic wrought iron with the correct material will be impossible. We know of no other producer anywhere in the world, and yet this vital factory only survives in a privately owned museum which depends on visitors paying to keep it going. This is a case for national lobbying by conservationists, historic building experts and heritage groups before it is too late.

Tracing history and path-finding at the World Cultural Heritage Zollverein

Dr. Ulrike Laufer, Essen and Berlin

On 14th december 2001 the colliery Zollverein, which was shut down in 1986, as well as nearby coking plant Zollverein, which had been in use until 1993, were oficially declared World Cultural Heritage.
The 100 hectares of land, that had been awarded, included an old and a new shaft, storage spaces and track systems. It also consisted of a little heap and the entire area of the cokery, boasting an impressive row of blast furnaces, workshops, labatories and warehouses, which had been built for the chemical processing of byproducts.
Colliery Zollverein was put into operation in 1851. It has been among Europe's biggest and most powerful collieries ever since. In 1961 the colliery first started to supply newly built cokery Zollverein, at that time one of the world's technically most up-to-date cokeries. The cokery was quicly expanded and already consisted of a row of 600 ovens in the seventies.
During a period of almost 50 years, Fritz Schupp, an expert in industrial archictecture designed the entire complex, and supervised its buliding process.
Apart from the impressive chimneybehind the boiler house, measuring 106 mts in height, hardly any important buildings have been torn down while the colliery was in operation.
Thus, Zollverein's unique arcitecture and autheticity were able to fulfill UNESCO's requirements for World Cultural Heritages.
At present there are two crucial issues at Zollverein; firstly the maintenance of the complex and secondly the transforming into an attractive tourist destination, with an inviting park and a carefully redevelopped "exhibtition landscape".
Before being shut-down Zollverein used to be a completely closed off area, designed solely for machines and industry, because of the huge number of tracks and tubes even dangerous for the workers. The new decisive challenge at Zollverein is know to save its identity and its demands as a World Cultural Heritage, to bring together the interests of the new users with those of the visitors who want to explore the beauty of Zollverein, its history and also its different cultural offers and events.
Working as guide and member of staff at Zollverein for several years the speaker has had the opportunity to gather experience of visitor's needs and wishes. Her most important wishes have not come true yet:

1. „Big stuff"- Zollverein needs an attractive heritage information center
2. Zollverein needs at least one viewpoint, offering an overview of the entire complex and it's surroundings that is publicly accessible.
3. Guidelines, such as designations and explanations of buildings and paths are needed.
4. Many visitors demand designated routes, in order to avoid missing some of the attractions.
5. True „path finders", especially young visitors, prefer to discover the area on their own. They are attracted by hidden paths and places and, most of all, things to discover and comprehend.
6. Last but not least: Zollverein should open more of its former workshops and halls not only for guided visitors but to all visitors to make them sure that they are really

Welcome at the World Cultural Heritage of the Ruhr area.

Ethical and philosophical issues of operating of functional objects; a developing approach

David Hallam, Senior Conservator
Collections and Research, National Museum of Australia

The major problem with functional objects is that the objects themselves have the capacity to work. Because of this inherent ability there are at present two common views as to the best way of caring for them.

Ethically we need to consider function as one of the significant material attributes of an object that needs to be conserved. We should not class operation as a deterioration agent but as an option available for interpretation of the object through the "storage and occasional use scenario". Function needs to be included in the significance assessment process.

Museums need to invest a little in the development of maintenance and storage materials and approaches for functional objects to ensure our engineering heritage is conserved appropriately. With this work we can forge a "middle way" between the two extreme approaches and adopt more maintenance and occasional use based strategies.

The ability to operate and function is an intrinsic property of technology objects which many conservators would rather ignore! Life seems safer that way.

When writing this paper I dragged through (English) literature searches and my electronic records of papers (published and unpublished) from the mid 80's to today (2007) and it amazes me that the ground has changed so little.

We still see the "conservation vs restoration" debate and the "use verses non use" saga.

We still seem unable to see the logic of the "middle way". Bob Barclay's wonderful book on the conservation of Musical instruments is a template for the way we should be going with technology objects conservation.

I will quickly pull some points from the literature then outline my own approaches to operation of Functional Objects. It is interesting to note my views have changed somewhat as the type of objects I treat have changed and risks have diminished.

In 1984 I stated;

"The major problem with functional objects is that the objects themselves have the capacity to work. Because of this inherent ability there are at present two common views as to the best way of caring for them.

The dilemma appears to be between use and non use of the object.

Just the fact that a object has been put into a museum is often used as a rational for either its use or non use. Little account is taken of how these affect its long term survival as a piece of useful cultural material.

In the first view use and wear are assumed to be directly linked. Wear aligned with uncontrolled degradation. Hence the object cannot be used.

Most museums fall into this trap.

The second view is often equally as simplistic in assuming that the object was designed to work hence it would be somehow unethical if it were not to do so even when long past its economic life. Hence the object is kept working even if this means it looses most of its original parts and heads towards a replica.

An example of this philosophy is the Shuttleworth Collection in England. Vehicles, motor cycles and 26 flying aircraft.

Running concurrent with that second view is the "Concourse" (or oldtimer) method whereby all machines are restored to a pristine "original condition" that never existed when the object was originally made or used."

Of course neither view is really sustainable."

Ethics, integrity and significance of the artefact

Significance is a difficult term to define in a museum context. What makes something worthy of preservation for the greater good of humanity? What about it warrants the expenditure of storage and conservation resources that attempt to prolong its presence as a community resource? Defining significance, the reason why an object is being kept in the collection, has pivotal importance to designing a conservation plan for an objects ongoing care. Without defining the objects significance questions such as it's potential uses in a museum cannot be answered.

Kuhn , argues that it is the "historical integrity" of the object that we are preserving in museums "Time leaves marks of a different kind on an artefact ... natural aging ... signs of past use and abuse ... traces that time has left on an artefact must not be altered- much less removed - ... loss of such evidence of past use and age also entails an inevitable loss of historical significance."

This theme is common of the "scientific conservation" approach - nothing is more important than historical integrity of the object, it provides a historical document, or primary source for interpretation of the objects significance.

Others argue that the conservation ethic approach of focusing on retaining material evidence is schizoid and should be abandoned for a new approach that has a primary objective of 'exploitation our artefacts for the public benefit'.

This kind of argument was further explored in the "Aircraft to Artefact: Exploring the principles of Historic Preservation" and " Risks and Rewards: Perspective's on operating Mechanical Artefacts" and it seems that we have got a more rational series of approaches over the last 10 years. Many of these are outlined in the papers of Wain, Hallam and Thurrowgood in "Bigstuff 04" and in Bob Barclay's wonderful book. Risk, Significance, Maintenance, Sustainability and Planning are all part of functional objects conservation.

Non-operation

Gillespie argues in "Aircraft to Artefact: Exploring the principles of Historic Preservation" that the risk of operating historic aircraft is too great due to the skills required and the outcome of mechanical failure. Most aircraft fall out of the sky if the engines stop or crash if pilot skill is not up to scratch.

Schlichting argues in " Risks and Rewards: Perspective's on operating Mechanical Artefacts" that important information is being lost by restoring objects to operate rather than preserving and conserving them. Initially he seems to be against all operation but this is not the case. He states "I see two distinct components in preserving and interpreting our industrial heritage. The first preserving the technology, and the second is preserving the evidence of the human component. We preserve technology by emphasising the function, the materials, the motion, the knowledge and skills, which is best done with a fully functioning accurate machine. On the other hand, we preserve evidence of the human component by doing all we can to conserve, intact, both physical and non physical remains of the object and its associated materials.

These two tasks are the root of the museums mandate, and cannot be done using the same artefact."

He also tries to dispel the "myth" that use preserves, but fails in my opinion as he draws on no solid data only generalisations.

Barkley on the other hand points to the undocumented work of "silent artisans" as a reason for the remarkable preservative qualities of use.

Ferrel in "Risks and Rewards" argues for preservation and interpretation as opposed to restoration and function. "Documents be they inscriptions on paper or three dimensional objects like steam locomotives, can be read. Each has a story to tell. And if a document is altered or corrupted its value as a source of information is compromised or destroyed"

He fails to recognise and address the added information that function adds to the object. I have argued similarly about the documentary nature of objects but have not used this as an argument for non-use. I now argue that we need to assess the significance of form and function to the story the museum wishes the object to tell.

This is best demonstrated in the National Museum of Australia (NMA) by the museums approach to the conservation of a 1860's Landau. We decided form (particularly the original surfaces) was deemed most significant so the coach now sits on a storage display trolley never to move on its wheels again behind a horse. (photo 1). Form is being conserved but the functional side of the story is being lost.

(photo 1)

Operation and occasional use.

Little scientific work has been done by museums or collection institutions on the affects of use and periodic maintenance on objects long term storage. This is amazing when we consider how much work has been done on the effects of light and relative humidity on objects in museums used in exhibitions.

Many authors in the “Risks and Rewards” argue that use is an appropriate museum activity. Many authors in this group discuss the risk of objects in storage or the degradation resulting from lack of care in storage and use this as an argument for use. Again much debate has been put forward as to whether the preservation or restoration approach is appropriate and should be incorporated in the operation of an object. Hence it has become a debate about restoration not running operation. Many of the supporters of operation do not see any worth in "original fabric of an object". To quote John Chapman "paint is a consumable item." I doubt he would say the same about a painting! Little discussion is encountered on maintenance and monitoring programs except for Mann and more recently Wain, Hallam and Paine. The connection between a sustainable maintenance program for a operational object and it’s preservation seems to be missing in many museums.

The NMA has a Murray River Paddle Steamer the Enterprise (photo 2). It’s function is deemed most significant, as are the skills of the engineers, through a volunteer program both are conserved. Surfaces and parts are replaced as required leading to a diminution of the original materials. The vessel is maintained in “continuance” (Barclay). Function is conserved. Skills are preserved. Original material is lost.

(photo 2)

Conversely the NMA has the Smith quartet, stringed instruments made by an Australian luthier. These instruments are played under a regiment of "exhibition/storage and occasional use" which allows us to conserve both form and function.

Wear

Wear is the main argument that is used to stop the operation of objects. I feel this is incorrect. Although wear analysis is done by WA Museum on a small scale no mention of it as a monitoring technique is made in the museum literature. It is a common industrial technique for ensuring that risks are minimised and catastrophic failure is avoided. By tracking wear the objects progress through its economic life can be plotted and failure avoided. Thurrowgood and Hallam have expanded on this with the concepts of "economic life" and "Just Noticeable Wear". We have found at the NMA that un-maintained, unplanned, intermittent operation gives us the maximum wear rates thru promotion of corrosive wear. We have also found that through use of appropriate maintenance, inhibition systems, oils lubricants and coatings that wear can be reduced to negligible levels.

Maintenance

Many papers have been published that discuss the problems of the storage of functional objects in a military context for periods of non operation. Dehumidification and periodic exercise are necessary to maintain functional objects in operable condition in long term storage. David Monthan Air Force Base (USA) uses natural dehumidification and yearly maintenance on its flying aircraft. Some aircraft have been stored for 20 years prior to being flown. Maintenance has always been recognised as being important to maintain operating functional objects in safe condition. The consequences of incorrect storage have been long known. Weil, among others, has recognised the need for conservation treatments to be based on sound maintenance to achieve the desired affect. Hallam and Ashton have out line the need for a maintenance and monitoring approach to the conservation of functional objects and that some objects may be in a operable condition to allow for conservation maintenance.

I believe that maintenance is the most cost effective way of looking after Functional Objects, even if that maintenance is just ensuring the objects is cleaned regularly, appropriately supported and stored. As the amount of use increases so to does the maintenance load. Eventually an organisation will find the load unsustainable. The trick is to ensure the operation of objects does not lead to cutting maintenance below an optimal level. This is one area in which museums need to do more work on appropriate maintenance programs for storage and use of objects.

A Middle Way

I believe that function is one of the criteria that museums and collecting institutions must consider when storing or using a functional object.

If we conserve a functional object without considering the roll of function we have not done our job properly. Form and function both need to be conserved. We need to consider the significance of both to appropriate engineering cultures.

Technically we have a trade-off – a sliding scale of what we consider important – form or function. If we decide form is most significant then our treatment will compromise function. Function is inhibited.

If function is significant then extensive use will lead to form being compromised.

I believe we can conserve both form and function if we follow Barkley's "exhibition (storage) and limited use" scenario. The NMA has done this with a variety of restored and original motor vehicles. The best example is the Bean car which Frances Birtles drove from London to Sydney in 1927. Functionality and original materials were all conserved. (photo 3).Appropriate inhibition materials and a sustainable maintenance programs, which may include running or "rotating", make the conservation of form and function possible. We have taken a similar approach with an original unrestored Outside Broadcast TV van. The van is drivable and TV channel still operates. Form and function are conserved.

(photo 3)

Wrap-up

Ethically we need to consider function as one of the significant material attributes of an object that needs to be conserved. We should not class operation as a deterioration agent but as an option available for

interpretation of the object through the “storage and occasional use scenario”. Function needs to be included in the significance assessment process.
Museums need to invest a little in the development of maintenance and storage materials and approaches for functional objects to ensure our engineering heritage is conserved appropriately.

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„Museumspath“ Zollverein – Ways through the industrial heritage

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Keywords: Zollverein, Museumspath, monument

Introduction:
In 1847 the story of Zollverein began with the sinking of the first shaft in Essen Katernberg. Only four years later the first coal was conveyed from a depth of 110 meters. The claim with a size of 13 km² was further developed and at this time there were four collieries with eleven shafts. Due to efficiency and modernisation measures the central colliery with shaft XII was opened. At this time Zollverein was one of the largest and most modern mines of the world.
After a production time of 54 years shaft XII was closed and the production period on the claim ended after 135 years. With the closure the colliery became a monument. In 2001 the cultural landscape and the colliery Zollverein were listed as a world heritage by the UNESCO. Listed are the colliery shaft XII, colliery shaft 1/2/8 and the coking plant.

Insight
In accordance with the statutes of the Foundation Zollverein the purpose is making the monument and world heritage Zollverein shaft XII an accessible experience. With the development and realization of guided tours along a circuit through the former decking plant we fulfill this duty. This so called „museumspath“ was created by the „Bauhütte Zeche Zollverein Schacht XII“ in 1998 and since 1999 the Foundation Zollverein is carrying on with it. Before arranging the museumspath there were only occasional guided tours by former miners and alumni. With increasing demand regular guided tours were initiated.
By now the Foundation Zollverein managed to increase the number of visitors from 20.000 (1998) up to 72.000 (2006) per year.
The „museumspath“ includes the plant and machinery in its original state which explains the way of the coal aboveground. This way makes the industrial heritage Zollverein accessible. It is a distinctive feature that the admission is restricted to guided tours.

Outlook
By suggestion of the office for preservation of monuments and historical buildings in 2005 the Foundation Zollverein got the order from its curatorship to work out a concept of the presentation „the way of the coal“ during guided tours. The previous stations of the tour will be updated and with new stations in the coal washing plant both parts will be reassimilated. Preparing the location Zollverein and the museumspath for future requirements is part of the plan to make it an attractive experience for all visitors. The concept attaches great importance to a visitor appealing presentation in line with generally accepted conservation practice.
With the closure in 1986 all machines were shutdown and cannot be put into operation again. Even if selected machines were put into operation again for presentation it would only be possible to show their basic functions. Therefore it is a duty of the museumspath to show and explain the partial complicated function in a lucent and comprehendible way without derogating the listed matter.

Perspective
The museumspath enables us to show the industrial heritage of the colliery Zollverein to our visitors and provide future generations an insight into the world of this colliery.

BigStuff07
Extended Abstract

BigStuff 07 Presentation 26/06/07 V6
Training of Volunteers in Aviation Conservation

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Good afternoon Ladies & Gentlemen. As you can see from the screen my name is Brian Barker. I'm from the UK and I am based at the Imperial War Museum, Duxford.

The museum, which is now Europe's premier aviation Museum, started life as an airfield during the 1st World War and then played a vital role in the 2nd World War. Initially as a Royal Air Force fighter station and then as an American fighter base. Today it is home to some 200+ exhibits and attracts visitors from around the world and in particular from the USA.
In the UK we have probably the largest collection of heritage aircraft in Europe. These are spread out at over 60 different locations ranging from collections like Duxford to collections where one aircraft is situated in a car park. Unfortunately the standards of care and preservation vary on the same scale as the size of the collections.
Most of these sites are operated and managed by volunteers many of whom have no employment background in aviation. What they lack in knowledge they make up for in enthusiasm.
Unfortunately, in many cases, enthusiasm is not enough:
For example, a Vulcan BMk2 aircraft, having been decommissioned by the Royal Air Force was flown into Blackpool Airport in 1983 – the aircraft had been obtained by a group of enthusiasts with the expressed intention of keeping it fully maintained and possibly in flying condition. This well-meaning group did not have the expertise to achieve their aim. Reportedly they failed to obtain any of the technical publications relevant to the aircraft nor did they purchase any spare parts even though they were in plentiful supply at that time.
Very little happened to the aircraft and given that Blackpool is a seaside location the heavily laden salt air soon started its inevitable destruction work. Despite several attempts to rescue it the object fell into a very bad state of repair. Eventually it became so dangerous that in 2006 it had to be sold for scrap!
This incident was not an isolated one and more exhibits are in danger of going the same way. To counter this the British Aviation Preservation Council – the body that links all of the aviation heritage organisations – formed a partnership with the Imperial War Museum, Duxford to attempt to redress the situation.
Together they were successful in obtaining a grant from the Heritage Lottery Fund which was to be used for providing training to BAPC volunteers in the conservation and preservation of non-flying aviation heritage exhibits.
(It is important to note here the distinction between flying and non-flying aviation heritage aircraft. All heritage aircraft that are actually flown must be maintained to standards set by National Aviation Authorities and as a consequence are in a condition that is far from the original standard).
Using the funds the partnership set up the **National Aviation Heritage Skills Initiative.** This was a groundbreaking project – the first of its kind in the UK and probably in Europe as well. Based on the original funding application the project was to have a life span of 5 years until Dec 2009.
The primary aim of the Initiative was to improve standards of conservation within the aviation heritage sector. Within the original application this was expressed as:

1. To design suitable training for volunteers in the conservation & preservation of aircraft.
2. To gain national accreditation for the training courses.
3. To provide that training, on site at Duxford and at BAPC member organisations across the UK.
4. To widen the volunteer participation base.

BigStuff07
Extended Abstract

I am here today to tell you something about how we got started, what we have achieved so far and where we hope to go in the future.
My role in this is as the Project Co-ordinator. I was recruited for the position having served 28 years in the Royal Air Force as an aircraft technician of which 8 years were directly involved in engineering training. The rest of the team consists of an Administrator who was seconded from the Museum, and 2 Instructors. The instructors are also both ex-Royal Air Force technicians with extensive experience in training; additionally one of the instructors had previously worked at the museum for 10 years as an Assistant Conservation Manager.
We formed up in July 2005. The first thing we had to do was develop a training strategy. This we did with reference to the Training Needs Analysis that had been carried out as part of the application process. What they did was send out questionnaires to both individual volunteers and to the management teams of the various organisations. The responses to these were carefully analysed and then presented to the Heritage Lottery Fund as justification for the training Programme. Having studied the application the training team found that there were a number of important constraints and factors that would impact on our decisions:

1. Training courses could not be longer than 1 day – volunteers said that was as much time as they were willing to give up to attend.
2. Training sessions must be available on any day of the week including Saturdays and Sundays.
3. Where possible training would be provided on site at the various member organisations.
4. Volunteers must be given the choice as to whether or not they wish to be assessed – it could not be mandatory.

Having taken into account these constraints and having closely examined the questionnaire responses and how they related to perceived areas where lack of knowledge was a factor we finally developed an initial Training Strategy.
Being experienced trainers and course designers we realised that this was just a starting point. It is important to recognise that the design process of any form of training must be the subject of constant review and testing to ensure that it remains appropriate and relevant.
If we jump ahead you can see from the date at the top this Training Strategy reflects the current position but as with all things in training every thing is subject to change. I think this is currently Version 12!! Fundamentally it's the same as Version 1 other than this one contains slightly more training modules because we found during the design stage that some subjects needed to be split in two. In addition we have introduced a series of presentations that are aimed at management level groups, typically these will last for approx 2 – 3 hours.
Another major decision that we had to make was the method of delivering the training. It had to be a consideration that the majority of volunteers in the aviation heritage sector are males over the age of 65. For the classroom elements we decided that participation in an interactive session with the instructor leading the conversation was the most successful method. During testing of the modules we tried the traditional 'chalk & talk' method where the instructor virtually lectures the audience but it was not at all popular. Given our chosen instructional format we decided to limit the class size to eight students; our experience said that an instructor could keep 8 involved but with any more someone might get lost in the crowd.
To support this style of delivery we put a great deal of effort into producing extremely comprehensive Training Notes with the intention that these would become reference documents for the future.
During the initial Course Design phase I made a point of going to various BAPC meetings and other organisations to advertise our activities and also to ensure that the team did not stray from the 'grass roots' requirement. We also produced brochures and posters which we distributed in order to keep the interest of our intended audience.
As part of the Training Strategy we produced a Volunteer's Log Book. These have since become exceptionally popular and volunteers are keen to show others the contents of their book:

Section 1 records all the training undertaken through this project.
Section 2 is for other forms of external training such as First Aid or possibly Fork-Lift Driving.
Section 3 of the handbook is probably a bit controversial. This allows organisations to document the activities that the individual is authorised to carry out**.** In our view organisations should authorise their volunteers to carry out certain tasks such as moving aircraft or operating various machines. In the UK under Health and Safety Regulations we believe this to be not just good practice but required practice. We have offered to assist any organisation that wishes to implement an authorisation process but does not have the necessary experience in such matters.
Finally Section 4 is marked 'Projects' and we encourage volunteers to record details of various aspects of conservation work that they have been involved in. This section has become a particular favourite and already we are seeing logbooks with some very impressive work records in them.
Another activity that started during the design phase was our bid to have our training accredited by an external educational body. Eventually we decided that City & Guilds was the most prestigious name that we could associate with our project.
Following many visits, much hard work and finally a full audit by City & Guilds staff we were accredited in May 2006. We now have to look forward to annual reviews to maintain our status.
As part of the City & Guilds accreditation we had to devise an Assessment strategy. Initially this was a bit of a problem. Things had changed dramatically from our time as trainers in the Royal Air Force where, in those days, assessment consisted of pass the examination or else!! We were very fortunate to secure the services of Cambridge Assessment, a commercial partner of Oxford, Cambridge and Royal Society of Arts examination Board. They gave us advice, ran a full day workshop and proof read our documentation – very fortunately all of this was free of charge thus I shall be eternally grateful. I am pleased to say that our subsequent assessment methodology met with the full approval of City & Guilds.
We held our very first course at Duxford in April 2006. The initial feedback from the volunteers attending training was very positive. As the number of modules has increased we see the same faces coming back for more and they still seem very enthusiastic.
As the range of courses has developed we have now started instruction on practical skills such as aircraft skin repairs and the application of protective treatments and paint finishes. In this we have been extremely lucky in that the Imperial War Museum has allowed us to take over a small corner of the main conservation hanger where we can hold training sessions.
This development gave rise to a new set of problems. First the training sessions must be held at IWM Duxford because of the amount of specialist tooling required and in particular access to a high-pressure air supply to power pneumatic tools. We were aware that most organisations did not possess this capability but we were of the opinion it was pointless to train volunteers using incorrect tools such as electric drills. For example a cordless electrical drill operates at about 1000 – 1200 rpm whereas a pneumatic drill operates at around 2200 – 3000 rpm. This difference is considerable and has huge ramifications when drilling out rivets to effect a repair or replace a component. We took the view that it was vital to show volunteers the correct techniques so that we might be able to influence standards from the grass roots up.
The second decision we had to make was to reduce the class size to 4 volunteers and where necessary to use 2 instructors. We decided that given we only had one day to achieve a number of training objectives it would work best with 2 groups of 2 volunteers, working as a team and each team being supervised by a dedicated instructor.
As I said earlier the one consistent point about training is the rate of change. So as we push on with course design I am certain there will be further alterations to our Training Strategy and delivery style.
As you will probably have guessed we cannot hope to train qualified engineers in a series of 1-day sessions. Our primary aim is to instil into the volunteer workforce a sense of empathy for the objects they work on and to make them more preservation and conservation aware. We firmly believe that we will have succeeded if when asked to carry out a task on an exhibit the volunteer asks **WHY!**
Unfortunately it is a fact that in the aviation heritage sector many volunteer run organisations believe conservation and preservation to be based around stripping all the paint off an exhibit and then

presenting it in a shiny new livery. Admittedly there may be occasions when this is a valid course of action, sometimes a necessity but not every time.
Presuming that the **WHY** question is answered then we hope that whilst carrying out the task the volunteer gives due weight to the knowledge that he has acquired from our training.
So that gets us to where we think we are today – what of the future. Indeed you might recall I said at the beginning that this project has a 5-year life span and is in fact due to close in December 2009, so is there a future?
The BAPC, its members, the IWM and the team firmly believe that this project is too important to disappear. We are actively pursuing a number of avenues:
First we are approaching various bodies, both public and private, to seek additional funding.
Another option is to run the Training Centre at Duxford as a commercial venture. Already we have had expressions of interest from Canada, Greece and Australia to provide similar dealing.
We are also keen to diversify and run courses for organisations in different sectors of the Industrial Heritage world. We believe that much of our course content can be delivered, with only minor changes, to Industrial, Maritime and Vehicle Museums and other general collections in the UK and possibly Europe.
To sum up the aim of the Initiative is: To provide conservation and preservation training to volunteers working in the Aviation Heritage sector on non-flying aircraft and exhibits.
So how do we know if we have achieved the aim?
Well we have certainly provided training – from Course No.1 in 2006 up to the end of June 2007 we held 110 Training Sessions for 780 Volunteers, of whom 425 have registered for the assessment programme. These sessions have included 18 different BAPC member groups around the UK.
We gained City & Guilds accreditation in 2006 and successfully passed our 2007 annual review.
When practical we do provide the training anywhere in the UK.
What about Widening Participation and have we made a difference?
These elements are not for us, the team, to judge so we have recently arranged for an external evaluation of the programme to be carried out by the Institute of Conservation. Their report will provide an independent assessment of our project and could be crucial if we apply for further funding.
Certainly those volunteers who have attended the training courses seem to be of the opinion that we are succeeding.

Thank you for you kind attention.

NATIONAL REPORT 2006
GREECE
Industrial monuments - gains and losses

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In recent years, industrial monuments in Greece have been taking a place of their own, maybe not the one we would wish for, but still a clearly recognisable place, among the monuments of culture.
In many cities of Greece, important high-quality projects have been completed in the last 15 years:
The Technological-Cultural Park at **Lavrio** in the metallurgy complex of the French Company, the Industrial Museum on the island of **Syros**, the olive-presses and soapworks of **Lesvos** island as cultural sites, the restored Tsalapatas Brick and Tile Factory at **Volos**, the Waterpower Museum in the watermills of **Dimitsana**, the Museum of the Olive at **Sparta**, and the Water Museum in the old waterpump-station of **Thessaloniki** are the most serious projects for the highlighting of monuments of technical culture.
Projects no less important have been carried out by the revival of a number of industrial monuments along the old industrial axis connecting **Piraeus** with **Athens.** These are the 'Technopolis' in the Gasworks and the "Melina Mercouri" Cultural Centre in the *Poulopoulos Hat Factory*, projects that were undertaken by the Municipality of Athens, the new School of Fine Arts in the *Sikiaridis Textile Factory* and the recent creation of two Athens Festival theatre premises in the *Tsaousoglou Furniture Factories* and the *"Sanitas"*
¨Paperworks. Also particularly encouraging is the prospect of the installation of the library of Parliament in the Public Tobacco Factory of Athens.
The Municipality of **Volos** has continued its utilisation of the city's historic industrial assets by the operation of the City Museum in what was the *Papantou Tobacco Warehouse*. This project is expected to be completed in 2008.
At **Karditsa**, on the initiative of the Municipality, the old water supply pumping-station has been converted into a museum. In **Thessaly**, a number of minor projects which involve the conversion of old industrial premises into exhibition halls and cultural venues are in progress (e.g., the *Hatziyannis olive press* in the Municipality of **Portaria**, the *Fappas flour-mill* in the Municipality of **Sipiada**, etc.).
In **Macedonia,** the Technology Management Department of the University of Macedonia has been established in the restored *Longos - Kyrtsis - Tourpalis Textile Factory* at **Naousa**. At **Veria**, the *Markos Mill* has been restored in order to house the city's Byzantine Museum, while at **Edessa** the restoration of the watermills continues.
During the past few years many positive steps have been taken in the field of railways to highlight the old nineteenth-century and early twentieth-century network. Good examples are the declaration as a monument in operation of the mountain narrow gauge rack-and-pinion railway alongside the **Vouraïkos** river in **Peloponnese**, the declaration of large sections of the railways and of the stations throughout Greece as monuments, the working restoration of the narrow gauge steam railway on **Mt Pelion, in Thessaly,** and the restoration of the railway stations in **Piraeus, Theseion, Monastiraki, Omonia** and **Victoria** for the capital's first electric-powered metro line.

All these projects have been based on, and have been completed thanks to a status of protection which took shape with the declaration of monuments, mainly in the 1990s. Unfortunately, during the preparation for the Athens Olympic Games of 2004, this positive climate was reversed. The "explosion" in the real estate market and the "priority" given to the organisation of the Games led the Ministry of Culture to a change of policy. This attitude has been persisting up to the present. During the last three years there have been lots of cases, in which industrial monuments have been frequently assessed for their uses not on the criteria of science but on exclusively market considerations. Their fate has been determined by the intention of the owners to escape from a burden and by the refusal of the state to support the cost of restoration with funding.
The result of this new attitude and practice has been the partial or complete destruction of important historic industrial units throughout Greece :
In **Piraeus**, the *Chemical Products and Fertilisers Factory* was demolished in 2003, the *Retsinas Textile Works* was destroyed at the same period by fire after it had been scheduled for preservation, and the *Saportas Tobacco Factory* was demolished in 2005. The *Cereals Silo* on **Kavala** harbour were also demolished in 2005. In **Thessaloniki**, the *Fix Bewery* is endangered by partial declassification. The *Hatziyannakis - Altinalmazis Flourmill* was also destroyed by fire in 2005, without having been the subject of a preservation order. In **Athens**, the greater part of the *Columbia Music Records Factory* was taken down in 2006, as well as the *Anatoliki Carpet Factory*, while a series of historic industrial monuments such as the *Lime Kiln* in **Galatsi** and the *Cardboard Packing Factory* in **Kolonos** are directly being in danger.
It is worth noting that at this same period, 2003 - 2006, thanks to the initiatives of groups of citizens, academic institutions and, occasionally, the municipal authorities, the destruction of other monuments, such as the *Kronos Alcohol Factory* and the *Iris Paintworks* at **Elefsina**, the *Votrys* and *Kambas Wineries* in **Athens**, and the *Matsangos Tobacco Factory* in **Volos**, has been averted.

Research and education

Research into industrial archaeology is nowadays carried out in a number of university departments in Greece, mostly of architecture and history.
In the Architecture Faculty of the National Technical University of Athens (*NTUA*), the "Historic Mines of the Aegean" research program has made a record of all the establishments of the nineteenth and twentieth century in the islands.
Two major historic industrial complexes, those of the *Chemical Fertilisers Company* at **Drapetsona (Piraeus)** and of the *Public Power Corporation* at **Ptolemaida in Macedonia**, have also been studied. There have been suggested re-use solutions for both of them. The first one was demolished, immediately after the completion of the research project, while for the second one the study suggested the setting up of an "Energy - Technology Park".
Within the framework of the postgraduate program on the protection of monuments of the *NTUA* a course on industrial archaeology has been included, and in recent years, scores of degree theses on Greek industrial monuments have been compiled.
At the *Thessaloniki Polytechnic,* a special postgraduate workshop was devoted for two years to the study of the *Fix Brewery* complex. At the same university, the Civil Engineering Department is elaborating models for the restoration of lighthouses within an international program.
Within the framework of the European inter-state action on "The industrial heritage between land and sea", which is directed by the Ministry of Culture, a workshop on the "Eco-Museum of the **Pagasitic Gulf**" took place in the Department of Architecture of the *University of Thessaly.* In the same

department, a research team studied the complex (machinery and equipment warehouses) of the American firm *Henry Boot & Sons* (**Trikala)** and suggested re-use solutions. This company had been carrying out land drying works in the plain of Thessaly from 1932.

The Department of History of the *Ionian University* has been carrying out since 2005 a research project on "Pre-industrial and industrial installations and techniques on the islands of the Ionian, 18th - 20th century". Within the context of the research are being recorded material remains, oral testimony, archival documentation, etc. in connection with each kind of productive installation which has survived in the Ionian Islands.

At the *Institute for Modern Greek Research* at the *National Research Foundation*, the three-year research program on the industrial heritage of the islands of the Aegean was completed in 2004, financed by the Ministry of Aegean. The historic industrial premises of the Aegean islands have been electronically recorded. A Conservation Workshop of historical industrial equipment, in the **Ermoupoli** Industrial Museum was co-ordinated and financed by the same program. A part of the data of the record of the industrial heritage of the Aegean has been incorporated into the digitalisation programme being compiled by the Institute for Modern Greek Research at the National Research Foundation and will soon be available on the Internet.

At the same institute is also being completed a research program on the preservation and highlighting of the industrial heritage, within the framework of which, and with the collaboration of the *University of the Aegean*, five doctoral theses are being compiled on subjects relating to the industrial heritage and ways of utilising this in industrial museums

A cultural authority of the private sector, the *Cultural Foundation of the Piraeus Bank Group***,** has been making important efforts of research in the field of industrial archaeology. At this Foundation, a research program on the recording of traditional workshops on **Mt. Pelion** is continuing for the sixth year. A series of research programs which frame the work on museums of the Foundation (see below), such as the program on the history of brick and tile-making, the history of olive oil and its technology has also been completed. There have also been studies on the development of cotton cultivation and the processing of cotton in the **Livadeia (Viotia**) region since the nineteenth century, within the context of a plan for a museum of pre-industrial technology in scheduled watermill buildings, which, however, has not gone forward. A small but interesting program entitled "The art of the tinsmith in the 20th century" has covered an unknown aspect of the history of metalworking in Greece.

One of the ambitions of the *Greek Section of TICCIH* is to make good use of the existing availability of the authorities concerned with the industrial heritage in Greece - together with new ones not yet apparent; it recently embarked upon the creation of a "Register of the Greek Industrial Heritage", with the *NTUA* as the principal co-ordinator, and in collaboration with other *universities*, the *National Research Foundation*, the *Cultural Foundation of the Piraeus Bank Group,* the *Volos Municipal History Centre*, etc.

An important step in the direction of the raise of public awareness has been the beginning of educational programs on the industrial heritage in elementary and secondary schools within the context of the environmental education of students. A network of schools has been created and the **Naousa** Centre for Environmental Education has been put in charge of it.

Museums

In the field of technical museums, the increasing activity of the previous decade encouraged expectations of a public policy which, unfortunately, did not materialise. The creation of industrial or pre-industrial museums in Greece has apparently not been one of the priorities of the Ministry of Culture. The only exceptions are the *Water Museum* which was set up in the old water pump-station In **Thessaloniki**, and the *Electric Railways Museum* in **Piraeus**, which was created thanks to the initiative of the Association of Retired Railwaymen. In Thessaloniki another organization called "Friends of Railways" Association has been set up and is running a small railways museum.
In this category of **public museums** the most important projects have been promoted by two academic institutions, the **NTUA** and the *National Research Foundation*. At the Museum of Technology of the French Mining Company at Lavrio, the restoration of the building by the NTUA has been completed (1996 - 2000), but its establishment by the Ministry of Culture, which is responsible for the site, has been pending for ten years now. The **Ermoupoli/Syros** Industrial Museum was opened in 2000. It was constructed by the Municipality of Ermoupoli under the academic supervision of the National Research Foundation, but is still facing serious operating problems because of lack of funding and a reliable framework of operation.
On the other hand, the phenomenon of the setting up of **private or semi-private museums** by private agencies has made its appearance, such as the *Cultural Foundation of the Piraeus Bank Group, the Silver & Baryte SAM Miining Company* and the *Kliafa Soft Drinks Company.*
In this category, the network of industrial and pre-industrial museums being created by the *Cultural Foundation of the Piraeus Bank Group*, with the collaboration, in many instances, of local government organisations, has been a great success. The oldest is the Silk Museum at **Soufli in Thraki**, followed by the open-air Waterpower Museum at **Dimitsana** in **Peloponnese**, the Museum of Olive and Oil at **Sparta**, the **Lesvos** Museum of Industrial Olive Processing.
Within 2007 the Museum of Brick and Tile Manufacture at **Volos** has been completed and the Museum of Marble-Working on **Tinos** Island, is expected to open at the end of the year. Also the Museum of Traditional Occupations and the Environment at **Stymphalia** in **Peloponnese** by the Cultural Foundation of the Piraeus Group is going ahead.
On **Milos** Island, the *Silver & Baryte SA Company* has set up the Mining Museum and a Conference Centre in the old perlite factory. The same company has also created the "Vagoneto" mining park on the premises of the bauxite mines at **Giona**.
At **Trikala** the owners of the *Kliafa Soft Drinks Company* have converted the factory (ice factory - refrigerator - soft drinks) into a History and Culture Centre.
At last there should be mentioned the construction of the new *Technical Museum* of **Thessaloniki**. This exceptional museum of sciences and technology was rehoused in 2004, moving from the old building in which it had operated since 1978 into a modern building of high-quality standards, as *The Centre for the Preservation of Sciences and the Museum of Technology.* The project, financed by the European Union, has been a great success of a team of specialists who have succeeded in creating one of the best museums in the country.

Conferences and events

On the initiative of the Greek Section of *TICCIH,* the 3rd Academic Meeting, on the subject of "Industrial Archives" was held at **Ermoupoli on Syros** island**.** The minutes of the meeting were published in 2003.
In 2003, the Academic Meeting on "Historic Mines in the Aegean, 19th - 20th century" was held on **Milos** island by the *NTUA*, the *Cultural Foundation of the Piraeus Bank Group* and other agencies. The minutes were published in 2005.
In 2005 and 2006, the *Greek Section of TICCIH* organised two three-month cycles of events in Athens. The first was entitled "Industrial Heritage Days" and hosted the reading of papers on the protection, preservation and re-use of industrial buildings and equipment. The second was entitled "Industry Memories" and its purpose was a meeting and conversation between its members and executives - mainly engineers - of important old industrial units.
The Nizhny Tagyl Charter on the industrial heritage has been translated into Greek and was presented on a special occasion organised by the Greek Section of the TICCIH.
In 2005, the *Cultural Foundation of the Piraeus Bank Group*, continuing a long tradition of academic meetings, held its 10th Three-Day Working Session on the history of Greek milk and dairy products. In the same year, it held a day conference on the "History of Paper".

Preservation of Archives

In many cities, on the initiative of the local authorities or academic institutions, the preservation of important archives of industrial enterprises has been achieved. Typical examples are the Archives of the Directorate for
Industry of the Prefecture of **Thessaloniki**, a part of which has been transferred to the *Historical Archive of Macedonia*, the Archive of the **Seriphos** Mines, which has been preserved on the initiative of *TICCIH* and the *NTUA* and is to be transferred to the Historical Archive of **Ermoupoli/Syros**, and the Archive of the *Drapetsona/Piraeus Fertiliser Factory*, which was transferred just before the demolition of the complex and is kept in the Municipality of **Drapetsona.**

Abstract: Country Report: Czech Republic

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The Czech Republic contains a number of extensive areas in which efforts are being made to preserve industrial heritage and put old industrial sites to new use. The biggest task, challenge and also problem in preserving industrial heritage in the Czech Republic is represented by the Ostrava industrial conurbation. The systematic documentation and evaluation of the conurbation's industrial heritage is carried out by the National Heritage Authority in order that the status of cultural heritage sites – and thus legal protection – is granted to the most important examples of the region's industrial heritage, not just those sites whose current owners agree with conservation efforts.
A key heritage site in the Ostrava conurbation is the complex of the Hlubina colliery, the coking plant and the Vítkovice blast furnace. A strategy has been drawn up for the conservation and rejuvenation of the site, based around a division of its various component parts into three categories, in order of importance: 1) the key parts of the technological process, for which conservation is recommended, 2) sites and technical facilities which cannot be put to new use, 3) those which can be put to new use. Currently, systematic renovation work is taking place on the site – which is divided between two owners – and studies have been drawn up detailing the future use of the site.
In view of the fact that the conservation and renewal of industrial heritage is an exceptionally complex, long-term and financially demanding issue, we recommend the establishment of an international group of experts on the relevant fields, under the auspices of ICOMOS and TICCICH, which will ensure greater stability of conceptions and project management.

Country Report: Czech Republic

The Czech Republic contains a number of extensive areas in which efforts are being made to preserve industrial heritage and put old industrial sites to new use. These include, for example, the Kladno ironworks and coal mines, or the Karlín district of Prague, which is now (in 2007) undergoing wide-ranging reconstruction after damage by floods. The biggest task, challenge and also problem in preserving industrial heritage in the Czech Republic is represented by the Ostrava industrial conurbation. The major milestones in the development of the conurbation were the discovery of coal in the late 18th century, the foundation of the Vítkovice ironworks in 1828, the opening of the railway line from Bohumín to Vienna and its connection with the Wilhelm line to Berlin and then to Krakow – leading to the accelerated development of the conurbation up to the mid-20th century.
The late 1960s saw the demolition of the large complex of the Žofín ironworks in the city centre of Ostrava. This, together with the closure of several important coal mines, led to the first attempts to preserve the region's industrial heritage – not just in the form of museum pieces for exhibition and storage, but also as authentic sites and technical equipment preserved 'in situ'. These attempts by a number of enthusiasts from the artistic and intellectual community ultimately met with failure, nevertheless they gave rise to the first systematic documentation of the architectural and historic technical heritage of the Ostrava conurbation. Unfortunately, in the totalitarian conditions which followed the 1968 Warsaw Pact occupation of Czechoslovakia, it was not possible to continue the systematic documentation of industrial (at the time, known as 'strategic') production or to promote conservation activities. Exceptions to this rule were represented by the Anselm / Eduard Urx colliery and the Michal / Petr Cingr coal mine; in the

early 1980s, projects for the re-use of these sites were drawn up by students at the Architecture Faculty of the Technical University of Brno under the direction of Professor Zemánková. It was only after 1989, in the new political climate, that the Ostrava branch of the National Heritage Institute began to systematically document, compare and select sites and technical equipment for the purpose of conservation and legal protection.

The central motivation and philosophy behind the conservation of industrial heritage is to ensure that the status of cultural heritage sites – and thus legal protection – is granted to the most important examples of the region's industrial heritage, not just those sites whose current owners agree with conservation efforts. This principle has led to many conflicts, nevertheless, in our view, the aim of conserving the most important sites and equipment has been successfully achieved.

The **first step** towards this aim was to carry out a thorough documentation of all sites and technical equipment from individual industrial sectors (mining, metallurgy, rail transport, chemicals, energy, workers' housing).

The **second step** was to select the best-known representatives of milestones in the development of each sector (e.g. different types of pit-head winding gear towers), examples of the systemic mutual interconnections within the conurbation (interlinking of technological flows, the transport network, housing and the social environment), and the overall face of the urban landscape (with its panoramas and landmarks such as pit-heads and the blast furnaces); these criteria represent only the most important principles of selection and evaluation.

The **third step** was to set out the strategy for the choice of conservation method; this choice depends on the importance and degree of authenticity of the site or equipment. A range of options are open, from the 'last working day' principle (conservation after reconstruction) to 'mere' architectural restoration with the aim of restoring a site to its previous appearance, as with railway stations; these sites always continued to perform their original function, but were variously damaged over the years, subjected to unsuitable building work and alterations, and required the installation of new transport and operational technologies as well as other changes. The re-use of sites ('recycling') also presents a range of options, from their use as small-scale manufacturing and storage premises, to their use as museums containing authentic exhibitions of preserved technical equipment or didactic presentations, including gigantic items of technical equipment brought to the site from other locations.

It is our view that only by applying the full range of approaches with regard to the importance of specific sites and technical equipment is it possible to conserve the 'milestones' of our industrial cultural heritage and to revive the original atmosphere of the historical periods in which those milestones emerged.

A key industrial heritage site of the Ostrava conurbation – the Hlubina colliery, the coking plant, and the Vítkovice ironworks blast furnace

The Vítkovice ironworks were founded in 1828 in the vicinity of local coal deposits. In 1842 the Hlubina colliery was set up on the site, in order to bring the extraction of coal as close as possible to its main point of consumption. In this way, the technological flow – from coal extraction, through coke production, to the use of coke in iron production – was concentrated on the same site. This basic, 'textbook' technological interconnection of industrial production continued until the gradual winding down of extraction at Hlubina and iron production at the Vítkovice blast furnace in 1997.

After production was terminated, and following complex negotiations, the site was placed under legal protection, ranked alongside the most important heritage sites in the Czech Republic by being listed as a National Cultural Heritage Site. The Ministry of Culture and the Czech government took the decision to protect the entire locality on the basis of detailed

documentation, technical and architectural assessments, and calculations of the costs of 'stabilizing' and reviving the sites. The entire strategy was based around the differentiation of individual parts of the site and equipment according to their importance, with the aim of identifying the real costs of their renewal:

The **key parts of the technological process** (the pit-head building, winding gear, processing plant, coking plant, blast furnace and other auxiliary technical facilities) were earmarked as a future tour circuit for visitors, with the aim of fully preserving the authenticity of the environment, including the outward appearance of the equipment and sites.

The **sites and technical facilities which cannot be put to new use** but which contribute to the environment and act as urban landmarks. These parts of the site were originally termed 'controlled ruins', but this name was soon dropped because it proved unacceptable to political representatives, who were reluctant to support the existence of a 'ruin' in their city centre. There was also a change of opinion to accept the necessity of carrying out basic work to reduce safety risks, by taking down some suspended structures and stabilizing construction systems (statics, re-roofing); the site is constantly monitored, and necessary repairs can be carried out as needed.

The **sites which can be put to new use** include former bathrooms converted into administrative premises or exhibition halls, or a gas-holder used as a multipurpose hall. The new uses were initially set out only in approximate terms, but the plans have gradually become more specific as ownership structures have been stabilized and new owners have expressed their own visions.

Currently, the site is divided between two owners. The part containing the Hlubina colliery – owned by DIAMO, the state-owned successor to the former mining company – is undergoing systematic renovation work, and negotiations have begun on transferring this part of the site to the National Heritage Authority. For the part containing the coking plant and blast furnace of the Vítkovice ironworks – which has been in private ownership since 2003 – studies detailing possibilities for future use have been drawn up on the initiative of the current owner.

Conclusion

Due to their outstanding importance, four industrial sites in Ostrava (Hlubina colliery, coking plant and Vítkovice blast furnace; Anselm / Eduard Urx colliery; Michal / Petr Cingr colliery; Vrbice ventilation shaft) have been selected by the National Heritage Authority to be submitted for UNESCO listing.

The preservation, rejuvenation and new use of technical heritage sites is a complex matter, involving a combination of various interests as well as various expert approaches. For this reason, the rejuvenation of large-scale industrial heritage sites or systems is always a result of long-term conceptions involving a demanding search for complex, often painful compromises.

In view of the fact that long-term and financially demanding projects are impacted on by a wide range of changes and decisions, we recommend the establishment of an international group of experts on the relevant fields, under the auspices of ICOMOS and TICCICH, which will act as an undisputed expert authority able to assess the importance and uniqueness of specific locations, or to adjudge on key rejuvenation projects. In this way, the group will contribute to a higher level of professional quality and greater stability in the protection and conservation of industrial heritage.

BIGSTUFF IN A SMALL COUNTRY. EXPERIENCES OF CONSERVATION OF LARGE SIZE INDUSTRIAL HERITAGE IN BELGIUM

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From the years 1970 onwards, the notorious regionalisation and the outlines of the federal State got gradually clear form in Belgium. In 1989, the metropolitan region of Brussels (beside the Flemish region and the Walloon region) becomes a full third Belgian region. These regions and the three "language-communities" (the Flemish Community, the French Community and the German Community) have adopted different views and policies with regard to cultural matters, included the industrial heritage, which comes into sight through different approaches, legislations, money flows and attainments.
The different policies in the Belgian regions and communities concerning industrial heritage reflect partly their economic history. The traditional Walloon coal, glass, iron and steel industry (all providing large scale equipment) is quite different compared to the small and medium familial companies have predominated the economy in Flanders for a very long time. The industrial heritage in Flanders is, in general, more spread over, of a smaller scale, and more heterogeneous than in Wallonia. In Flanders, sub-regions with former mono-industries (such as the brick-industry in the Rupel-region, the coalmining in Limburg, the flax-industry around the city of Kortrijk and along the river Leie) were more exceptions than the rule.
For a more detailed analysis on this topic, see our recent contribution, published in the review "Industrial Patrimony : resources, practices, cultures" (1).
Lets' try now to give a brief (and incomplete) overview of concrete realisations in the field of the big scale industrial heritage in the different parts of the country.

BRUSSELS

Huge restoration projects are quite marginal. For example, it was not possible to preserve (even partially) the impressive heritage of the "Cokeries de Marly" in the Brussels-harbour. Nice exceptions of renovation of some spectacular industrial heritage sites should be mentioned, all resulting of public-private-partnership operations. The reuse of the Royal Warehouses "Tour & Taxis", turned into a complex of offices, restaurants and shops and the "Entrepot B" (with exceptional shed-structure), reused as multi purpose event hall, are the first succesful steps of the "Tour & Taxis"-transport and commerce site renovation (2). Another recent renovated big scale building is the former Wielemans-Ceuppens brewery, reused since very recently as contemporary art centre (3).
During recent years the Royal Greenhouses of Laken (4), open to the public every year in may, underwent a gradual restoration, in strong contrast with the bad maintenance and poor condition of several glass houses in the "Nationale Plantentuin" (National Botanic Gardens) at Meise (in Flanders), one of the few scientific or cultural institutions still financed by the federal government.

FLANDERS

Flanders has a very varied industrial heritage (5). The small scale sites and structures are predominant and this peculiar situation leads to a fragmentation of local and regional heritage initiatives. Very few of the older big scale industrial structures have survived : space is a precious good in the very densely populated Flemish region !
Near Kortrijk, the former electric power station of Zwevegem, now a public property and under restoration as art centre and cultural equipment, is a good example . In the surroundings of Kortrijk, the brickyards and tile-production culminated in the interwar-period. Some dry-sheds were renovated as shops, as can be experienced at the Pottelberg-site, conserving also a power hall with steam engines, forming part now

of the scenery of a local restaurant : although the renovation is not very respectful, the contrast of "Pottelberg" with the ruins and derelict sheds of "Koramic" & "Le Littoral" in the same town as surprising.
In Antwerp, the Central Railway Station (6) underwent a meticulous restoration, with its "hidden" underground adaptation as shopping area and "high speed train"-platforms.
Other interesting large scale structures are located in de old harbour district. Since 2006 the monumental "Sint-Felix warehouse" is the new location of the municipal archives. In the immediate surroundings, on the west side of the Kattendijkdok, are located : the 19th Century dry-docks (still in use nowadays). Nearby is the Montevideo warehouse (not yet renovated).
The old port of Antwerp is a huge open air museum of transport heritage (7), considering the importance of the Mexico bridges, the weigh bridge Siberia, rare types of pumping houses, old examples of (listed) harbour cranes along the river Scheldt, the "Royerssluis" (a rare lock dating from the beginning of the 20th C, hydraulic power stations as the "Zuiderpershuis", now a multicultural theatre (8).
Meanwhile a brand new museum about the history of city and harbour, the so called "MAS" (Museum on the River) is under construction in between the oldest docks, dating from the beginning of the 19th C (9). The new museum will focus also on the recent history, popular culture and actual developments, as on the threat of destruction of villages like Kallo or Doel, due to the extension of the left bank harbour of Antwerp.
Despite big efforts of the local actors, very few remains of the world famous, once a time 15 kilometres long row of brickyards in the Rupel region and the town of Boom. Most interesting conservation area is the district of Noeveren, where the "ecomuseum" EMABB (Ecomuseum and Archive of the Boom Brickyards) is located, underlining during the guided tours the social life and work of the local community (10).
The "Vaartkom" in Leuven with the old and more recent brewery buildings of Artois (nowadays "InBev") is a nice example of a inner harbour under permanent redevelopment through 2,5 Centuries. The whole site is threatened now with demolition, with exception of the (listed) Mills Van Orshoven, partly rented by SIWE, a platform in Flanders for associations in the field of industrial and scientific heritage (11).
Perhaps the best example of "bigstuff industrial heritage" in Flanders is the legacy of the Flemish coalmines, all dating from the beginning of the 20th Century (12). After the closing of the last mines (1989-1992), the most representative mining heritage elements were listed and restored with government support. In the Beringen-mine, the best conserved mine as a whole, we find nowadays the "Vlaams Mijnmuseum" (Flemish mining museum), a modest initiative supported by volunteers and municipal funds, waiting for a more professional extension over the whole site.
Several mining buildings of the Zolder coalmine were renovated for new uses (second hand shops, training centre for unemployed workers (in the former Electricity-hall), a centre for ecological construction, restaurant, etc. In between these buildings a new market place was created, used also for different public events. In Winterslag, the oldest (1917) and last constructed (1967) mine tower coexist. Part of the administration building is used as offices and as a cinema, but the heart of the mine, the machine hall and power house, are kept in their original state and often used for wedding parties and other social events. In Eisden, a abusively demolished (listed) mine tower has been (badly) reconstructed. The prestigious mine buildings are used as municipal art academy and music school, as a hotel, a cinema and an outlet centre (conceived as a postmodern shopping village). In Waterschei only the exterior part of some important mine buildings are renovated, many plans came not true until now.
We insist on the impressive size and scale of the coalmine - garden cities (good examples of "company towns"), with their schools, huge churches, casinos, etc., all of very high standards and architectural quality, considering the construction period, some 80 years ago.
To complete this overview, lets mention a recent legislation "Decreet varend erfgoed", approved by the Flemish Government, concerning the conservation of sailing heritage, applicable to still used boat and ships. Another new legislation about the future legal protection of airplanes, trains and cars is under preparation now (13).

WALLONIA

It is hard to imagine that so very few large scale artefacts of the heavy industry have been preserved from total destruction (14). For example, absolutely nothing remains nowadays of the legendary 19th and 20th Century glass industry in and around the city of Charleroi, Jumet and Lodelinsart.

The conservation efforts orientated towards the coal extraction heritage. This can be partly be explained by the high degree of "emotional value" of the mine labour, but also by the extraordinary quality of some sites in Wallonia. "Le Grand Hornu", near Mons is the most visited site, reused for a the walloon Museum of Contemporary Arts (MAC'S) and Design gallery "Grand Hornu images" (15).

Only ten kilometres from there, in Frameries, the Crachet-coalmine was transformed by the French architect Jean Nouvel as "Parc d'Aventures Scientifiques" (PASS), a science centre orientated to young visitors (16). In Péronnes-lez-Binche, a huge washing plant of the 1950 is actually under transformation as a walloon Archive Centre. The mine village of Bois-du-Luc (near La Louvière) is perhaps the best conserved, most complete and most authentic (still occupied) mid 19th Century coalmining site (17). The industrial buildings are well restored and managed by the « Ecomusée régional du Centre ».

About 20 km more eastwards is the industrial town of Charleroi. In the colliery of "Le Bois du Cazier", in the suburb of Marcinelle, major accidents occurred (the 8th of august 1956 and next days 262 miners died, following a short-circuit and devasteting fire). The winding engine room of this mine has become a remarkable memorial, forming part of the "Museum of Walloon Industry" (18). Other remains of mining are spread all over the agglomeration : the pithead gears of "Le Pechon" in Couillet, tip heaps in Châtelet. These are examples of isolated, listed monuments but without conservation of educational links…

The same can be said about the (very rarely conserved) coal monuments in the surroundings of Liège (19). Since more than twenty years the ruins of "Le Charbonnage du Hasard"-colliery at Cheratte are waiting for an investor and a suitable rehabilitation project. Not the Cheratte-colliery but (only 6 kilometres from there) the more recent and not so outstanding colliery of Argenteau, located on the heights of Blegny, has been developed as main tourist attraction of the region. Because of their high position in the topography of the region, these galleries are permanently drained without major technical efforts info the Meuse-valley. This is the raison why visitors can explore some of the underground coal galleries. "Blegny Trembleur" is the only place in Belgium were visitors can do so (20).

"Tip heaps" are better known as "terrils" in Belgium. In Wallonia more than 300 terrils remains after the closing of the last mines in 1984. "Espace Terrils" is the name of an association who organises all kind of cultural and sport events related to the terrils. They helped to realise the "Sentier des Terrils", a signposted footpath of 280 km long, crossing over and along the most important tip heaps, the so called "transterrilienne walk" (21). Many recent publications deal with the ecological value and natural beauty of the blacks mountains, changed in natures reserves and even in vineyards ! (22)

The "crown jewel" of big stuff around 1900 in Wallonia is the ensemble of four hydraulic ships elevators on the "Canal du Centre" (mentioned since about ten years on the "Unesco World Heritage List"). They are an important part a unique canal landscape, including all kind of bridges, viaducts, even strange barracks and "la Cantine des Italiens", poor quality temporary constructions, occupied in the 1950 and 1960 by Italian immigrants, working in the blast furnaces Boël in La Louvière. The Unesco nomination confirmed that there was no longer risk of destruction of the old elevators after the construction of the world biggest ship elevator in Strépy-Thieu (in operation since 2002) : both engineering masterpieces are visited yearly by ten thousands of tourists and a different boat tours proposes the discovery of the elevators in combination with other canal engineering works al the "Plan incliné" at Ronquières, built in the 1960. Are these expensive infrastructures have as much value from economic point of view and as tourist attractions (23).

One of the most dramatic industrial landscapes of Wallonia (and western Europe) is the concentration of metallurgy factories in Marchienne-au-Pont (Charleroi), almost all belonging now to Arcelor (24). Part of the industrial installations are obsolete and there is no hope that representative parts we be saved from massive destruction. The actual politics will erase the black image of industrial past, often associated with corruption, crime, unemployment and other social problems. In the same agglomeration of Charleroi,

marked by a great variety of old industrial sites, one can find impressive old quarries, as for example in Montigny-le-Tilleuil

The city of Liège has an interesting amount of industrial and technological monuments. One example is de "Pont de la Fragnée", created for the 1905 World Exhibition, decorated with a monumental sculpture group dedicated to Zénobe Gramme, inventor of the dynamo. At the south western and northern outskirts of the agglomeration one can observe along the Meuse river the monumental industrial landscapes of Cockerill-Ougrée, the Cockerill-Iron foundry at Seraing (with the HF 6, out of use since april 2005), the Chertal rolling mill at Herstal. All these installations are property now of Arcelor and the future of this heavy is very uncertain (25).

About 25 km east of Liège is located the city of Verviers, once the most important wool manufacturing centre of Europe (26). The city experienced a deep economic crisis during the sixties and seventies, when nearly all mills closed down. One of the oldest wool spinning mills is the Simonis-factory (also called "Le Chat"), reused since more than twenty years for social housing. Some of the old textile factories are decorated with symbols of the wool and large scale machinery to process the wool are displayed all over the city, as washing installations, put in front of the "Maison Bonvoisin", a house belonging to an early industrial wool baron.

The history of the Verviers wool industry can be experienced in the "Centre de la Laine et de la Mode" installed in the former "Usine Bettonville". Verviers renovated one of the oldest working houses district (1800-1810), "les Grande rames", still used for social housing. The textile legacy of Verviers is spread also at the outskirts of town and in the surrounded villages, like Pépinster and mostly located along the river Vesder. There is a lot of cooperation in the Euregio Verviers – Aachen (with support of European funds), also in the promotion of industrial heritage tourism.

To end our brief travel through "big stuff industrial heritage" in Wallonia, we mention the "Schieferstollen" (or 'Slate mines') at Recht, a mining-village situated German speaking Belgium. A 19th C. slate mine was opened in Recht very recently for visitors, who are invited to explore a labyrinth of caves caused by rude labour and long human (mostly manual) efforts (27).

CONCLUSION

The conclusion of this brief sketch about "big stuff" industrial heritage in Belgium is clear : despite some isolated efforts to save large (mostly appealing and prestigious) industrial building and / or machinery, the actual situation is disappointing. One can notice a lack of global public policy in these matters. Urban planning priorities and the constant need of space of develop old industrial places for new economic, traffic of recreational purposes are very clear in each of the three Belgian regions. The stock-capacity for the conservation of huge industrial equipment in the few industrial museums is also very limited. Meanwhile it is important to record threatened sites by all means possible iconographic / photographic databases, oral history projects, saving company-archives, etc.

NOTES

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Conservation of Large-Scale Modern Cultural Heritage in Japan

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Recently in Japan, as in other countries, the public has become aware of the value of modern cultural heritage, and attempts are being made toward their conservation. However, there are not so many examples of modern cultural heritage in Japan, and many of those that are conserved as nationally designated cultural heritage are buildings. Thus, in reality there is an imbalance in the types of modern cultural heritage conserved. One of the reasons for such a situation is that there are not many brick and stone buildings constructed in the early years of the Meiji period remaining today since they were damaged by wars and earthquakes or reconstructed. The rarity of such buildings seems to draw the attention of the public toward those brick and stone buildings that they find around them in their daily lives, making it easier for the public to understand them as important objects to be protected. Another reason for the imbalance lies in the fact that since the concept of "industrial heritage" is fairly new it takes time for people to become aware of their historical value, and many valuable heritage have been neglected and lost in the meantime. In addition, as will be mentioned later, the lack of space available for use in Japan and the fact that this industrial heritage had been constructed at favorable locations may be considered as other factors. Finally, it is also a fact that remarkable progress in technology from the modern to contemporary times has made the technical value of industrial heritage seem old-fashioned to such a degree that they are quickly becoming neglected by society.

Modern heritage that are nationally designated in Japan today consist of:

184 buildings

51 industrial heritages related with transportation, civil engineering, etc.

26 others (dams, bridges, docks, tunnels and other railway facilities)

10 historical materials (railway-related archives, etc.; these include such matters as photographs, technical papers, or others which are not the subject of this meeting)

There are few districts in Japan that have maintained blast furnace sites or large factory sites as monuments, unlike in Germany. This is because since many such industrial facilities were located in important places of industry and transportation the high commercial value of the land on which they were located made it more profitable for their owners to use them as other types of industrial facilities than to preserve them as they were. Another reason is that in Japan there was not enough spatial freedom to leave such large pieces of land unused. However, in recent years movements have

started to convert a part of these large sites into parks as a way of improving the welfare of the residents. Even then, since these will remain as parks and not as industrial heritage, in many cases only a part of the buildings in the heritage or the machinery therein are conserved as monuments.

In such currents of the time, the site of the Tomioka Silk Mill is an important modern heritage in that its factory has been conserved in its entirety and many of its related facilities have remained. Of course, the Tomioka Silk Mill site being a nationally designated Important Cultural Property, it is a target for protection. The local public body, which is its present owner and the people of the city, are working toward its registration on the World Heritage List, making necessary preparations.

In the Kiso River valley, the Yomikaki Power Plant, which at the time of its construction in 1923 was the largest conduit type power plant, is also nationally designated an Important Cultural Heritage. Included in the designation are the main building, reservoir, iron pressure pipes, conduit bridge and wooden suspension bridge built for construction work (Momosuke-bashi Bridge). These are still in service, and at the time of their designation in 1994 they were the first constructions to be designated while still in use.

Not to be forgotten among modern heritage are transportation facilities and, especially among them, railway heritage. In the early years of the Meiji period many steam locomotives were introduced to Japan. Today the No. 1 Locomotive, No. 2 Locomotive and the first Imperial Train Car No. 1 are nationally designated Important Cultural Properties. In addition, the former Temiya Depot in Otaru, Hokkaido was nationally designated an Important Cultural Property for its being the first railway facility constructed in Hokkaido. It is now conserved as an important exhibit of a railway museum. Other railway facilities designated Important Cultural Properties include those of the former Usui Pass (4 brick bridges, 10 brick tunnels and a brick substation) that were closed down with the introduction of the Nagano Shinkansen. Part of these facilities has been made into a promenade and is utilized as an attractive tourist spot. However, the condition of conservation of these brick constructions are not necessarily the best when the progress of deterioration due to natural causes such as repeated freezing and thawing, salt formation and weathering is considered. Moreover, since brick constructions are not resistant to earthquakes, when they need to be protected from natural deterioration, they are made earthquake resistant. Although in such a case some change may necessarily be made to the original structure, it cannot be helped since the visitors must not be exposed to danger.

Other transportation-related facilities that are now protected as nationally designated Important Cultural Properties are the No. 1 Dock and No. 2 Dock of the former Yokohama Dockyard. No. 1 Dock had been relocated to a nearby place before it was designated and is now used as a part of a commercial facility under the Landmark Tower of Yokohama. This, of course, is one way of utilizing heritage, but there is room for debate in that it is not utilized in its completely original state. With regard to No. 2 Dock, however, since the last Nippon Maru is now moored and exhibited there it is utilized

sufficiently in its original state.

In addition to these transportation-related facilities, Kachidoki-bashi and two other bridges are to be designated this year. These bridges are actually used today and that fact itself is one of the characteristics of modern heritage.

Coal mining is another industry that has been forgotten in Japan since it is considered no longer profitable. Reminders of the mining industry, however, still remain today at such places as Yubari in Hokkaido, where mining was done until quite recently, as well as at Manda Pit and Miyanohara Pit of the former Miike Coal Mines that extend from Kumamoto to Fukuoka prefectures and at Hashima in Nagasaki, which is also known as Gunkan-jima. Even though they were closed down at different times, today these mining sites are valuable modern heritage. Most of them are now owned by local public bodies and are conserved, more or less, in their original state. The local public bodies that own this modern heritage are presently debating ways to utilize them. Since one way, of course, is to make them sources of tourism, parking lots, rest houses and stores that will become necessary to accommodate tourists are constructed. As for Manda Pit and Miyanohara Pit sites, since they are already nationally designated Important Cultural Properties it is not easy to modify them to meet the requirements for tourism. However, it is also very clear that expenses must be paid in order to maintain them. Since their owners are bearing all these expenses now, it is also true that some matters need to be overlooked if maintenance fees are to be earned. Still another issue that must be considered is that of providing safe facilities for the increasing number of tourists that visit these places. Such facilities are increasing, but at the same time efforts are made to notify the public that they are not parts of the original but are new additions. Other mining sites have not been designated nationally and even if they are designated by local public bodies, some room has been kept to make changes. The Agency for Cultural Affairs is aware that some procedures, including early designation by the nation, must be taken to prevent changes to this heritage in cases where there is a certain amount of freedom to make changes. However, it is also true that the financial circumstances of the nation do not make it possible.

This is another characteristic of modern heritage. Since the scale of modern heritage is large, the cost for anything that is done with regard to modern heritage is great and it is difficult to start any project. The Agency for Cultural Affairs has so far been doing what it can within the framework of the Law for the Protection of Cultural Properties. Nevertheless, it is clear that the present Law cannot respond sufficiently to protect these large-scale facilities as nationally designated cultural properties. Much is expected of the future.

BigStuff 07 – Country Update for the United States

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The preservation and conservation of large industrial artifacts in the United States remains mostly a collection of independent activities. While the National Park Service, state agencies and several large museums have successfully protected certain industrial sites and objects, dozens of smaller organizations struggle to adequately protect and interpret their resources. This presentation contains a few representative examples of conservation activities throughout the United States. These examples highlight various conservation and funding methods used to preserve important elements of the industrial landscape

Three different industrial complexes help illustrate some of the approaches used to protect former industrial sites. In Birmingham, Alabama, the local community rallied to create the Sloss Furnace National Historic Landmark. Faced with the impending demolition of the site in the late 1970s, the citizens of Birmingham voted for a bond measure to protect and interpret this excellent example of a twentieth-century blast furnace. The initial bond funds helped to stabilize the industrial remains, while today, the site supports itself through interpretive tours, donations, public event hosting, and by offering metalworking workshops. In contrast, the Bethlehem Steel Mill in Bethlehem, Pennsylvania struggled to find a new use after closing in 1995. Home to what was once the second-largest steel mill in the United States, the site remained essentially dormant until 2006. A group called Sands BethWorks Gaming is now constructing a casino and hotel complex in the former ore pits at the site. The larger development plan includes a shopping mall, event space, and the creation of the Smithsonian-supported National Museum of Industrial History. The developers also plan to preserve and interpret the blast furnace complex in order to retain some of the historic fabric of the site. The third example of an industrial site is the Soudan Underground Mine State Park. Located in Soudan, Minnesota, the park provides an interesting example of a federal – state partnership. When the former iron mine closed in 1962, the mining company donated the site and equipment to the state of Minnesota. The state then added the mine complex to their state park system and began giving historic underground tours. In the 1980s, university researchers collaborated with the park to conduct physics experiments in abandoned portions of the mine. The underground spaces were so well suited to their experiments that the federal government became involved in the late 1990s. After an initial $50 million investment in equipment and modifications in the mine, a consortium of federal and educational institutions now provides annual lease payments and other funds to operate and maintain the mine.

Unlike the sites mentioned above, a more common method of interpreting U.S. industrial history occurs through the selection of an individual structure or object for preservation and conservation. The Anaconda Smoke Stack State Park in Anaconda, Montana celebrates the copper-smelting heritage of the area by preserving a 585-foot tall smelter chimney. The smoke stack is all that remains from the once huge Washoe smelter complex. Local residents helped save the smoke stack by lobbying for its preservation during the smelter demolition. The state of Montana now maintains the smoke stack as well as a small interpretive park near the smelter site. Another

example is located in Hancock, Michigan. At 150 feet tall, the Quincy Mining Company's No. 2 shaft-rockhouse is the tallest structure in the local area. Although the structure has not operated since 1931, it serves as an important identity symbol for the local community. The local non-profit organization that owns the structure completely replaced its rusting corrugated steel exterior in the 1980s to help slow its deterioration. Although the group received some complaints about adding new materials to the structure, the newly covered shaft-rockhouse and its companion steam hoist played a major role in the subsequent creation of the Keweenaw National Historic Park. Unfortunately, within sight of the shaft-rockhouse is an outdoor collection of historic mining equipment that currently receives little or no care.

With regard to movable objects, one of the most impressive restoration activities in recent years has been the work on the schooner *CA Thayer* in San Francisco, California. The *Thayer* was the last commercial sailing vessel to operate on the west coast of the United States. It has been a floating museum since the 1950s and was in poor shape as crossed its hundredth anniversary in 1995. In 2003, the San Francisco Maritime National Historical Park removed the *Thayer* from its berth and relocated it to a nearby seaplane hanger. Over the next four years, workers completely disassembled and reconstructed the ship using a mix of old and new parts. The *Thayer* returned to the water in April of 2007 where the restoration work continues. Another high-profile restoration activity involves the *USS Monitor*. The *Monitor* is a United States Civil War-era ironclad ship that is best known for its 1862 battle with the Confederate ironclad CSS Virginia. The *Monitor* saw limited action after that first battle and later sank in a storm off North Carolina in 1863. In March of 2007, the USS Monitor Center opened in Newport News, Virginia to help conserve and interpret the wreckage of the *Monitor*. The new 63,000 square foot museum contains conservation facilities, interactive exhibits, and a full-scale replica of the Monitor.

Although not a ship, an historic shipbuilding crane illustrates how even when objects are in their original locations, they may be extremely difficult to properly interpret. The Rosie the Riveter National Historical Park in Richmond, California recently acquired a World War II-era whirley crane from a nearby scrap yard. Whirleys were a key element that enabled the four Richmond shipyards to produce almost 750 ships in four years during the war. The park employees placed the historic crane at one of the remaining shipways within the park. Unfortunately, the special nature of these cranes was in how groups of them worked together to arrange pre-assembled pieces of the ships. A visitor to the park today can get a sense of the scale of the operation by seeing the existing crane, but the majesty of the how it worked in conjunction with one to three other cranes is extremely difficult to convey.

Finally, in a display of what a small group of dedicated volunteers can accomplish, a group in Youngstown, Ohio formed a non-profit organization to save and interpret a Tod steam engine. Built in 1914, the 4000-horsepower steam engine drove a number of rolling mill operations before being retired in 1979. The engine then sat idle for fifteen years. In 1995, the non-profit group stepped in to save it from the scrap yard. The group disassembled the engine, stored it, and purchased a piece of property to display it. In 2006, the group reassembled in the 600,000-pound engine in the new Tod Engine Heritage Park in Youngstown. The group is now working to obtain funding to construct a display building over the engine. In the meantime, they have painted the engine to help protect it from the elements.

IBA (Internationale Bauausstellung) Emscherpark – a successful attempt in Germany

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Like by a latter day St. Christopher, the state agencies for the preservation of industrial monuments in Northrhine-Westphalia have been taken up on the shoulders of the “International Building Exhibition - IBA” held in the Ruhrgebiet from 1989 to 1999. This meant a quantum leap in the possibilities to preserve industrial monuments like historic ironworks, coal mines and power stations.

After nearly twenty years of listing those objects since 1970 and nearly automatically reaching larger dimensions following the course of the industrial revolution, IBA enabled preservation strategies involving much more funding possibilities. This scale however implied also certain dangers for the large-scale objects: looking for some kind of difficult-to-achieve profitability, the range of alterations to the structures has grown considerably, thus endangering the documentary character of the sites with regard to the authentic stories they are expected to tell. This can be exemplified with buildings like Jahrhunderthalle in Bochum or Zollverein XII mine (a world heritage site) in Essen, where contemporary uses have led to a considerable threat to the original substance. IBA nevertheless has come up with a considerable improvement in the self-assessment of the Ruhrgebiet and the way this region is perceived in Germany and abroad.

Workshop Notes

Optimizing the rehabilitation work of Malakofftower Prosper II

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Keywords: rehabilitation, mining, shaft-building

The rehabilitation of large industrial buildings is in most cases not a technical problem. The challenge lies in the available budget for these tasks. In the rarest cases resources are sufficiently available to rehabilitate the whole plant. The cultural-heritage-manager has to use the available resources effectively and optimize the repair works. The effective planning of resources includes also the possible personal investments of the building user or other participants and the possibilities of further sponsorship.

Since its closure in the year 1987 different considerations for the reactivation of the Malakofftower above the former shaft Prosper II in Bottrop arose. But unfortunately the plans for the reactivation always failed because of a not sufficiently available budget. After the tower lied fallow for more than 10 years in an unused way and without protection, its structural state deteriorated sharply.

In the year 1997 the German Mining Museum was entrusted to document the tower in a use-independent way. On this basis the Museum developed a rehabilitation concept which could be realized in the following years with financial relief of the IBA- Emscherpark. With the use of modern information systems and extensive documentations and planning the DBM accomplished to preserve the historical substance of the tower with a comparably small budget.

Since the beginning of 2004 the tower became publicly accessible again and is today used by the Historical Society Bottrop as a place for the information about mining and migration history as well as for cultural events.

In the following article the procedures during the repair of this masonry tower are explained under special consideration of the efficiency. In that the documentation of the existent structures, multidisciplinary working methods, efficient building scheduling and the commitment of the participants play an essential role.

RECOVERY AND PRESERVATION OF INDUSTRIAL HISTORICAL SITES IN SÃO PAULO: NEW USES, NEW CHALLENGES

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Keywords: São Paulo (Brazil), industrialization, brownfields, industrial heritage, preservation

Large scale industrial initiatives in the city of São Paulo took place only in the later decades of the XIXth century and beginning of the XXth century. In this first stage of industrialization, the railroads attracted and structured the location of the industries. São Paulo clearly illustrates the intense concentration and subsequent de-concentration process that happened in this area with the closedown and transfer of many factories. Important districts with a strong industrial past are now dominated by hundreds of brownfields.

Amongst the first manufacturing buildings of São Paulo industrialization – composed by buildings of great historical and aesthetic interest – some have already been demolished and several are currently abandoned or have almost no use. In spite of the state of degradation of these industrial areas, they still represent large idle urban extensions of land endowed with ample infrastructure, fact that has called the attention of real estate market entrepreneurs and consequently accelerated the demolition of this heritage.

The present work was based on three main fronts of analysis: the economical and historical study on the industrialization and de-industrialization in São Paulo; the study of the remaining constructions, found during field surveys and the inventory of actual situation; and the discussion concerning the preservation of industrial heritage, based on analysis of examples of redeveloped brownfields, in the light of the international debates on the preservation of cultural elements, as the *Venice Charter* (1964), the *Declaration of Amsterdam* (1975) and *Washington Charter* (1987).

A RECORDING EXPERIENCE

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The paper deals with the experience of recording large industrial sites. How to record a large mining site with limited resources? Stressing the sole initiative of the Norwegian Mining Museum in instigating the recording project, the paper deals with motivations for the project and methodological considerations in choosing an adequate approach to process recording. The project was initially planned for the site of the largest mining enterprise in Norway, *Titania A/S*, in the middle of the so-called Rogaland Anorthosite Province, in the southwest part of the country. During planning the question of demolition of the mining company's old mining site arose, changing the task of the project. It was no longer only a question of recording of living industrial heritage, but documentation of an industrial ruin. Would it be possible to do both with the same approach?

The paper deals with the results of two related recording projects. One of the old mining site at *Sandbekk*, a fully integrated mining site in operation from 1916 to 1965, now standing as a unique industrial ruin. The other of a mining site in operation (1965-2007), *Tellnes,* - where ilemenite ore is mined in an open pit and processed in three separate dressing plants. The sites are presented regarding three aspects of the industrial process: First the input side, how the site relates to its surroundings with respect to geology, ore deposits and transport systems. Second the production side, how the ore is processed within the works, with respect to machinery, techniques and applications of technology. Special attention will be given to change and development of the productions processes. Third, the out put side, how the product is stored, loaded and transported to the marked.

The paper discusses practical and methodological problems regarding process recording at large industrial sites. Opportunities and limitations of the so-called pragmatic approach to recording, a simplified and structured modus of work, involving techniques such as measured drawing, systematic photography, inventorying procedures and oral history, are discussed with examples. In concluding, the question of whether the ambition of a comprehensive process recording at industrial sites needs a more sophisticated approach or not is raised. Nevertheless, a realistic view is presented. The pragmatic approach is the only way, at least in a Scandinavian context, of "preservation by record" of large industrial sites.

Hidden Treasures

Norbert Tempel
Investigation and Treatment of Hazardous Substances in Industrial Monuments

When it comes to dealing with the conservation and restoration of former industrial sites most emphasis is laid on the architecture, design, construction and surface of an industrial building. However there are also “hidden treasures” – treasures which are too often ignored by curators, restorers and owners. Different kinds of dirt, waste and hazardous substances, all of which are testimonies to the past life of a productive plant.

Most of these substances are a source of danger to the environment, not to speak of the construction staff and visitors to the site. The best known examples are asbestos and mercury, but even accumulations of pigeons droppings are a potential risk to the health of staff.

Systematic detection, examination and testing has to be based on an intense knowledge of the respective production process. Certain characteristic parts of plants or machines can rightly be suspected of being contaminated with hazardous substances. Now and then the efforts to remove these substances whilst observing all health and safety regulations may become very expensive. In some cases on-site stabilization may be more appropriate, especially when important parts of a monument cannot be cleaned up without destruction.

My paper today will highlight some frequent examples of “Hidden Treasures” and discuss some methods of removing and stabilising contamination in disused industrial sites.

Are we just 'hooking up' to machines a no-life-expectations patient?
The challenges of cultural significance conservation when physical fabric preservation is an ever-postponed goal.

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Keywords: mining site, conservation, volunteers

This article is an account of the conservation of a sulphur mining site in Formignano, Italy, where the 15 years experience of a volunteer association has prompted the Town Hall to acquire and schedule the site, developing a cultural project aimed at valorising and conserving its history, with research work and the involvement of local community and distant affiliates.

Volunteers are sometimes the only guardians of complex sites, that otherwise would be destined to a forgetful decay. The range of issue investing complex sites (with the conservation of various evidences - material evidences, technological know how, landscape and community significance and memory- and with a landscape, where natural and human historical interaction needs a sensible, integrated approach) is nevertheless difficult to be dealt with in these situations, mainly due to a lack of action planning, funds and basic premises to work.

This often leads to episodic interventions on the site's fabric, that may contrast with standard conservative procedures, but are the only available actions to avoid further decay.

What is to be faced is the issue of an high financial investment needed to repair/preserve the site from total physical decay and the volunteer cultural activity seems to be the only affordable means of valorisation and conservation of a site's significance, often with a underlying awareness of any physical preservation being an unachievable goal.

Restoring Large Concrete Storage Buildings At The World Heritage Site Völklingen Ironworks

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Keywords: concrete / World Heritage Site Völklingen Ironworks / storage buildings

It is in restoration theory only that ‘repair’ and ‘conservation’ appear to be opposing terms. Based on several examples of historical concrete surface preservation projects from the World Heritage site of Völklingen Ironworks, we want to demonstrate that in implementation there will – to some extent at least – necessarily be an amalgam of both concepts.

The basic decision to stop the progressive decay of a concrete construction offers a wide range of preservative measures. If no action is taken, the continuing decay will eventually result in the total loss of the building. With a building of essential importance for the facility as a whole, a complete reconstruction may then have to be considered.

An early intervention, however, opens the possibility to develop a preservation concept that will fundamentally be a mixture of repair and conservation. Decision to be made will concern:

- Composition of concrete
- Surface structure
- Possible coatings
- Visual adjustments

Based on the experience of various concrete preservation-projects both completed and still in completion, we would like to point out different actions of conservation and repair taken at the World Heritage site and discuss the underlying theoretical concepts.

The objects to be presented are:

- The new ore storage (1913)
- The water tower (1917 / 18)
- The coke silos (1926)
- The tar storage basin (1926)
- The coking plant’s coal- storage (1942)

The projects chosen will exemplify the development in restoration-concepts and clarify why the contradiction between reparation and conservation will necessarily remain a more or less theoretical dispute.

Coating systems for industrial monuments – demands and options

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The many different constructions of industrial cultural heritage as well as their exposure make the use of individual chosen coating systems necessary.

Because of the unchangeable constructions the choice of a coating material is mostly a compromise between the wishes of the conservator and the expected long term protection of the coating systems.

A long term protection will be reached only with several layers of pigmented coloured paint systems. The result is that all signs of former use could not be shown any more.

Further more there are a lot of objects which never has been coated before, e.g. blast-furnaces.

The use of transparent coating systems is because of their shorter protection time not usable for former uncoated large and unprotected objects. This is the result of several trials and the use in practice with different transparent systems in the past.

In future it will be more necessary to analyse the objects in view of their exposure and their signs of use to find out which coating systems have to be taken for long term protection.
In this connection the conservators should know that every reactive coating system is better then a reversible physical drying system.

Abstract

New coating materials and strategies for the preservation of iron / steel industrial cultural heritage: The CONSIST project

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An EC-funded 3-years research project titled “Comparison of Conservation Materials and Strategies for Sustainable Exploitation of Immovable Industrial Cultural Heritage made of Iron and Steel” has been set up in summer 2005. Background, objectives and results of the project are as follows and will be presented:

Suitable conservation materials are required to treat indoor and outdoor immovable industrial heritage with weathered / corroded / coated iron and steel surfaces. For this purpose, new coatings and consolidants with improved properties are to be developed. This new class of lacquers should be transparent, long-term resistant against weathering and sunlight, easily applicable on site, and reversible. The synthesis is based on sol-gel reactions resulting in water-based, solvent-free hybrid ORMOCER® (ORganically MOdified CERamics) systems.

For comparison, various established protective resins ranging from traditionally used oil paints to modern microcrystalline waxes and organic lacquers like acrylics, polyurethanes, or alternative silanes have been tested by accelerated weathering and instrumental analyses. Also, moderate pre-cleaning measures of the iron / steel surface and reversibility tests of resins are in the focus of interest.

Research activities and related test applications are closely connected to restoration demands of selected pilot objects and areas. Moreover, integral management plans for future exploitation are developed and will influence the restoration and conservation attempts. As pilot objects, typical underground machines of the Mining Museum Bochum in Germany, architectural ironworks of Palladian Houses in Ireland, and the inventory of an open air Railway Museum in Jaworzyna Slaska (Lower Silesia), Poland, have been selected.

Promising lacquer development results and implementation concepts for preservation and further sustainable exploitation of objects and sites will be presented.
The work is supported by the EC, DG RTD I (STREP Contract: 513706-SSPI-CONSIST).

Historical automobiles as cultural-historical objects

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The mode of preservation of automobiles as an embodiment of 20th century culture is still highly controversial. In the workshop one attempts to preserve it as a museum piece in the sense of object restoration. It will become apparent how much can be gained in the sense of cultural-historical substance if one allows the high quality of technical, material, social and aesthetic essence of these objects to emerge, and when such an approach is clarified and inferred from other historical sources. The restoration work is seen as a contribution to the historical raising of awareness and to the exact research of pertinent sources.

Objects in cultural-historical collections

Objects which are safeguarded in cultural-historical collections are the flotsam of history, or those deliberately misplaced. There, all those formerly useful things are seen as ‘objects’ which at the same time are the material bearers of history, as they reflect different levels of insight into recent and remote happenings. The field of preservation and restoration has as its primarily task the protection from natural decay of objects composed of different materials, and the handling of them as if they constituted forensic evidence, by preserving them in the state in which they came into our hands. Further on, the discipline of non-verbal communication could be figuratively applied to a multi-layered testimonial and general historical statements imbedded in the objects themselves.

The most important task involving preservation is material and climate-controlled protection; it requires scientific and technical engineering expertise. The task of restoration, by contrast, is based on a conceptual framework, taking into consideration the available aesthetic and technical-historical qualities of a historical object to be made prominent by the restoration measures in such a way as to provide the public with an aesthetic experience; also, working through primary and secondary historical data, inquiring into the meaning of the interplay between the form and the material, finding a sensible concept of restoration and finally, possible utilization of the object.

A precondition of these both tasks of the restoration is the exact descriptive documentation of the historical object on hand. In this process the original materials would be examined with forensic care in all their multifaceted aspects, looking for sources of their origin, their usage, negligence and decay.

Preservation of historical automobiles in the context their history

Due to their high significance in the context of the recent cultural-historical past, automobiles occupy a significant place in collections of technically complex objects. They became prominent on the landscape of our towns and countries from the first quarter of the 20th until the middle of the century. This relatively rapid alteration in the entire human environment is a unique phenomenon in history. The still-preserved historical automobiles testify and remind us of this. Their steadily improved construction and progressively better technical engineering and cheaper production accelerated in the first half of the 20th century.

The self-propelled thing, the 'auto-mobile,' significantly changed the perception of life of every single person when compared with the not yet motorized times. New aesthetic categories and a wide spectrum of yearning and wishing emerged. This took on different forms depending on social status and circumstances. They ranged from the middle-class enjoyment of the scenery, to taking a drive through the country and being intoxicated with speed, to the technically perfect smooth road surfaces, the utility vehicles of all categories, including motor homes for world trips or the family vacation.

The concept of the museum preservation of automobiles relates to the history of the vehicles' use, which is detectable from the outer appearance of their surfaces, the styling and color, the choice of materials and the treatment of their surfaces, reflecting the perceived vision of the world. In the workshop it will be demonstrated how such an idea is developed with the search for clues and their classification in a time frame, as well as with the help of logically developed historical research, differing from one type of vehicle to another. It will be demonstrated that these are not romantic feeling or the escape into a vague image of the past which accounted for museums laying claim to this concept. It was the will to perform precise work in historical context, and the search for a variety of historical dimensions, which constituted its main motivating factor.

Abstract

Communication – our new challenge?

A call for dialogue

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This presentation examines the social roles and responsibilities of experts in the conservation of industrial heritage objects. Are we still acting on a realistic basis, or have we drifted off, because of the difficulties of our task, into expert debates which do not attempt to make themselves intelligible to the public?

If we are to succeed in guaranteeing industrial monuments a long-term future, the wider public must appreciate and support our projects. This presupposes that the community appreciates the cultural significance of the monuments. So far, the guardians of the industrial heritage have not done enough to grasp and communicate this cultural significance. In future it will have to, for its own long-term survival.

Those who preserve the industrial heritage can learn from the experience of museums. Our counterparts there have experience in structuring guided tours for specific target groups, and of giving visitors an interactive role in projects. Industrial conservators have the challenge of further developing the museums' techniques, and of entering into a dialogue with the community that is characterised by mutual respect.

Krupp: a cast steel manufactory as archaeological resource

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One of the most significant zones of industrial archaeology in the Ruhr area is the so-called west city of Essen, the area the former Krupp cast steel manufactory of which only a few buildings have been preserved.

The industrial use of the area in the Altendorfer Straße - in the west of the historical center of Essen - started in winter 1819/20. At this time, the core for the later Krupp cast steel manufactory was laid. Until 1912, the area of the factory had already grown to 482 hectares. The area was strongly damaged during the Second World War. Later on, big parts of the arrangements were dismantled and levelled, with the result that an area having been industrially used for decades, lay widely unused up to the year 2000. Since that time, the area has rapidly changed.

The first archaeological observations were carried out in 2001. In the period following, this happened when ground interventions took place in those areas which were old parts of the factory or areas which were of special interest because of lack of information in archives. The archaeological observations revealed that old functional levels were simply filled up or integrated in newer ones because the expenditure for removing all massive remains would have been too big.

From 2007 on, the main focus of documentation has been on the area of the so called ThyssenKrupp Quartier, the new Headquarter of ThyssenKrupp in Essen. However, an area of approximately 230 hectares totally was concerned by changes. The ground interventions put out in the new Headquarter took place on an area of approximately 20 hectares. At the archaeological works, which are to be continued till 2009, the huge size of the relics, the immense working-tempo and... the weather represent the greatest difficulties in documentation.

In a common project of the advanced technical colleges of Bochum and Mainz and the city of Essen's local Department of archeology all construction findings are documentated as far as possible by photography, fotogrammetry and by aerial pictures and Laserscans.
The project is supposed to end in 2009.

THE TORPEDO TESTING STATION IN RIJEKA, RECONSTRUCTION AND CHANCES FOR MUSEALISATION

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Remaining of first world torpedo factory in Rijeka, Croatia, and its launching station facility for torpedo testing, is in continuity on the almost same place, from 1870, 1880, 1910, 1930, to 1950. Torpedo factory ceased its torpedo production around 1965, the factory was alive until recent times (they produced diesel engines, trucks, tractors and so), and its production halls are now in process of demolishing or finding new uses.

The location of Rijeka's torpedo launching station is on the sea shore, 2 km far from the center of town. From the time when the last torpedo was tested there (around 1966) it is abandoned and in quite bad condition, in danger to fall down by it, or by force of sea. Last 40 years there was not done any maintenance on launching station, so it is problem with sea salt (chlorides) in its construction (concrete and rust in steel reinforcements). Other part of it is in bad shape too, as wooden roof, brick walls, and so.

Torpedo launching station is in Croatian register of cultural monuments.

Torpedo industrial heritage is not only Rijeka's topics; there is interest for almost same story in Italy in Livorno, in France in Toulon and Saint Tropez, in England in Weymouth, in USA, Germany, Holland, Sweden, and maybe in other places.

What to do with remaining of Rijeka’s torpedo factory, and how to find and realize new life for torpedo launching station? For a while there are some ideas to make a kind of technology and science museum in it, and in near abandoned ex factory halls, to put it in a new cultural function, to offer it as a tourist attraction, to make it international, and later on, to start a system of historical torpedoes museums, (torpedo collections), connected with same common story, adventure of high technology and inventions.

Abstract

Two series of machines in the new five storey lobby of the Old Wheat Mill of Huexotitla in the city of Puebla, México

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Keywords: Large object, Analysis, Intervention, Conservation, Industrial heritage

Theme: Conservation of “buried treasures”: gathering and preserving technical, working knowledge from past generations.

This paper has the objective to share the reutilization project of the Old Wheat Mill of Huexotitla, in the city of Puebla, in Mexico, along with the conservation of many of its industrial pieces, as agents of heritage and witnesses of history, as sculptural objects of artistic value, as elements of ambiance and decoration. Founded in 1537 and last modified at the end of the XIXth century, the building has recently been transformed into offices and apartments. At the center of the factory, where the new six storey staircase and elevator have been built, one fourth of the old machinery has been preserved.

The industrial pieces are displayed at their original level, while the new and surrounding areas of the project have been offset up and down, in a way that two levels of the original factory are seen from most of the new spaces. Out of the nine remaining machines, five are still on their original spot, four have been relocated, with their connections modified. Although direct access to the machines is not open to the public, their arrangement within this five storey lobby works very well as a showcase, a small museum, and it is still possible for a team of maintenance people to reach them climbing over handrails.

Abstract

The factory stopped working in 1979, still having many machines from decades before. This means that most of the pieces originally there, and all the pieces there today, are made out of wood, and function with external transmissions, bands and pulleys, and not with electricity or motors of their own. After the factory was closed, it was not immediately dismantled, and it wasn't abandoned either, as adjoining areas of the building were still used. The machines were partially taken apart only a few years ago, after the general idea of the offices and apartments was already clear. The ones in their original places were covered and protected, and the others were stored carefully (and some still are) with their reusal in mind. This obviously accounts for the very good state of conservation in which they still are.

Curricula Vitae

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Pathways through heritage: necessary and endcumbing

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The North Rhine-Westfphalian Foundation for the Preservation of Industrial Monuments and Historical Culture was set up in 1995 as a new instrument for addressing fundamental structual transformation in the region.

It is the first foundation in Germany committed to the perservation of impartant industrial monuments.

Its aim is to protect them from demolition, to conserve them, research their history, make them accessible to the public and put them to new uses appropriate to their status as monuments.

What is an appropriate way to make a disused coking plant or colliery accessible to the public?

Thesis to this theme and what experience the Foundation für the Preservation of Industrial Monuments had made over the last ten years will be given in the workshop

“The challenge of converting the Tsalapatas factory to a roof tile and brickworks-museum and a multifunctional centre”

Mechanical engineer, Athanasios Chatsigogas,
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A very important industrial complex of roof-tile and brickmaking, called the “Tsalapatas factory”, was shut down in 1976, due to the pressure of hard competition at that time.

Build inside the city of Volos the “Tsalapatas factory” includes all the characteristics, that would point out a significant industrial monument such as :

- imported European technology of the beginning of the 20th century
- industrial buildings of a specified architecture
- historical machinery equipment

It was exactly these characteristics that were decided to be marked out by creating a brickworks-museum, while ensuring the sustainability of the project, using the surrounding buildings and installations to host several cultural activities.

The specific given solutions and the first experience using the installation, give us the opportunity for evaluation and critical thoughts, concerning the typical situation of reusing an industrial monument.

The old Tsalapatas factory tries to be at the same time a guard of the industrial heritage, an inviting museum and a very attractive cultural centre of social activities.

Fengersfors Works – musealisation to working order as instrument for regional development

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Fengersfors Works is situated in the northern part of the Region Västra Götaland (West Sweden), in a landscape characterised to day by decreasing population, unemployment and urgent need to revitalise local economies. The Works history dates back to the end of 18th century, first as iron works and later turned into a paper mill.

In the 1970s the Works went bankrupt and was left more or less unattended until the mid 1990s, when local initiatives let to the present situation where a group of artisans and craftsmen together with a fish hatchery, selling of recycled building materials, and a small jeans designing company are established in the former industrial buildings. The volume thus in use corresponds roughly to ca. 60 % of the total building stock at the site.

In the parts not in use, we find some key topics in the development of paper milling, such as ground wood pulp grinders with rotating stones, (holländare), paper machine from 1906, and dating from 1948 as the first sulphate paper mill in the world, a 19 meters high continuous pulp boiler. There is also an illustrative representation of power production in industrial plants by a steam engine, boiler and D.C. and A.C. generators, all installed in the 1920s. These parts of Works are rapidly decaying and will soon become a ruin unless an economic base fore their restoration could be developed.

Industrial buildings with empty volumes are fairly easy to adapt to new uses, thus generating the economic base providing funding for running costs and maintenance. When such buildings, on the other hand, still have their original production equipment, re-adaptation other then museum or renewed production is harder to achieve. The objective for the continued restoration of Fengersfors Works is therefore to restore remaining production equipment to as near working order as possible, aiming at pedagogical, museological and low-scale industrial uses, attracting spin-off activities with positive effects on local economy. The overall goal is then to balance cultural heritage both as a re-active historical story teller as well as an active societal development instrument, thus defining working order to a broader content.

“Operating very large stationary steam engines under museum conditions”

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Keywords: steam engine; safety; integrity.

The technical team at Kew Bridge and the associated sites at Crofton and Kempton Park have nearly forty years experience of returning large steam driven pumps to working order for museum demonstration. The oldest is the non-rotative beam engine at Crofton, built in 1812. The newest is the 1929 triple expansion engine at Kempton Park, weighing 800 tonnes and 19 metres high. The principal activity has been at Kew Bridge where four resident non-rotative Cornish cycle engines have been steamed and four large rotative engines have been brought in, re-erected and steamed.

All these engines have had to be adapted to be manageable in their new role. Many have thrown up unexpected problems due to the need to operate them under conditions quite different from those they were designed for. Issues such as the integrity of elderly machinery designed, largely by instinct, in the early 19th century, parts worn beyond serviceable limits at the end of their working life, driving skills and close access by the public have had to be addressed.

Time witnesses of German coking plants: An interview project of the historian circle of the VDKF

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Keywords: Coking plant history; oral history; biographic archives, practical and technical knowledge of cokemaking

The historian circle within the association of German coking plant specialists (VDKF), which was founded in summer 2004 and is coordinated by a scientist of the German mining museum Bochum, works on the historical-scientific project „time witnesses of the German coking plants“ for quite some time. The project uses the methods of oral history as an established means in the science of history today. A group of app. 100 persons, who were directly engaged in the coking plant nature (mostly in Germany) within the last decades, was designated by the historian circle at first. On the basis of this sample each person is asked to talk about the own personal and professional biography within an interview. These interviews are led in the German mining museum Bochum and are recorded on tape. Each interview is formed of the asked person and two interlocutors, who were also involved in the business and therefore know the professional surrounding of the asked person. By this it is tried to achieve a material depth of each interview as far as possible.

The project aims for the creation of biographic archives of the relevant personal of the German coking plants in the second half of the 20th century. These archives cover both a further increasing number of tapes, which deliver the spoken word and the voice of the individual persons, as well as written versions of the interviews, which are produced by copying the tapes. The biographic archives in developing will become a relevant source for historical research on German coking plant nature not only in the time of the Federal Republic of Germany.

The project will supplement in particular the already existing sources in national and relevant archives of the economy to coking plant history by perspectives that did not find an entrance into business correspondences. Above all the practical knowledge and the technical interests in the operating everyday life of the coking plants will be secured in historical perspective.

The contribution describes the formal and scientific bases of the project.

Arthez Ferrarie : Big Stuff of Four Centuries
-Evocation of working glory-

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The Arthez Ferrarie situated in SW of France, near Pau, is a direct reduction furnace with the associated systems to convert iron ore in metal. Built in 1588 and closed in 1866.

The remaining ruins may incline people to put the question: when do you go reworking?

We will explain the actual knowledge, the working conditions, the understanding and the experience we have today cannot permit to really approach an efficiency similar to these of the workers, “ferrones” of the XVI to XIX centuries. We present the cooperation project in the frame work of European Cultural Itinaries: “The Iron Route of Pyrénées” where organisms of 5 Regions: Andorre, Aquitaine, Catalogne, Euskadi, Midi-Pyrénees try to present similar old glories to public.

Poster

Flight of Fancy? The Conservation of the Supermarine S.6b

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Keywords: Floatplane, Schneider, Supermarine

In 1931 a racing seaplane designed by R.J. Mitchell for the Supermarine Company took flight on a September morning from RAF Calshott, England. Within an hour it had completed the course unchallenged and lifted the Schneider trophy for Britain; seventeen days later it broke the world air speed record reaching 407.5 mph.

This was the S.6B floatplane and it is often hailed as the pre-cursor to the development of the Supermarine Spitfire and Rolls Royce Merlin engine, which both played their role in the Battle of Britain.

In 1932 the Science Museum, London acquired both the S.6b and the Schneider trophy, which have sat alongside each other in every Flight gallery since.

But the years began to catch up, the paint flaked on the floats and fuselage and decades of handling took its toll.

The conservation department was eager to intervene, but with a very heavy schedule of work already in hand the project needed to be made distinct, a conservator designated and a suitable approach be found.

This is where the journey began – what would be the museum's approach? The plane needed conservation and consolidation but the exposed metal would need to be toned in.

With no engineering experience an object conservator practiced in working on small to medium sized objects was chosen and research into the proposal began. The approach was to treat the plane as any small object, by conserving in a bench way, just multiplied in scale.

In autumn 2005 work began on gallery and an information panel was created to inform the public of the process.

There were many reasons for the planes deterioration; years of handling, poor paint applications during its working life and direct sunlight while on open display have all combined to cause extensive paint losses, friable layers of the remaining paint, graffiti and build up of grease from handling.

Conservation of the airplane hangar doors from 1937 in Werneuchen, Mark Brandenburg

Retaining the historical fabric for the re-use of the hall as a workshop for restoration and an art foundry

Philipp Hann and Ruth Keller-Kempas

Hangar no. 6 of the Werneuchen military airfield, constructed for military purposes in 1936-1937, is part of an airfield and a group of seven hangars with a centrally located control tower that has been unused and under protected monument status since Russia's withdrawal in 1993. The architecturally pure form is based on a wide-spanned bridge construction of steel-reinforced concrete used since the end of the 1920s. Especially noteworthy is the 50 meter long and 6 meter high foldable sliding panel door installation. Through weathering of the Russian camouflage covering, which dates from the use of the facility by the Red Army from 1945 -1993, the underlying layers have become visible. These multiple layers bestow a transient beauty to the entire surface of the sheet steel doors. This aesthetic moment is supported by the iridescent red-brown colour of the concrete pylons, made of concrete mixed with brick in the Reich style.

The construction of the folding panel sliding door of double-sided, planked steel framework is extraordinary: the individual segments of the door are foldable and suspended in the middle on rollers and by this means, in spite of their great weight and without requiring much space in the hall, they can be pushed to the left and right pylons on a rail system by one man. One aluminum skin spanning a wooden framework on the inside of the door and imparts two climate zones and has an insulating effect on the hall. This distinguishes the facility from countless similar military or civilian facilities from the 1930s.

After 10 years of vacancy and decay the hall was used for grain storage from 2003 - 2005, before it was sold by the Property Restitution Claims Agency (BBG). Now it is used as a workshop for the restoration of large objects and an art foundry.

Within the context of a dissertation carried out at the Berlin FHTW, a plan for the preservation of the door installation was developed. During the course of the research it became apparent that many engineering achievements of the 1930s existed in the Berlin and Brandenburg region; the door installation and the entire hangar are an example: The clear form, combining functionality and solid construction are remarkable. Preserving this engineering feat, by restoring the operational functionality of the doors, was the basic plan of the project.

In this connection, a special difficulty for the implementation of the plan was seen to be the outdoor weathering of the entire outer surfaces, the countless dents arising from carelessness and vandalism, the holes and tears in the sheet steel covering, as well as the missing rollers, hooks and handles.

It is apparent that the entire outer covering must be replaced for the sake of corrosion protection. The covering can be restored by means of the techniques that were developed as the goal of the dissertation work. Dents are leveled by means of tensile loading; tears in the metal, for which MIG-welding proved to be ideal in small pre-tests, are finally closed in the return to the original configuration by means of MAG-spot-welding without introducing excessive heat in the construction. The transfer of heat to the large metal surfaces, during a series of MIG-welding tests on the original panels, was judged to be too difficult to control.

Representation and Restoration of Taiwan's Textile Industrial Arts and Crafts - Tompkins Knitting Machine

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Keywords: knitting machine, Tompkins knitting machine

Before 1949, there were only a few textile factories in Taiwan, which had obsolete equipment and operation. Through only a few craftsmen with salvaged knitting machinery from Shanghai, Guangzhou and Shandong in China. Based on a series of efforts like purchase components and new machines from Hong Kong and Japan. Taiwan's textile industry then began to take off and grow to be self-sufficient. Until now, a great deal of old knitting machinery and equipment have been lost or accidentally destroyed as technology progresses rapidly. Among these rare historical textile industrial arts and crafts, Tompkins Knitting Machine from Chung Shing Textile Company, become a magnificent object to represent the accomplishments of Taiwan's economic and industrial development over the past six decades.

The textile industry plays a portal role in boosting Taiwan's economic growth. The textile industry provided abundant job opportunities and was Taiwan's major export in 1960s-80s. The textile industry not only helped generate a large amount of foreign exchange reserve, but also propelled the development of other industries, such as petrochemical and machinery. Taiwan's textile industry began to decline since 1990s as central government eased regulations on tourists visit and investment in Mainland China. The textile industry also began to shift its focus on design and production of functional fabrics. In early days, Tompkins knitting machine played a major knitting tool which was used as single transmission and spun cotton placed on the ground. For improvement to accelerate production speed, most machines become automatic and controlled by computer now.

The Tompkins knitting machine is the important representative of Taiwan's early knitting machine since 1940s, and only a few can found nowadays. Through the conservation and exhibition of the Tompkins machine at the NSTM, the public can have a deeper understanding of the glorious history of Taiwan's textile industry.

An Historic Airfield as a Museum

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Keywords: Airfield, scheduled monument, National Museum of Flight, collections, conservation, development plan.

This poster will outline the history of the National Museum of Flight (NMoF) a World War I & II airfield which is one of the National Museums Scotland (NMS) museums. It will also look at how the site integrates with the collection and some of the issues.
It has scheduled monument status as defined by Historic Scotland (HS) and houses the National Museums Scotland aviation collection.

Currently there are four main hangars displaying the NMS aviation collection. NMS is trying to create the best environmental conditions possible for the care of the collection. This is difficult with 1940 hangars that are single skin steel clad and draughty and single brick buildings with asbestos roofs that were never built to last. NMS has a development plan for the site which involves upgrading the current hangars and buildings, with a long term view to build a new bespoke hangar off site which will eventually allow all of the collection to be stored indoors.

New Nissan huts have been built in the style of the original ones; they were dangerous and about to collapse. One is being used as the education centre and the other will be for a permanent exhibition focusing on the social history of the people who worked on the site during its life time.

The recent acquisition of a Concorde meant that the roof of the hangar had to be modified to ensure the fin fitted. This involved obtaining permission from Historic Scotland to unbolt parts of the existing structure and to replace it with a modern steel “top hat” section. This permission has only been given for a five year period.

The original stores building has had a full refurbishment to store the collections in and had again to have all the work approved prior to starting by Historic Scotland. There are limited things that can be done as the originality of the building has to be maintained as far as possible. We now do however have a very good store where the environmental conditions are reasonably stable this being aided by internal heaters.

Other enabling works for communications, security and alarm systems require underground cabling; again, to dig trenches permission is required.

When planning the development of the site it is important to treat the site itself as an artefact, which sometimes does not seem clear as there is the potential for the collections to seem more important.

The funding for conservation of the site and the collections is just as important and is integral to the development plan.The NMS is slowly improving the fabric of the buildings and the infrastructure on a planned basis.

Company Exhibition

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Company exhibition

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4. Our references

The World Cultural Heritage Site at the Völklingen Ironworks, Deutsche Messe, CeBIT Hanover, Wismar Municipal Archaeology, the State Garden Show in Trier, Hambach Castle, the Cathedral Museum in Bremen, the Kaiserpfalz in Ingelheim, the Frankfurt Book Fair, Siemens PG ...

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Informal Contribution

Engineering Works and Scaled-down Models Or Industry Laid Bare

Marc-Antonio Barblan

Contribution to the international conference **BigStuff2007**
Large technology objects: Beyond conservation – Industrial Heritage Management
Bochum (Deutsches Bergbau-Museum), 11-14.09.2007

Introduction

The following remarks are based on a long-standing concern of mine and are related to several interventions in the field of industrial heritage. In view of the advent of new parameters – or the recent emphasis on certain trends – these reflections appear to me of the utmost urgency.

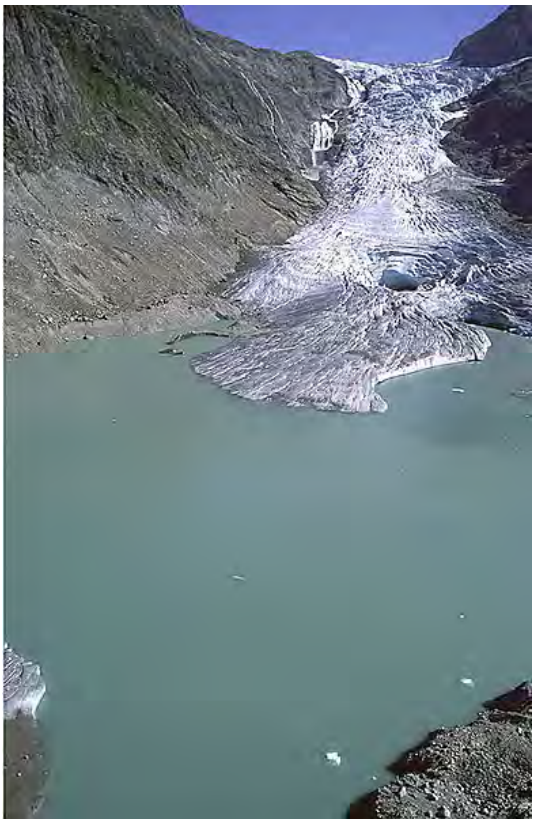
On the positive side, there has clearly been a potential increase in the conceptual and spatial field: be it the enlargement of Europe, the increased interdisciplinary and intercultural opportunities, endorsing the idea of the true interconnectedness of our universal heritage, as well as the realisation of the recently recognised status of immaterial heritage.

On the negative side, however, we must lament those ever-increasing, contemptible moves to cash in on culture in the wider sense, moves which reduce culture to a mere pretence, in which performance-mode takes over at the expense of critical discourse (this may well explain the casual approach to methodology which is so often the case); therefore the difficulty in constructing a complete picture, a comparative one, incorporating the requisite hierarchical order.

Without mentioning the worsening risks to climate and the environment, so much so in fact that water, which will figure prominently henceforth, is threatened in its essence, and will be the disputed prize of future conflicts.

One of the major conclusions, arising from the case studies presented, involves moving from the notion of immaterial heritage to that of the immaterial conservation – by means of technologically advanced models, representations and virtual systems – of a material heritage whose survival may seem highly questionable.

This allows us to evoke the notion of *landscape* – in this case, industrial – which we must consider in its ambiguity as an element of our immaterial heritage. Landscape in fact is not a material element simply bounded by its physical reality. It only exists, as such, through the look of a subject, who, in 'recognising' landscapes, discovers at the same time, his own identity. Notions of the artificiality, subjectivity and historicity of the landscape are elemental.



Triftgletscher (Gadmen, Bernese Alps). A most dramatic example of climate change as shown by the situation in summer of 2002 (left) and autumn 2003 (right). Melting glaciers in the alpine area are a particular concern that might make us rethink our views in preserving and interpreting the hydraulic and hydro-electric heritage.
Source: http://www.swisseduc.ch

Engineering Works and Heritage: a matter of methodology

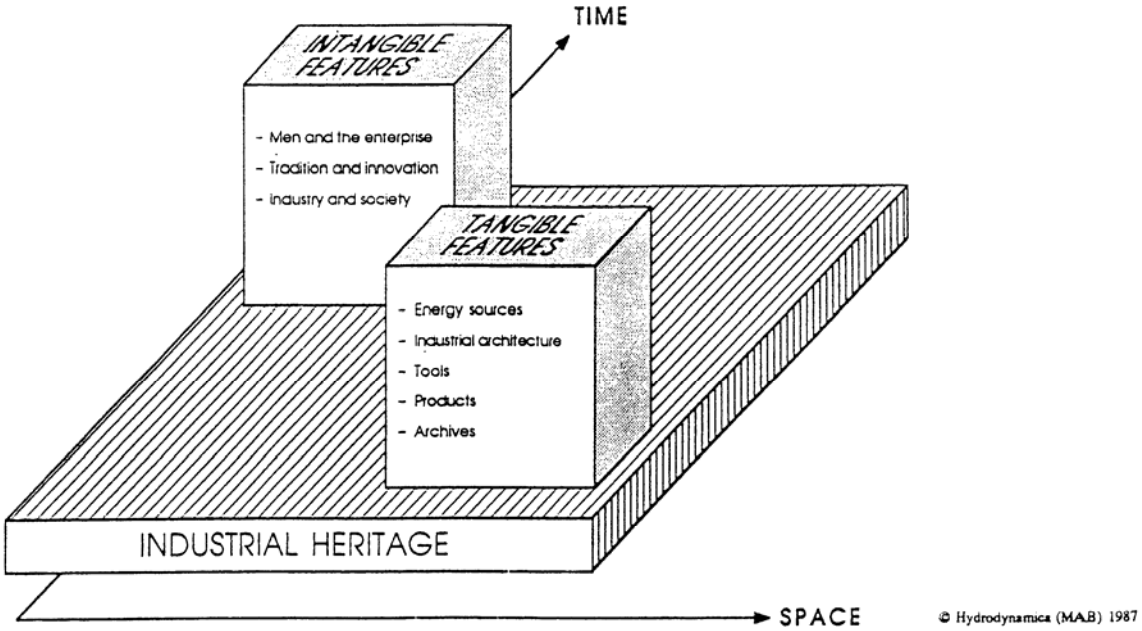
The Conventional Wisdom

There is no need to redefine the term 'industrial heritage'. It may be useful however to remind readers that we consider it to be much like a kaleidoscope: its principal components are to de found in a field unrestricted by time or space. The area defined by those two axes, makes it possible to do away with the obsolete, restrictive and inappropriate notion that only things belonging to a specific period (that is, starting roughly with the English "industrial revolution") and geographical location (namely, in general, the northern-hemisphere industrialized nations which followed the same pattern of development) may qualify as "industrial".

In addition, two separate levels should be identified within those components. They are the tangible level, composed of buildings, artefacts (machines, tools, products) and documents, and the intangible level, made up of all that relates to the relationship between industrial activities, their geographical impact and population groups.

This basic premise makes it possible both to identify a certain number of sub-groups (among them sites and engineering works) – which, however, do not have an independent reality – and to establish the appropriate methods of investigation, action and communication.

Stating and restating this concept and, above all, showing what it can lead to, may finally win over those "pockets of resistance" which threaten the formulation of a fully integrated heritage policy.



Failure to remove the artificial barriers to our approach and the activities which it implies, means going from bad to worse, as we keep wavering between treating the issue in terms of "monuments and sites" and considering it from the point of view of "technical logic".
Neither of these two one-dimensional alternatives can by itself aspire to reveal the cultural significance of this heritage. To argue otherwise leads to engaging in misguided efforts, the likes of which – achieved at no small expense – are found among recent projects. In the long run, one must unfortunately come to the conclusion that they are but rehashings of old themes with new gimmicks.

Engineering and Heritage

"In the past, when applied arts and techniques were the product essentially of experience and of closely guarded traditions, builders, who had to both design and complete constructions, gave the strong impression of having supernatural powers. Hence the derivation of the term engineering from 'genie' or 'genius' to describe both the activity and its product, namely the work itself."
This common dictionary definition considers as belonging to the field of civil engineering all that relates to the design and construction of buildings which are neither defence nor hydraulic or public works projects. This is why, throughout this essay the terms "industrial sites and engineering works" have been chosen to describe that which is our primary concern.
Do these achievements constitute a new dimension, a "new frontier" of humanity's heritage? The answer can be in the affirmative, if we consider the new awareness of our intangible heritage, conservation endeavours, new museums, various international conferences; or it can be negative if reference is made to the conceptual and methodological approaches which were already articulated more than a quarter of a century ago.
Industrial sites and engineering works do not, in and of themselves, represent an independent whole. They fall under the general heading of industrial heritage, of which they are an important aspect, as much for their tangible aspects (frequently very substantial) as for their, in many ways, exemplary intangible extensions. Indeed, projects of public works or sites of mineral extraction in most cases involve whole networks (of energy, goods or people) which, while they define – or result from – the geographical development of industry, become important channels for the interaction between industry and society.
In this respect, they could even be considered to represent the quintessential industrial heritage.

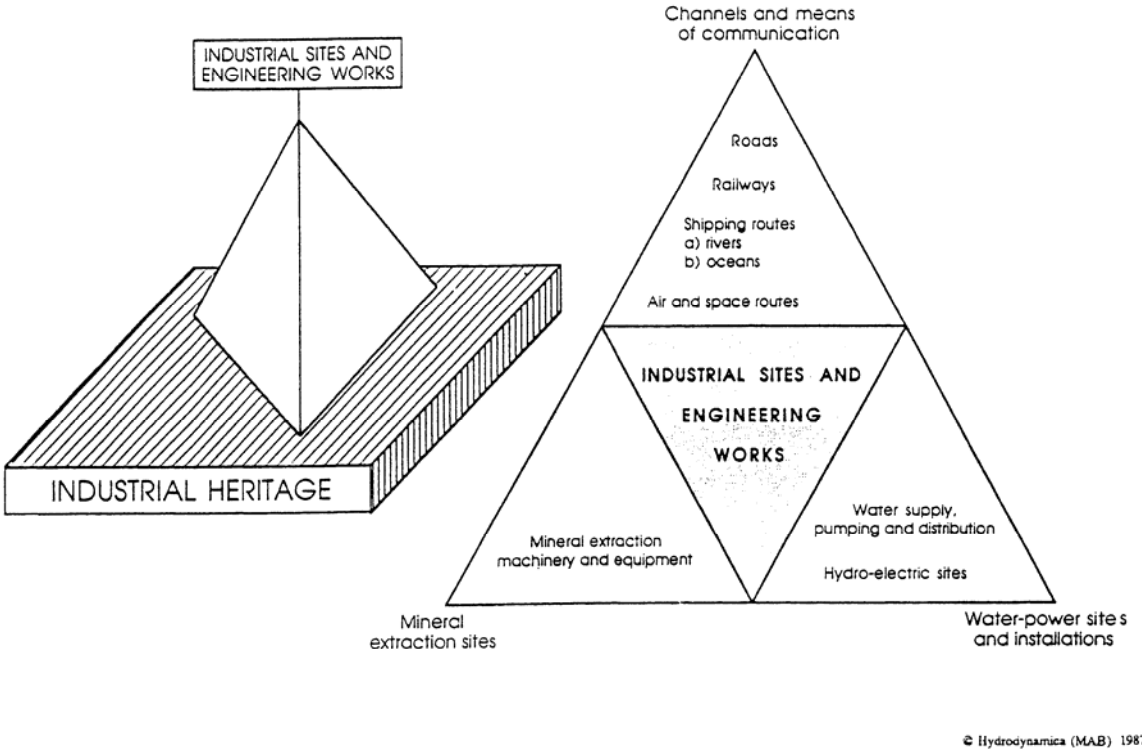
The fact that sufficient attention has not been given until now to such larger entities may be ascribed largely to the conceptual confusion which existed in the approach to what still used to be known as "industrial archaeology". By mistaking a part for the whole, the "industrial revolution" was overemphasized, even though its "achievements constitute a factor of very limited scope, functionally as well as chronologically" (J.Fernandez-Ordoñez).

Engineering Works, Systems, Networks

It can be seen at once that this whole, the parts of which are defined by their functional typology, is only partially autonomous. One needs merely to note that industrial sites and engineering works almost always include built components, falling under the general definition of civil engineering, together with actual industrial equipment with specific functions, either operative or productive. Both of these elements belong equally within the general concept of the industrial heritage.

For practical reasons, a three-tiered classification has nevertheless been selected: channels and equipment for communications (by land, rail, river and sea, air and space), hydraulic projects and equipment and mineral extraction sites.

Whatever illustrative examples come spontaneously to mind, it will be immediately obvious to anyone that these buildings and the sites of which they are part are typically "monumental". They also form systems, either in part or as a whole, that in turn achieve their full identity only through interaction with networks to which they are connected or contribute to create.



As we shall see later on, when we examine the subject further, this factor implies a specific approach from the point of view of understanding, preservation and conservation.

For if this heritage is to be recognized, as is both legitimate and necessary, it needs to be given a human, cultural and social dimension, its various degrees of complexity must be publicized, brought into view.

In addition, considerations of financial, functional or even methodological order prevent us from systematically advocating keeping these systems in existence.

Hence the apparent contradiction whereby ways and means are being sought for the preservation and conservation of technical systems while circumstances may make it unadvisable to preserve their tangible aspects above or below ground, either in part or as a whole.
Meeting such a challenge will require that novel methods be found, based on time-proven traditions and using new tools, techniques and languages, so as to devise the most efficient means of both restoring and communication.

From Sadd-el-Kafara to Itaipu

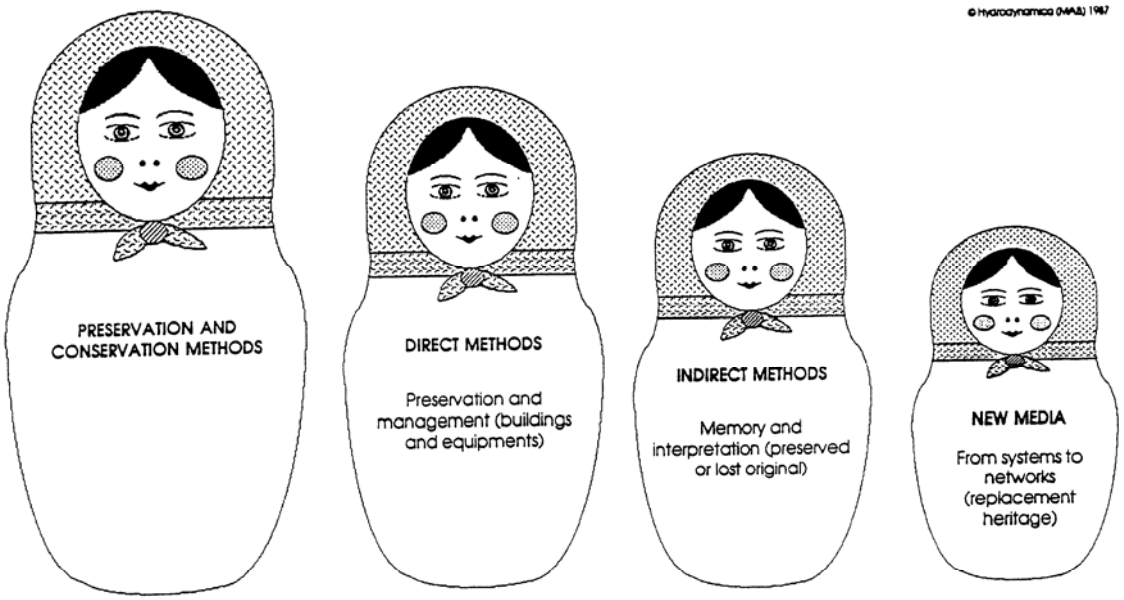
These two hydraulic sites are separated in time by almost four thousand years. The first, dating back to the ancient Egyptian Empire, is considered to be the oldest known large structure (a flood control dam retaining up to 500'000 cubic meters); the latter, built on the border between Brazil and Paraguay, lays claim to being, at the beginning of our century, the largest in existence in terms of output capacity.
Even if the choice of these two obvious leading examples may be termed arbitrary, they have the advantage of putting the spotlight, at the global level, through time and space, on the rich and many-sided nature of this heritage.
Some twenty years ago, a group of Spanish experts articulated certain basic principles, which perfectly reflect our own views:
- in addition to having a cultural and social dimension, industrial sites and engineering works have had an impact on the aspect of the land itself, on the way Europe looks today, on the gradual definition of the continent's identity
- industrial sites and engineering works are always part of a wider space and geographical area
- the builders themselves are part of a more extended network in terms of space and time: a comparison between the suspension bridges built at different times in countries such as Peru, Madagascar, China, India and Bhutan, among which there is no known direct connexion, suggests that there may exist some form of universal notion of civil engineering, based on primitive intuition.

As for activities which are implied by such considerations, we must, above all, manage to fully integrate this heritage into our cultural and socio-economic life by using, or re-using it, in a correct way. We must go beyond the purely archaeological stage to make the works in question function within the context of their original role and of the needs of our times.
Consequently, it makes little sense to preserve such works, and to restore them, without the knowledge that, in the final analysis, the best guarantee of survival consists in either keeping them functioning as before or in finding a new role for them.
That is why, in this field, research and activity must go hand in hand with an operational and investigative concern that any work of future rehabilitation will take into account historical and cultural factors.
This makes it possible to bring out a point which is specific to industrial sites and engineering works within the scope of our industrial heritage, namely that when their preservation is possible and desirable, the critical factor is whether or not they are able to function.

Different Problems, Separate Solutions

Everyone agrees that, logically (from a geographical or historical point of view) it ought to be possible to choose typical examples to be preserved, while highlighting what could be called their added cultural and social value.
These examples can be chosen only after available resources are known, as well as after their impact has been measured in terms of multidisciplinary criteria. By the time it takes to accomplish this (at least to a meaningful extent) a number of potentially interesting examples will have disappeared or been altered beyond recognition.
Hence the urgency to encourage – together with the trans-national survey mentioned above – the starting up of these directories in all countries where they do not yet exist. Hence also the need to temporarily and preventively freeze certain projects where emergency situations have arisen.

It must also be kept in mind that our changing view of the heritage, albeit a positive one, can present us with difficult choices. We keep from past centuries what has been left to us by time, historical accidents and the nature of things, as well as what we shall be able to preserve for posterity.
The situation as far as our contemporary heritage is concerned is quite different, as it is being created and destroyed at an increasing pace. A living concept of conservation must from now on incite us to create a "memory of the present" out of examples whose true historical and cultural relevance will only be measurable in the future. It is no less necessary to establish criteria for selecting such examples, while at the same time clearly acknowledging the risks of judgemental error implied therein.
Prior to making recommendations, various forms of action should be examined (be they forms which exist or forms which still need to be defined), so as to select the most appropriate ones.
A general remark must be made here and, later on, its practical significance will be examined, after a look at two case studies. It is clear that those who sought to consider "industrial archaeology" as a separate field of study, as opposed to a new way of looking at items located at the interface between various interrelated disciplines, have exposed themselves, and are still exposed, to a contradiction whereby our industrial heritage would consist of only abandoned factories, or those about to be abandoned, and can be protected only by preserving the actual existence of buildings or other artefacts.
The definition given above, which is unrestricted by time or space – its necessary anthropological extensions – implies various modes of conservation which can be classified as direct and indirect methods.
These can be used simultaneously, whenever the original item is preserved. On the other hand, if the physical preservation of items cannot be guaranteed, indirect methods can be used to create an alternative heritage.



Three major considerations, among others, support such an approach. They are:
a) the fact that there are elements of the industrial heritage which have been preserved – prior to its "discovery" or independently of it – within traditional heritage institutions (collections, museums, archives, etc.) which are not exclusively industrial in character; conserving this heritage (together with its cultural aspects) presupposes that such items be identified within existing collections and be grouped in a consistent manner, to illustrate different projects.
Those might be, for instance, European cross-inventories as comparative study-bases, thematic exhibitions whenever advisable etc.

b) that, by its very nature (dimension, volume, weight) and by its extensions (the "shadows" it casts around itself), the industrial item cannot always be preserved intact; to maintain that it should be, rapidly leads to unsolvable material and financial problems, as well as antagonizing potential supporters, while failing to consistently meet the principal aims of assimilation, conservation and communication.
c) the fact that the industrial heritage can be characterized, for instance, by the coexistence of alternating tradition and innovation within a past-present-future trend. For this reason, by analogy, the most recent techniques should be used, in addition to traditional methods (which could be modernised), to devise new modes of preservation and conservation which should function as media. These elements will in turn become part of the heritage, as examples and at the same time as works themselves, if not as substitutes for the lost items.

The Industrial Heritage: a matter of networks

Two Water Systems: Bologna and the Grande Dixence

Industrial sites and engineering works, as we have seen, consist not only of what are often very complex technical systems.
They also form parts of networks, which they define or into which they fit. Like the industrial heritage, of which they are a part, these networks comprise material aspects (technological, spacial, territorial, for instance). In addition, they in turn imply the notion of streaming – this can never be overstated – of a tangible or intangible order.
As we mentioned earlier, water-power constructions and engineering works are not yet considered sufficiently as technical and cultural systems.
Within the scope of the present paper, we shall therefore try and fill this void with the help of two examples.
Chosen from among many others, they offer, above all, a methodological framework, an operational guide of general interest for the integration, the communication and the enhancement of the industrial heritage.
They are all the more relevant whenever the subject at hand – what is being examined, discussed and acted upon – happens to belong to that category of large sites which concerns us.
In addition, considering that, as with methods applicable to the history of enterprises, the examples chosen should by themselves make it possible to understand the entire history of the sector under consideration, who would deny that the Bologna water system and the Grande Dixence sites are indeed cases which meet such criteria?
We are confronted here with two technological and human ventures which are, each in its own time, at the threshold of the modern era (textile industry, hydroelectric power), perhaps even precursor forms of it.
Both are, through a variety of interactions, parts of closely-knit networks which together form an aspect of civilization which in all likelihood should interest all of us, not just those specialized in industry and its history.

The Wedding of Water and Silk

When, in the early 12th century, the Bolognese undertook to build the Chiusa di Casalecchio – which was to become the main component of the city's water system and a genuine "Gateway to Europe" – they meant it to provide, in fact, free access to the Adriatic, which had existed in nature, but which hydrographical changes had later obstructed.
Located west of Bologna, the installation made it possible to divert the Reno river through the city by the Navile canal. This was an event of considerable economic impact, which led the municipal authorities to reopen a waterway toward Ferrara and the northern Adriatic. The Navile canal was therefore a symbol of Bologna's opening toward Venice,
Europe and the East: a technical achievement, a travel and shipping route, with economic and commercial stakes which almost constantly drew the attention of local and papal authorities.

When completed, the waterway followed a course dropping almost a hundred feet, through ten locks, or *sostegni*, from Bologna to Malalbergo in the Po River valley. To visitors, Bologna therefore appeared as a true "city on the water", which today seems unusual, with all life taking place around its water system (it has been estimated that the volume of cargo handled by the port reached 100,000 metric tons by 1580).
The availability of water led to the appearance of a variety of hydraulic machinery (close to 400 ducts and wheels at the beginning of the 16th century). The diversified traditional milling sites were dominated by the silk mills, a highly sophisticated water-power structure whose secret was closely guarded by the Bolognese.
Moreover, technical improvements made in the silk mills gave rise in Bologna to an organization of work which foreshadowed the modern silk mill, well ahead of that of J.Lombe in England (1721), while doing away with domestic workshops.
Water and silk came to symbolize the vitality of an important city, ensuring at the same time its prosperity. Soon however, the situation was to reverse itself. The disaster brought about by the outbreak of bubonic plague in 1629, the progressive closing of traditional markets, and the flight of capital toward other activities were factors in a decline, which ended in a total collapse of the industry during the Napoleonic era.

Bologna Water System, 12th – 17th century. Silk production, depending on water as source of energy, involves a series of interdependent networks: technological (primary and secondary), spatial and territorial, industrial and economic, cultural and social. © Marc-A.Barblan

By the end of the 17th century, the textile industry (in all of Italy, not just in Bologna) had been almost completely supplanted by agriculture (the region had become a net exporter of raw materials and importer of manufactured goods). The progressive shift in population away from urban areas was to give Italy a predominantly agrarian character which remained unchanged until the end of the Second World War.
These events inevitably caused the water system, centrepiece of the industrial structure, to feel the repercussions of such a decline and to fall into disuse. It is however symptomatic that a change in mental attitudes, a sort of collective amnesia (all the more inexplicable since the principal entrepreneurs had fully supported the silk industry, prior to investing in the agricultural sector) preceded the actual collapse of a large number of the structures.
As late as 1948, when it stopped being used for shipping, the Navile canal was still operational, so that urban changes during the 1950's (succeeding those of the end of the 19th century) managed to erase that essential aspect of Bologna's identity, that which represented its "hydrosilk" activity, only because it had already sunk deep into the oblivion to which it was to be relegated by the collective memory.

From the *Bisse* to the Pressure Pipeline

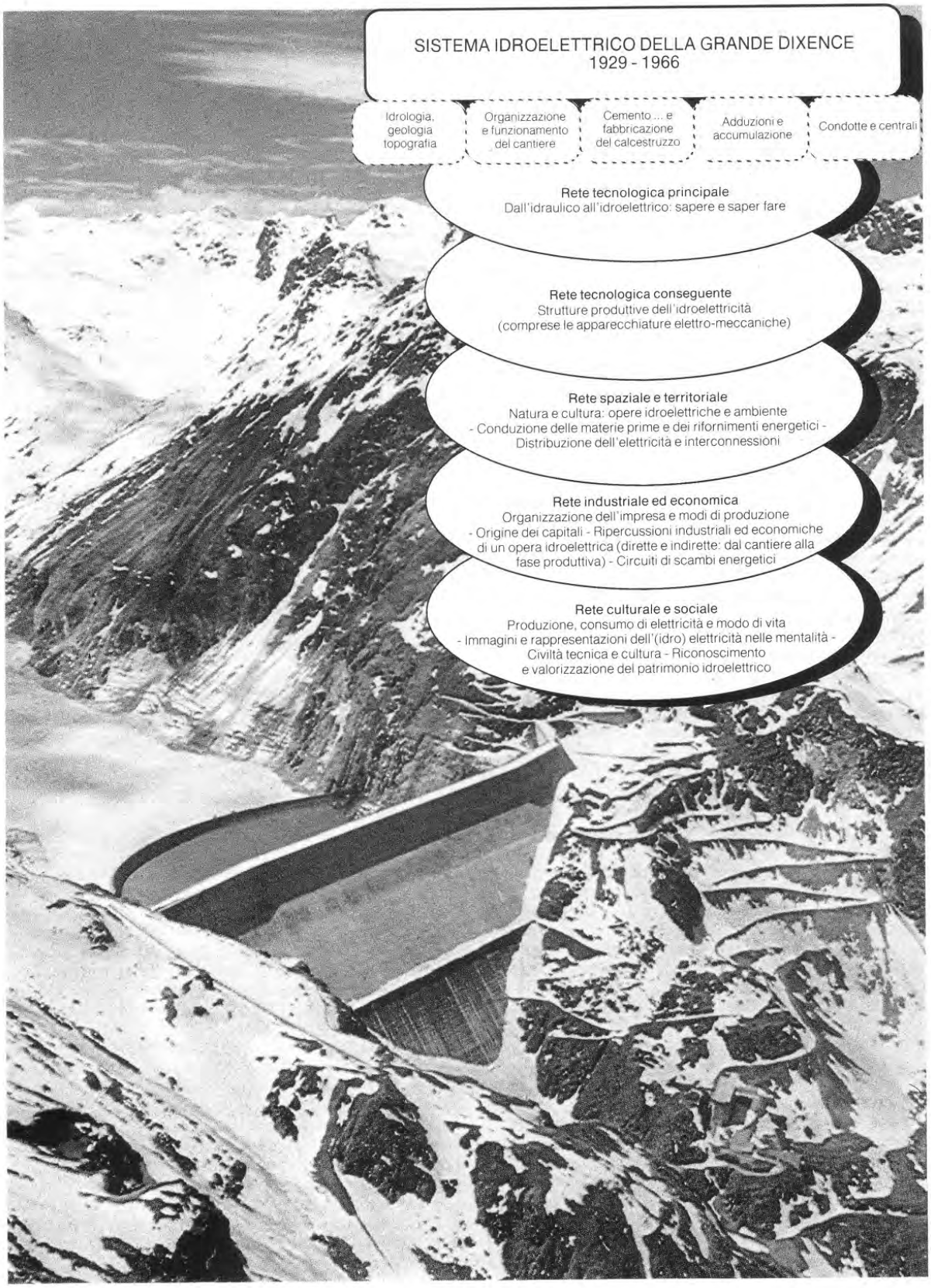
The people of the Swiss canton of Valais have always built what are locally known as *bisses*, or open wooden irrigation canals, frequently found on the side of mountains, and they certainly built them too in the Hérémence Valley.
It appears in fact that seven of them were installed in the area between the 13th and the 19th century, while documents also indicate the presence there of preindustrial operations which used water power: three flour mills with ovens and fullers' areas attached (the oldest dating back probably to the early 15th century), as well as various sawmills. Unfortunately, nothing remains of these structures, destroyed by successive landslides (in 1951) then by the spillout of an underground lake (1963).
The development of electrical power led to other ideas for the use of the Dixence River's floe. Although an application for a concession was first filed at the end of 1899, it was not until 1927, when the company *L'Energie de l'Ouest-Suisse (EOS)* purchased the concession and started work there in earnest in 1929, that the first dam was begun at the mouth of the Val des Dix.
EOS had been founded some years earlier by Jean Landry (1875-1940), the then president of the Lausanne Engineering School (as well as one of the inventors of the system used in building the dam).
In the early days of electricity, after solutions had been found to production problems, the 1891 Frankfurt Electricity Exhibition saw the appearance of a significant new development: Brown and Boveri demonstrated the first transmission of high-voltage power (25,000 volts) over a distance in excess of 100 miles (170 km).
The impact of this new technology on the growth of hydroelectrical power stations can be readily seen, in particular on those at mountain sites, with a catchment area and high water fall.
Power transmission networks, essential elements in the geography of industry, from then on, systematically integrated different power stations, whose output levels fluctuated widely depending on whether they relied on a river's flow (and were affected by nature's course) or were fed by high-altitude reservoirs.
At issue was the construction, at an altitude in excess of 2,000 meters, of a hollow dam 87 meters in height (of a type known as Landry-Stucky), and 458.5 meters in length at the crest.
Its upstream and downstream walls would be covered by 9,200 cubic meters of quarry stone. A metal bridge supported by pylons anchored to the dam's recesses would serve to transport and spread the concrete from a conveyor belt combined with a system of movable chutes. The infrastructures on the site (where 1,200 workers and supervisors were employed) were considerable. Two penstocks, with a level drop of 1,750 meters, fed the Chandoline station, built at the same time.
In spite of labour problems and of difficulties in the financing of the work's ultimate stage, the installation was completed at the end of 1935.

An official research paper, issued in 1945, concluded that, due to its potential of available energy, the Val des Dix would be an obvious choice for the siting of a huge reservoir at high altitude.
This constituted the starting point from which the world's highest concrete dam would be erected (6 million cubic meters for a height at the crest of 285 meters).For after having considered various alternatives, *EOS* opted for the building of a new gravity dam downstream from the existing one (so as not to have to interrupt the latter's operation).
The entire project, achieved between 1952 and 1966, covers a distance of 50 kilometers as measured in a straight line, or 125 kilometers in terms of the length of the tunnels. It is divided into three main sections:
- water conveyance (intakes, waterworks, head race tunnels)
- water storage (Val des Dix lake and dam)
- production (two power stations and their conduits)

There is no need to describe in more detail the construction work, the considerable importance of which can be readily imagined. The project forms a technical system (which can in turn be divided into several subsystems) characterized by the diversified nature of its functions.
The following are some of its main aspects:
- the exploitation over several centuries of the Dixence River's waters, at first to agricultural ends (irrigation *bisses*), later for preindustrial uses (milling and sawmills)
- the probably unequalled size of the catchment area (360 square kilometres) and of the water-supply installations
- organizing at such a high altitude a construction project of this size (when fully operational it consumed 30 million kwh annually, enough to supply a city of 20,000), calling for original technical solutions
- building within the same valley, some 20 years apart, two successive dams and the impact thereof on a region untouched by economic development and, additionally, the symbolic significance of this perhaps unique instance the first Dixence dam (1935) immersed in today's lake.

of "underwater industrial archaeology" constituted by Grande Dixence hydro-electric system, 1929 – 1966. Very substantial for its tangible aspects it also shows exemplary intangible extensions. Thus allowing several levels in our approach to industrial systems and landscapes. © Marc-A. Barblan

It should be noted too that this sampling of aspects – restricted to the work accomplished on the site and to its direct repercussions – omits all the "shadows cast" or side effects of the project (in terms of technology, space and geography, as well as industrial, economic and sociocultural impact).
These ramifications, both visible and invisible, have a much wider impact, reaching – sometimes creating – new surroundings, so that what may have started as an isolated – albeit unusual – event, ends up changed into an important cultural fact. All the more so, and it is not



just happenstance, that the two main phases of this adventure coincide with the great transformations of the 20th century.

Bologna in the Middle Ages, the Dixence in the twentieth century: everything seems to set these two cases apart.
And yet each of them can teach us much about general principles of understanding, preserving, conserving and enhancing the industrial heritage, in particular when engineering works are its main components.
In Bologna the water system which was the very pulse of the city has not only fallen into oblivion but has been seriously damaged by the twin factors of economic development and urban renewal.
When it was rediscovered, at the end of the 1970's, important sections of the projects still remained, however, principally outside the historic center (including the impressive Chiusa di Casalecchio). To the extent that it can be done, the municipal authorities evaluating preservation and conservation measures needed to give new life to this evidence of man's ingenuity and energy.
Here we have the situation of fragile elements disappearing from a system. It ought to show us the urgent need to devise new means of communication, if we wish to preserve such a system and to make it comprehensible. With the proper means, it should be possible to reflect the magnitude of the water-and-silk era of Bologna while preserving its authenticity.
At Dixence the situation is altogether different. Here, unlike in Bologna, the entire industrial site and its equipment exist, operate and will continue to function in the future (the Grande Dixence concession will expire in the year 2045). Paradoxically, it is the entire heritage, including the first dam, now immersed in the lake (though visible when the water level is at its lowest) which should incite us to develop new conservation methods.
In addition to possible conservation problems which future generations would have to address, the overall magnitude of the project and its sheer complexity could render traditional conservation meaningless.
The challenge here consists therefore of devising and putting into work methods of conservation aimed at integrating and presenting not just the industrial site as such, which is in itself technically complex, but also its many ramifications.
Being aware of such methods is, in our opinion, a necessary condition for the successful conservation of this heritage.
Moreover, the degradation of climatic equilibrium in the Alps, bringing about the increased melting of glaciers, will very likely change our way of looking at things and incite us to open quite abruptly, the whole heritage debate.

Scaled-down models: a matter of communication

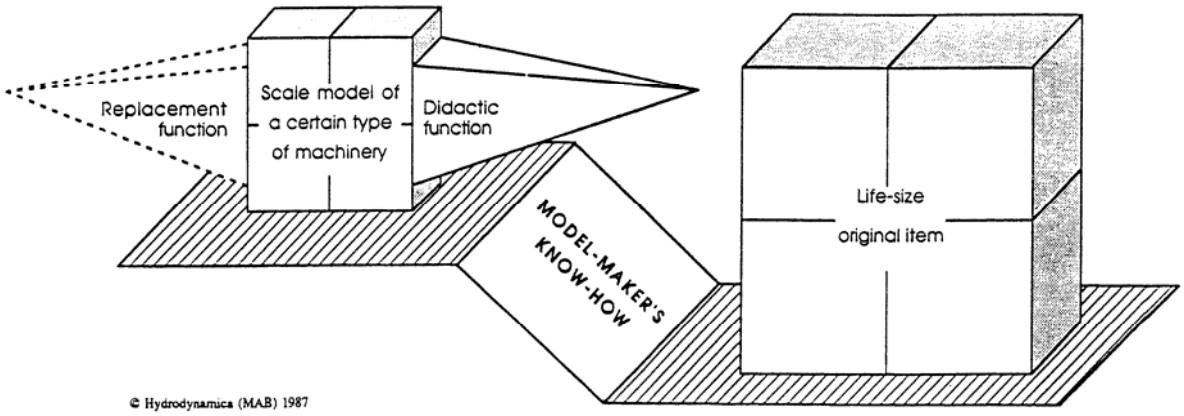
Streaming, systems and models

Having reached an advanced stage in our investigation, we must now suggest which methods we believe will ensure conservation.
It should be noted at the outset that, as mentioned earlier on the subject of direct and indirect methods and combinations thereof, the assimilation and communication medium described below will itself have an important role, regardless of whether the original item is preserved, be it in whole or in part.
Quite simply stated: Should the original item be lost, the medium will become a substitute for it, in addition to having assimilation and communication functions, and will in fact itself, become part of the heritage.
Claude Levi-Strauss considers mock-ups (or scaled-down models) as providing a kind of learning process in reverse. While knowledge is generally acquired by proceeding from the particular toward the general, scaled-down models make us understand the whole before we know its parts.
But a scaled-down model, he goes on to state, "has an additional aspect: it represents a genuine experiment on the object. And to the extent that the model is artificial, one can now understand how it is made. Grasping the way it is constructed adds a new dimension to its existence (…) In other words, the intrinsic value of the scaled-down model resides in its ability to trade a dimension which can be perceived for one which can be understood."

It should be noted, however, that the sense of perception needs not always nor systematically disappear. Its presence will depend largely on the nature of the original item and on the type of mock-up used. For the model-maker will use his own perception to create the understandable version.
As for its users, they may be called upon to use their ability to perceive before being in a position to understand. The two notions of perceivability and understandability are therefore not mutually exclusive but rather complementary, one leading to the other, as the case may be.
These obviously constitute the reasons why, traditionally, scaled-down models have played a crucial part in the transmission of techniques and of engineering knowledge in Europe.
We wish to demonstrate this by relating briefly the "parallel lives" of three institutions whose collection of mock-ups and models have had a direct bearing on our thinking.

Memory of Expertise and Know-how

Shortly before the French National Engineering Conservatory (*Conservatoire national des Arts et Métiers, CNAM*) was founded in 1794, Abbot Grégoire, as rapporteur, held forth as follows, at the Convention:
"The creation of a conservatory of engineering which will assemble all newly-invented or improved tools and machines will give rise to curiosity and interest and you shall witness very rapid progress in many fields. Nothing there will be theoretical: practice alone, visible, will be entitled to be represented. (…) I come before you with the means of perfecting our nation's industry."
Using the collection assembled by the inventor Jacques de Vaucanson, France's Conservatory was for a long time the only one of its type. It may be remembered that, at the international level, the 1851 universal exhibition at London's *Crystal Palace* led to the creation of the science section at the *South Kensington Museum* some years later, while the *Deutsches Museum* did not open until 1903.
The CNAM's collection witnessed an almost continuous development. But it became, in 1919, a full-time teaching institution, relegating to a secondary place what was later to become the *Musée National des Techniques.*
Aware of the problems of "monumentality" inherent in the conservation of industrial works and equipment, the founders of the CNAM seem to have dealt with the issue from the very outset.
Indeed, some machines were built as scaled-down models in order to conserve the image of what Vaucanson had built full size elsewhere (for example his machine for making organzine silk); small-scale versions of others were made for demonstration purposes; still others were reduced to graphic representation or to three-dimensional mock-ups (gear-cutting machinery) because of problems encountered in taking them apart when the museum changed locations in 1799.
Soon after the opening of the CNAM, the Austrian emperor Franz I founded an *Industrie Kabinett* (later to become *Fabriksproduktenkabinett*) in 1807.
The assembled material remained with the Imperial collections until 1815, when it was transferred to the *Polytechnisches Institut* upon the latter's opening. It was then replaced by the *Technisches Kabinett* which grew until 1840, when Emperor Ferdinand I turned it over again to the polytechnical institute. Similarly, a particularly well-endowed collection of reduced-scale agricultural machinery was assembled by Archduke John at the beginning of the 19th century.
All of these collections – which were certainly used in teaching – were taken over by the *Technisches Museum für Industrie und Gewerbe*. Started in 1918, this institution was the outcome of patient work initiated at the 1873 world exhibition of Vienna.



In Bologna, the collapse of the single-industry silk economy at the end of the 18th century undermined the city's entrepreneurial vocation. Any hope for a social renaissance then became contingent on a change in attitude toward the industrial reality, requiring among other the introduction of technical training.
The *Istituto Aldini-Valeriani* was born and developed within this context. While waiting for technological principles – as articulated by the European polytechnical institutes – to become educational subjects, the *Scuole Tecniche Aldini-Valeriani* (1844-1860) used scaled-down models of existing machines for the training of students.
Most of these models had been left to the local authorities by virtue of a bequest contained in Giovanni Aldini's will (1834).
Other scaled-down models (such as hydraulic wheels and machines) were ordered between 1850 and 1860 from local manufacturers as well as from such renowned international suppliers as the A.Clair firm in Paris.
This activity was pursued under a different form at the *Gabinetto Aldini* (1863-1876). The institution broadened its mechanical sector but was now no longer a school, becoming instead an experimental museum of inventions and discoveries, prior to the first experiments in establishing a "factory-school", the likes of which remain in existence to this day.
Over the years, with no one to look after the model and mock-up collections, they fell into oblivion until a safeguarding and conservation effort finally started in 1977. Its initial stage was marked by the exhibition *Macchine, Scuola, Industria* of 1980-81.
In the course of different stages (notably in 1986, with the realisation of a large model in movement of a silk mill) we ended up in 1997, with the installation of the *Museo del Patrimonio Industriale* in a disused brickworks. The collections of the *Museo-laboratorio Aldini-Valeriani* will later be transferred.
A European typology of models and mock-ups and of their uses during their golden age can be derived from the three examples above, as :

- instruments of knowledge
- tools for training and developing skills
- vehicles for know-how (through the skills needed to make them).

Later on, scaled-down models started being used as a substitute for the original item, though this was not their original intended purpose: machines and equipment were reduced in size to facilitate their demonstration and not to replace an original item which was still in existence.
Because of the ends to which this type of mock-up – which we may refer to as "first generation" – was used, it possesses characteristics which are one-dimensional.
On the basis of an examination of the original item, the aim was to illustrate and explain, with the help of a scaled-down model, the manner in which such a machine or project was constructed and functioned.

Tradition and Innovation

Engineering works, large machines or equipment thus present a two-sided problem: the issue of their preservation is connected to their being made comprehensible.

Preservation problems arise principally from the size of the objects and are reflected at the material and financial levels.

Even if conservation problems were to be resolved (can one imagine for a moment that industry or government would be prepared to turn into a museum the acreage used by a cement maker, for instance, thereby removing this portion of land from industrial or other uses?), it would be justified to question whether such conservation would be actually useful.

These machines, equipment and sites are, as we have seen, both large and complex and they would have to be activated since they would no longer have a productive function.

In such a situation, from a cultural and heritage point of view, how could an outside observer understand how they worked and what they represented?

It is for such reasons that we wish to argue in favour of going back to using mock-ups for communication purposes and to developing a "second generation" of scaled-down models.

We can indeed agree with André Desvallées:

"As soon as the technical aspect (or, for that matter, the historic or ethnographic aspect) is considered to be more important than the object itself, there is nothing wrong with a metamorphosis, with substituting a copy for the original. Using models leads us to the issue of animation as much as to that of conservation (…) are we barred from animating historical collections so as to better transmit what they can teach us? (…) For if science can be explained by demonstration and if technology also needs to be explained, then this holds true as much for ancient science and technology as it does for their contemporary equivalents. And if it appears indispensable that demonstrations of contemporary science and technology be performed with contemporary objects, it is difficult to understand why historical references for these disciplines should not be necessary."

It follows that technical systems should not be considered on the basis of their own internal logic alone. For any object can be integrated into a whole which will give it depth and meaning.

This is true in particular of large machines and equipment, of industrial sites and engineering works: each defines broader networks (tangible and intangible) by its very nature and function.

Hence the imperative need for substitutes which could also re-create – and render comprehensible – such broader networks.

To achieve this, we must invent this "new medium" which will allow us to put into effect, in our field of activity, Claude Levi-Strauss' statement quoted above: "(…) the intrinsic value of the scaled-down model resides in its ability to trade a dimension which can be perceived, for one which can be understood."

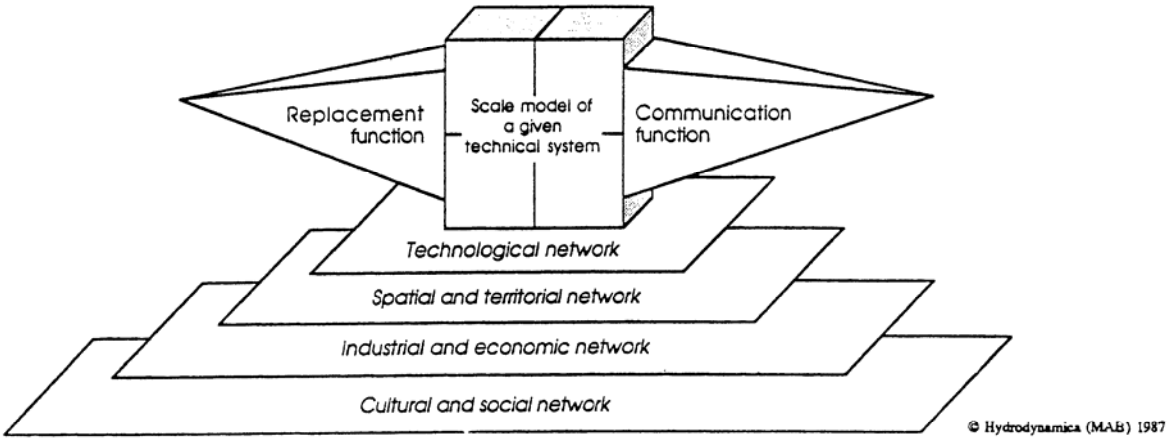
From a "European Knot" toward Wider Horizons

In the preceding pages we have attempted, by using two important case studies, to define the nature of the heritage consisting of industrial sites and engineering works, to briefly illustrate some of its aspects and to understand its impact on history, culture and society. By underscoring certain specific conservation problems and related issues of understandability and communication, we have come to plead for a return to the use of mock-ups, to their design and production as well as to their function. Is it not in fact true that scaled-down models represent an area defined by two coordinates representing the characteristics of the industrial heritage: that which traces the progress of tradition and innovation and that which reflects the passage from the past toward the future, by way of the present?

Starting from an examination of the educational, physical and historical aspects of mock-ups at the time of their greatest popularity (18th and 19th centuries), we soon ended up arguing in favour of conserving this heritage.

This approach then went beyond this initial goal, as the discussion encompassed a wider area and touched on other issues. We came progressively to re-examine the role of scaled-down models under a different angle, as we considered the issues connected with the conservation of entire hydraulic projects,

such as those described above, with the preservation of large machinery and industrial sites (which evidently cannot be achieved by a full-scale approach), with the imperative need to consider conservation in terms not only of preservation but also of communication (without which, in our opinion, a heritage policy cannot but remain ineffective).
It makes perfect sense, after all, not to remain tied to traditions and the past but to extend these instead toward innovation and the future.
No break with them is intended, but quite the opposite, for mock-ups remain perfect communication media, be they of the first generation (with their teaching and educational qualities) or of the second which we are suggesting.
As a start, this should not be limited to producing simple scaled-down models. Rather, it would be a matter of integrating technical systems within a series of networks.
This could be done either within single integrated models (possibly evolving) or within several separate but combined models.



As a second step, the range of materials and techniques being used would have to be broadened. To wood, plastic, metal, etc. should of course be added other materials and media, taking full advantage of the technological opportunities of the day.
Such a revitalizing of the medium implies at the outset that a survey be made, at the European level, of what has already been done or can be expected in the future.
A program of this kind would have to be conceived, in two stages, if it is to achieve its aim. A first stage would consist of exhibiting principally the Paris, Vienna and Bologna collections, so as to show the evolution which led to the making of scaled-down models for the uses for which they were then designed.
The origins of mock-ups would be shown, starting from the life-size original item in its surroundings, with emphasis on the technique and know-how of model makers by showing the production process.
This would cover the upstream end of the question. For the downstream end, that which concerns the purchaser and the user, the cultural climate should be recreated to show why this technique was used.
The history of the collection would be explained, together with the teaching and educational aims for which the models were used, as well as their role in the development of technology.
Without question, the heritage aspect would be present even at this stage, since the mock-ups have become, with time, the only replacements for lost originals.

While assembling material for such a project, an inventory could be made – even a cursory one – of existing resources of this type in European countries, which would at the same time have a positive effect on their value and importance. To think of the sad state in which the Bologna collection was, a mere 30 years ago, before it was rediscovered, is to imagine what other secret treasures may be waiting to be brought to light from their perilous obscurity, especially in technical schools, if not in museums or in private collections.

The aim of the second stage would be to demonstrate the methodological and practical considerations which favour going back to making models, now with new functions. This would involve creativity and innovation, which would require a cross-cultural approach and cooperation, as much for the nature as for the expression of the message to be delivered.

As this is still unexplored territory, a certain number of projects would have to be selected (be they machinery, industrial complexes, sites or engineering works), and the reduction of these to model size would have to be investigated, which would make it possible to take stock of the situation and to draw conclusions applicable to the future.

This is certainly a European, if not Alpine, approach, but which – through the perspectives it opens – may, and must apply (taking into consideration the requisite technological, historical and cultural adaptations) to other continents.

I think, in particular, of those countries with an extremely ancient contribution in terms of hydraulic engineering works.

A heritage which is all the more important since it allows us to follow, through diachronic and spatial depth, the different stages which man has gone through in the management and mastery of water for the production of food, preindustrial and eventually industrial operations.

A *shaduf* in Egypt (original photograph by Henri Béchard, 1875). From the start photographers paid attention to labour and techniques. Simple device for small-scale irrigation this *shaduf* is nevertheless emblematic of the high skills shown by ancient civilizations in water management and mastery, especially in the Middle East. Leading to remarkable engineering works such as the Jawa reservoir (Jordan), the

Marib dam (Yemen) or the *aflaj* irrigation systems of Oman. A tradition brilliantly carried on later by the arabo-islamic technology. © Private collection
So, it is on this "hydraulic base" that we should then build, for these regions, a true heritage policy; all the more so, since development is rapid and may well bring about irreparable loss, without the requisite distance and hierarchical ordering of objects worthy of safeguard (direct and indirect).

Like a Russian Doll
What conclusions can be drawn at this stage?
a) in spite of some remaining "pockets of resistance" it can be taken for granted that a multidimensional approach unrestricted by time or space has been generally adopted
b) considering its actual nature, our industrial heritage calls for a type of conservation which is not restricted to direct preservation but uses, jointly, various methods of investigation, action and communication (which fit into one another like parts of a Russian doll) while developing new media whenever the need arises
c) by its very nature, and because of the systems that make it up, and of which it is a part, the industrial heritage needs to be looked at within a trans-national framework which encourages exchanges and debates
d) having reached the exploratory stage (started in 1973 with the first international conference at Ironbridge), we must now give priority to the promotion of projects which are of a multinational nature from the start.
To make such projects easier to carry out, they could be limited from the outset, to those involving one or more groups of countries which share a common environment and common traditions.
This is the aim of the suggestions presented above.

As for the concept of « second generation of mock-ups » I would like to specially recall here the fruitful discussions, at the start, with Roberto Curti and Carlo Poni on the Bologna hydraulic system, which I later related to the Dixence site and, comparatively, to other parts of the world.
Unfortunately, due to lack of space, it has not been possible to reproduce all the desired illustrations, but the reader may consult my previous publications:

- *Ouvrages d'art et maquettes, ou l'industrie mise à nu. Zürich, Société suisse des Ingénieurs et Architectes,* D006/1986, pp.117-139.
- "L'industria messa a nudo.Un capitolo di ricerca sulla storia materiale". In: *Rivista dell'IBC,* Bologna, 1987/1, pp.33-49.
- "Hydrodynamica: un partenariat efficace, ou la citoyenneté culturelle de l'entreprise au service du patrimoine industriel". In: *Images du patrimoine industriel*. Paris (Cahiers de la section française de l'ICOMOS), 1987, pp.91-96.
- *Il était une fois l'industrie.Zürich-Suisse romande : paysages retravaillés*. Quelques exemples d'occupation industrielle du territoire. Genève, 1984. In-4o, 243p, nbeuses ill. (ISBN 2-88166-000-2).

- "A exposição da Central Tejo". In: *Museologia e arqueologia industrial, Lisboa*,1991.

The translation of quotations into English is ours. Translation revised by Maurice McAdam.

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The requalification of the “Ex tobacco Manufactory” of Cagliari as creativity and architecture

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The subject is the disused industrial area of the **“Ex tobacco Manufactory”**, near the port of Cagliari (Italy), that was used for the tobacco manufacture until 2001, when its activity stopped.
Born as a monastery for Observant Grey-Friars in 1482 and turned into a tobacco manufactory in the second half of the eighteen century, it assumed for many years an essential role for the city because of the high number of employees.
The buildings of the factory extend on 20000 sq.m., including inside some original parts of the monastery of the 1700 and the next widenings that date back to 1950s.
The strategic position and the space availability suggested the following proposal of requalification including the reconversion of the industrial area into a Creativity Factory and some places destined for the new Architecture Faculty.

The buildings of **“Ex tobacco Manufactory”** are divided into several levels and are disposed around two wide open spaces, reproposing in the succession of its rooms the tobacco manufacturing cyclicity.

In the building there are wide rooms for the collection, the manufacturing and the packaging of the product, the offices, a cinema, the table and some spaces for the staff.
The planning hypothesis reuses this cyclicity in the rooms arrangement, increasing the value of the existing spaces through the use of simple materials like wood, glass and steel for the interiors or stone and wood for the outside.

The project features, both in the interiors and in the outside, oppose to the simplicity and linearity of the manufactury rooms trough the use of curved surfaces which produce penthouses and bays in the buildings facing the internal courtyards and the spaces destined for the creativity.
In conclusion it has been attempted to turn a work place into a space for creation and learning, preserving the industrial vocation of the plant.

Housing in urban industrial dismantled areas: reshaping the townscape

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Keywords: industrial dismantled areas, housing, townscape, urban morphology

Urban industrial dismantled areas have strategic localisation inside the European historical cities: they are often in the centre of the city, or along the river, or near mobility infrastructures as railways or important axes. Furthermore, the important dimensions of industrial areas make them economically attractive.

In those cities, housing is still a growing sector as social changes generate an important lack of dwelling.

Those two considerations could maybe explain why many of the major housing projects in the last five years took place in industrial dismantled areas. Those housing project are conceived following two kinds of attitude.

The first attitude considers the industrial sites as a sort of *tabula rasa*, of desert land without historical imprint. This kind of approach engender auto-referential forms, as well in the field of architecture than in the field of urbanism, that break down any sort of continuity with the historical city. Historical city and industrial sites have growth together shaping themselves mutually building the contemporary urban identity, that's why simply erasing the old industries forgetting their morphological imprinting means to loose important pieces of cultural landscape not only historical memory.

The second attitude is more careful of the historical value of the architecture, so the housing project keep some part of the industrial building, as a façade or a chimney or any other architectural piece with aesthetical character, conceiving them as a sort of ruin included in a general plan that still doesn't have any relationship with the surrounding landscape.

To avoid loosing important landmarks and fundamental formal relationships able to strength urban identity and to generate the contemporary cultural landscape we need to recognize the morphological characteristic and the urban role of the industrial sites, not to freeze them conserving them all, but to reshape them through new housing projects able to generate new meaningful townscape organically related to the historical existing city.

This paper will show some emblematic cases of new housing projects in industrial dismantled areas showing how those design attitudes correspond to two different historical phases and how some analytic tools could drive to a more aware redesign of those areas able to improve the urban quality of the "future" cultural landscape.

THE FACTORY OF WHITE RIVER, VERACRUZ, MEXICO.

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The Factory of White River

Was traversing the year 1821 Mexico was starting living through his Independence in the middle of serious political and economic difficulties; without industrial production, with the paralyzed mining industry and the very reduced agriculture. Probably the production of textiles, at the time of family or handcrafted type, performed the little rescatable.

In this year, looking for fortune, there came to Mexico the brothers Arnaud, original of France, of a region it was located in The Alps, to the south-east of that country called Barcelonnette, after have had to close his textile industry, for the crisis that also one was living in that country. With few resources, although with great spirit of work, donkeys began with do each one, to do routes by towns and cities mainly, dealing with textile products, such as fabrics, table cloths, colchas, clothes, etc.; most of these products mattered of Spain, France, Germany and the United States, to settle down fifteen years later (already with knowledge of the language and means), in the city of Mexico with a store of fabrics and clothes, in the then Street of Portaceli, today second street of Suárez Pine whose name was "Drawer of Clothes of the Seven Doors". A place and a plate that shines in one of the principal buildings of the village of Barceloneta, realizes of this fact, which was the surprising beginning of the prosperity of his owners and personnel and turned in a real flow of going and return of Barcelonian between France and Mexico, To such a degree that the young men's quantity that they came in the course of hundred years from 1821, was superior to five thousand. Many were returning to his natal land after having " done to America ", that is to say, after having forged some capital, qualifying them there as "Mexicans", But others remained in Mexico, installing prosperous business that on having run of the years turned into " The Palace of ", Iron " The Port of ", Liverpool " The Universal Factories ", etc.
But returning to the situation of the country in the first years of the XIXth century, we think that " in 1826 there was created the first textile factory moved by steam engine, located in the peninsular city of Valladolid and call “La Aurora Yucateca”, And in 1830, the insistent steps of the engineer don Lucas Alemán, for the second time The Minister of Exterior and Interior Relations, gave fruit and there was created the Bank of Avio which capital of a million weight, it was the engine that initiated the march industrializadota of the country.
With bottoms provided by this bank, industries were stimulated as to established in the Mill of Santo Domingo in Puebla, To the márgenes of the river Atoyac, property of the illustrious and

visionary manufacturer don Esteban de Antuñano and other textile factories of Querétaro, Celaya and Tlalpan in the D.F., Cocolápan in Orizaba, (that certainly was installed by the own don Lucas Alamán in 1836), and some of other branches as that of the paper, that of glass, the miner and the metallurgical one.
The general situation was improving slowly. For 1843, in what to the textile industry it refers, already there existed " 59 factories of threads, of fabrics or of threads and fabrics and the cotton production in entanglement and longed in Cosamaloapan's region, it was the largest of the Republic. From 1837 to 1842 it produced 210,285 arrobas, in 1843, 14,600; in 1844, 56,000; and in 1845, 45,000.
The impulse that some lines of railroad provided to certain areas was determinant for this improvement and the business that were trading with textiles every day were more prosperous, provided that they received also the indirect benefit of the high prices that reached the cotton and the products manufactured with him in the American Union, As consequence of the Civil War. They were continuing surtiéndose of products and fabrics of import, though already without intermediaries, in such a way that little by little the domestic market was his and these circumstances could think of making they themselves, part of the fabrics that were mattering, besides the blanket, that it was a product of major national consumption.
Three groups joined to give the first step. They were: Signoret, Honorat and Cia., Lambert, Reynaud, and Cia. And García Faudon and Cia. They bought in 1886 the factory of San Juan of the Cerritos, installed in the year of 1883 in Orizaba, for the German don Enrique Wiechers and to which they baptized with him name of " Manufacturing Company of Cerritos, S.A. "
The results were magnificent. The merchants now also manufacturers, decided in a few years later to give one more step and to create a company that was the biggest and strong of then, not only in Mexico but in Latin America.
For it, it was necessary that the group was joining other merchants, also Frenchmen, as well as to invite to form art of the same one, to the gentlemen Escandón and to don tomás Braniff, owners already, some, of Cocolápam in Orizaba and the second one of newly the created St Lawrence in Nogales. The first ones they did not accept the invitation back; not this way the second one who agreed with great enthusiasm, established the new Society the commitment to install to the major briefness, a new factory that it was operating with the most modern machinery and the last technical advances. Hereby there arose the project to create the Factory of Threads and Cotton fabrics White River.
His installation was decided in the place that it occupies, for several important reasons. To knowing: First, for nearness to his "sisters" cerritos and The St Lawrence; later, to take advantage of the privileged geographical situation that was making her adjacent to a mighty river and to the high index of relative, almost permanent dampness in the region, condition that in those years was indispensable to work a textile factory. Also certainly to the effective communication that was granting the railroad between the capital of country and the first port of the Republic and finally for the support that there were offering the political in force ones of the government of the General Porfirio Díaz, President of the Republic in those years, in order to attract the capitals and foreign technology that they were helping to develop the country.
This company, then the biggest and modern of Latin America, joined to existing The St Lawrence and Cerritos and added Cocolápam in 1899, formed the most important industrial complex of ends of last, so called century " Industrial Company of Orizaba, S.A. ", better known as CIDOSA.

The Society was constituted and taken minutes on June 28, 1889 before the fee of the Public Notary don Rafael F. Mulberry trees in the Capital of the Republic, with the initial capital of $2' 550,000.00, being the contributions as it continues:

Tomás Branifff	$	700,000.00
J. Ollivier y Cía.	$	323,000.00
J.B.Ebrard y Cía.	$	323,000.00
J. Tron y Cía.	$	323,000.00
Signoret Honorat y Cía.	$	323,000.00
Lambert Reynaud y Cía.	$	242,000.00
García Faudon y Cía.	$	216,000.00
Juan Quinn	$	100,000.00
TOTAL	$	2´550,000.00

Don Tomás Braniff, North American born in Staten Island, N.Y., of Irish ancestry, that come to Mexico years behind on the occasion of the construction of the Mexican Railroad and that had established in the founded country The St Lawrence in 1883, for hiscondition of majority and for having solid links with the own Mexican Railroad, was nominated President of the new company and his associate in The St Lawrence, don Juan Quinn who had been the director in this factory, also appeared as part of the new Society.

It is said that the factory The St Lawrence calls this way for the fact that the mother of don Tomás, took that of Lorenzo as a name exactly and in his honor like that it was baptized. As curious and anecdotal information, we transcribe what an anonymous author wrote in 1967, in language fránces, under the Title of " Cidosa's Factories " on a detail that curiously it happened when the contribution of Mr was taken minutes. Braniff to the "CIDOSA". It says to the precious residence (of the style of the constructions that it(he,she) was doing the Company of the Mexican Railroad), constructed close to the own Factory, to be lived by the family Braniff:

"This house was not mentioned in the record of sale that towards spending the property of the factory, of Mr. Braniff to the CIDOSA. Then, when they realized that the record of sale was signed, Mr. Braniff very nicely, offered him the house to the CIDOSA. The Company, not being able to do another thing, gallantly donated a necklace of pearls to Ms. Braniff "

To court for gallantry, since it corresponds to polite people!....

But let's return to the history. Immediately after the signature of the Constitutive Writing, the raising of the buildings for the factory White Rio, began to an impressive speed, in the place known as " Holy Catarina Tenango ". There took the stone (principal material for the construction), of the own(proper) hill of Holy Catarina, located opposite to the place chosen for the work, with the " Royal Way " of by means.

The direction of the great one, work, owes to itself the Mexican engineer Arturo B. Coca, of whom lamentably we do not have major information.

The columns of molten iron and unite metallurgies they were brought directly of Belgium and France and it was such the rapidity with which there was constructed, that on October 9, 1892 you upset to three years of his beginning, with great solemnity and pomp, was inaugurated by Mr. President of the Republic, General don Porfirio Díaz, who accompanied of " The Sres. Secretaries of State D. Manuel Romero Rubio, D. Matias Rosemary, Gral. D. Manuel Gonzalez Cosío, D

Manuel Fernandez Leal, D. Joaquín Baranda and all the most eminent members of the Army, of the foreign colonies, of the banking, of the trade, and of other distinguished classes ", taking advantage of the efficiency of the Mexican Railroad, he travelled (Initiating at ten o'clock in the night of the previous day) of the city of Mexico up to White Rio, to preside and to support the act of inauguration of the factory, in which it met, according to there is read " the most select of the French capital and the national politics " that answered with his(her,your) assistance to the summons that for such a effect should do the Council of Administration of the Company, by means of the corresponding invitations.
The chronicle that on this event did the newspaper " The XIXth century of the Federal District, says " The convoy it was consisting of the machine Not. 49, "Anáhuac", the cars pullman Guadalupe and Sotomanauk, two cars palaces and a car of third. The cars palaces were occupied by the President and the Secretaries of State. Mr. Braniff and his friends; the pullman for the guests and of third, the Gunners' music that I accompany on the gendarmes' procession of the Army.
The trip did to itself without newness and ado in the way that to have been desprtados the travelers at 2:30 a.m. to his step along Apizaco, with volleys and music. At 5:20 a.m. the convoy came to Hope where a sumptuous luncheon was served..
The trip did to itself without newness and ado in the way that to have been desprtados the travelers at 2:30 a.m. to his step along Apizaco, with volleys and music. At 5:20 a.m. the convoy came to Hope where a sumptuous luncheon was served.
The passengers had the opportunity to see that already there is in perfect condition the route that suffered so serious damages on the occasion of the last cyclone and to admire the splendid panorama that was developing before his sight.
Minutes after 8 a.m., the procession could distinguish the factory of White Rio with his hamlet spread in the glen, with his giant chimneys and his smiling and picturesque aspect.
At the arrival of the factory of 23 Battalion did the honors of ordinance to the President of the Republic; the artillery left oir his hoarse voice and the bang of the rockets, to resound with the music and the hurras of the multitude, they greeted the arrival of the train. Immediately one happened to visit the factory; but the President of the Republic put in movement the turbine of the factory.
The same President directed some allusive phrases the fact that was commemorated and in answer, Mr. Braniff who invited it addressed to Orizaba's Industrial Company. Immediately, after resting some minutes, they were visited one to one, all the departments of the great installation.
About 12 a.m. of the day it finished the visit to the factory, going on the guests to another department of the same one, where one had arranged the banquet.
At the moment of the champagne, they drank Mr Tomás Braaniff, giving them thanks to the President of the Republic for having deigned to support the ceremony; the Lic. D. Tomás Reyes Retana for the properidad that the President provides; the Gral. Díaz giving them thanks to the company for having designated it to support this act, which he was considering of great importance for the future of the Republic, adding that the Government is ready to give to the industry prudent and not impertinent protection; Mr. Lic. Alcolea, Mr. Aldasoro, the Lic. Silvestre Moreno Cora, Mr Vicente Ramirez, the French Minister, the Lic Rafael Dandé, Mr Romero Rubio and Mr. D. Joaquín Redo.
About 3 p.m. it finished the food at 3:30 the train was started again for this city, where it came at one o'clock in the morning ".

The construction and installation of the factory had lasted comma already it was said approximately three years and it was settling itself in a " surface of 167,750 mts.2 "; it is to say, almost 17 hectares. It had occupied in these labors hundreds of men, many of which already did not return to his places of origin, being constituted this way partly importantly of the founders of the people, contributing with his presence to the increase of population of " Orizaba's Industrial Center who turned into the most important textile zone into 1910, almost his population turned between(among) 1870 and 1910 ".
" The effect on the area of these facilities was big. Some small indigenous communities as the municipality of Tenango, Ixhuatlancillo and Huiloapan, almost disappeared on the factories having be constructed.
In 1889 Tenango's agricultural municipality that had a population of 679 inhabitants and a brute annual revenue of 401 weight, changed his administrative center to the adjacent area to the factory of White River.
The general aspect of the work was impressive: The enormous lounges were illuminating splendid given the singular dimensions of the horizontal ships, that in turn, they were making emphasize the great audacity and beauty of his colossal chimneys.
To the sides, the buildings for the auxiliary services and of maintenance and separated by a wide court of distribution, the central building that was shining as forehead of the factory and was giving him to the joint character, dominion and elegance, chords to the requirements of the epoch and to the importance and magnitude of the signature.
This frontal building of a style and neoclassic particularities, (though with an auction of tower of the purest neoclassicist) it was illuminating exceptionally pace, composition and symmetry as prominent characteristics.
On having considered his composition, it is necessary to relate the global concepts of use, function and forms that was destined, having as central preponderant element, the tower of four bodies that desplanta of the building of two levels and him gives exceptional height; to expire this way, with his different and important functions: As indicator of principal entry, of clock of four faces in the third level, with belfry in the fourth level, which was offering, in his days of functioning, a pleasing sonority and was using as agreeable communication between the own labors of the industrial establishment with the population; of backbone of the building and finally of adornment, for his slenderness and the purity of his auction.
Of the tower, in equidistant form, they divide both wings of the building, one to every side, as part of the eminently horizontal work of great length, forming this way three principal symmetrical bodies, staying to the center the most important building.
It possesses the principal entry with three metallic doors, the traffic head office and wings peatonales; this body was lodging the tasks of receipt. On him a central balcony and two wings under round arches in vertical very slender proportion, continuing for both six boards of two levels, as front of bodies dedicated to administrative activities.
As continuity of the front, there is to every side of the described building, two lateral bodies of an alone level, with eight boards each one, dedicated to administrative labors also, finishing off in his ends in other two buildings of two levels and six boards each one, with assignments habitacionales and of accomodations.
The pace of the building is marked by equidistant boards to specific modulations, depending on every building and in every board there is exposed columns, skirting board in relief, frame of doors

and windows startled, partition of the board with an intermediate molding and rerammer in the railings finished off with battlements.
Finally, it is necessary to make notice that the frontal garden with the railing that limits it, is a surface that gives him a touch of relevant singularity to the main face
Everything described previous, it allows to observe a careful tracing and of pleasing proportions, in the style of the epoch.
But the society acquired also most of the bordering areas to the factory, constructing great quantity of houses room, already of masonry, already of wood, to shelter in exchange for a symbolic revenue to the families of workers and personnel who would occupy in his labors, which were constituted in founders of the people.
The Factory of Threads and Cotton fabrics White Rio, it was established by the technology of top of that epoch; years later, it was the first one in using hydroelectric energy for his movement and the machinery that in her one installed was more modern that it existed in this moment. Between other things broad strangers caused real admiration the telares doubly till then in the way.
Once in functioning, it used in his labor near 2,000 persons who occupied the houses of his surroundings. This brought as consequence that the importance of White Rio was exceeding immediately to the one that had Tenango, so much so within three years, February 24, 1895 there began the construction of the Municipal Palace, which I inaugurate on September 16 of the same year and June 8, 1899, the Municipal Head-board moved officially to the site where today he is, taking the name of " Tenango of White River ".
Due to the fact that preferably it was needed of manpower already initiated in the speciality, they came to be employed at the factory, persons of different places of the country, principally of the conditions of It Populates, Tlaxcala, Oaxaca and the Federal District, for whom already with knowledge of the branch, the learning and adjustment was turning out to be easier for the managing of the new machinery.
They were a few years of apparent harmony in this encouraging beginning. You upset fifteen: Unfortunately it is very difficult for the human beings to find the average just person; that point in which abuses do not exist in one or another sense; this site longed in that the imaginary public inspector of the scale of to justice, detains and marks the precise half. Lamentably the abuses, the injustices, the arbitrary and despotic measurements of some, supported by the wicked laws tolerated by the authority, did that others, panting of the rights that for humanity were corresponding to them, were protesting, rebelarn and it(he,she) was reaching this lamentable process with the bloody snap that we we all know as the transcendental facts of On January 7, 1907, which historically they were the outbreak of the fights for the proletarian recovery of the country and gave to him to White Rio the title of " Cradle of the Working Movement of Mexico ". They turned of fact into the embryo that it prepared to the own Mexican Revolution, which snap happened only three years forward.
After revolutionary initiated of November 20, 1910 until 1930. White Rìo and his textile specializing workers, were avoiding the vicissitudes of the violent epoch and in the course of those unstable and eventful years, were obtaining conquests on having gained positions and force. The working movement was gradually recognized, syndical organizations were in preparation and it(he,she) became institutionalized as an important branch of support to the Public Administration. His conditions of work improved sensitively as for hours for day, salaries, presentations, etc., that were

legalized on there having be inserted the Article 123, called " Of The Work and Social Forecast ", to the Political National Constitution.
On the other hand, the textile companies in it generates and with them the Cidosa, they suffered a serious economic affectation. Almost during all these years they stopped paying dividends to his shareholders, being Cidosa the one that during less time stopped it doing though with percentages substancialmente diminished.
Many factories closed in the country, almost the third part of the whole; the lack of the money there was patent, the taxes that the government was demanding, every year they were major and it was not but until ends of the decade of the thirties, which the economic situation began to improve
The foreign demand during the decade 1940-1950 that included the Second World war offered a sensitive relief; in spite of the fact that it is this space, the needs of the market were covered with obsolete machinery to whom one forced to work permanently during three shifts that skilfully were in a season, turned to four, not to lose production ever.
" For 1950 95 % of the telares of Mexico was antiquated " and certainly also it it was the whole Cidosa's machinery.
On having finished praise years cuarentas and during the cincuentas, it began properly, though with many slowness, the modernization of the factories. It is necessary to understand that the problematics for resolving great and very complex age; the conversations between company and unions in search of ways that they were leading to solutions were extending too much and in times they were flooding detal way that was turning out to be difficult to restart the dialogue. In spite of it the initial steps were given changing first the frequency of the electric power that was generated in the hydroelectric plants, of 25 cycles / second to the common one of 60 cycles / second and in The St Lawrence the partial substitution of machinery began; later in Cocolápam and finally in form more limited in White Rio and Cerritos: Also in this decade I install " Ended Mexico, S.A. " In the Federal District like an important step of the way for crossing.
For the decade 1960-1970 it was had contemplated to continue more intensively with the modernization, though already by then it was turning out to be urgent. Nevertheless, in 1962 the possibility of a merchanting arose; on the same one having made concrete, the company changed owners staying at the expense of a consortium leading for the gentlemen Jerónimo Arango, Carlos Trouyet and Manuel Senderos.
This new administration continued with the already initiated modernization and in 1964 practically it had been completed in The St Lawrence, Cocolápam and the hydroelectric plants of the own Cocolápam, big Corner and Kind of anchovy.
For years setentas, concretly in 1971, Cidosa faced another change of administration and consequent more loss of time; she was bought by the group " The Asturian " of the families Ruiz Ruffles of the Valley and Of The Valley, which decided to continue with the modernization, and inclusive they took to end in The St Lawrence and Cocolápam some reequipments and amplifications.

The Road of the Wool

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Keywords: industrial landscape, textile industry, pathways through heritage

The paper aims to show a study-case of pathway through industrial landscape, overall illustrating an operative methodology.

The route -planned by DocBi-Centro Studi Biellesi in conjunction with the Polytechnic of Turin and part of the *Ecomuseum of Biella Province*- links Biella to Borgosesia and has been called *The Road of the Wool* for several centuries.

The route expands through the Strona river and the Sessera river valleys, where textile industrialization was born, and after about fifty kilometers, it reaches Borgosesia, the seat of an old wool market. Along the route, there is an abundance of historical industries with diverse characteristics in their building typology and in their state of preservation.

The perception of the «wool landscape» is helped not only by ancient woolen mills (many of them are still active) and their chimneys, but also by infrastructures connected to them by workmen's dwellings, by old water channels, by the «path of workers» (opened in the last century for reaching woolen mills along rivers) and by the hoot of factory whistles, which characterize the «sound-landscape». Some alternative and integrative routes run through the valleys and delve into the knowledge of the wool country.

In the *Factory of the Wheel* (former Zignone Wool Mill) -the symbol of the Biella area industrial heritage and the center of the whole route- there is a permanent exhibition that studies the history of textile industry.

Returning to Biella, via a route that starts from Vallemosso and touches Strona, Lessona, Vigliano and Cossato –places with ancient wool traditions- it will be possible to visit the chief town of the textile district and to use this as a starting point for exploring other routes in the western Biella area, that preserve vital buildings related to age-old wool activities.

Informations to the Conference Location

How to get to the Conference Locations

“Deutsches-Bergbau-Museum”

Useful information: http://www.bergbaumuseum.de/englishstart.html

Phone number: +49 – (0)234 – 5877 - 0

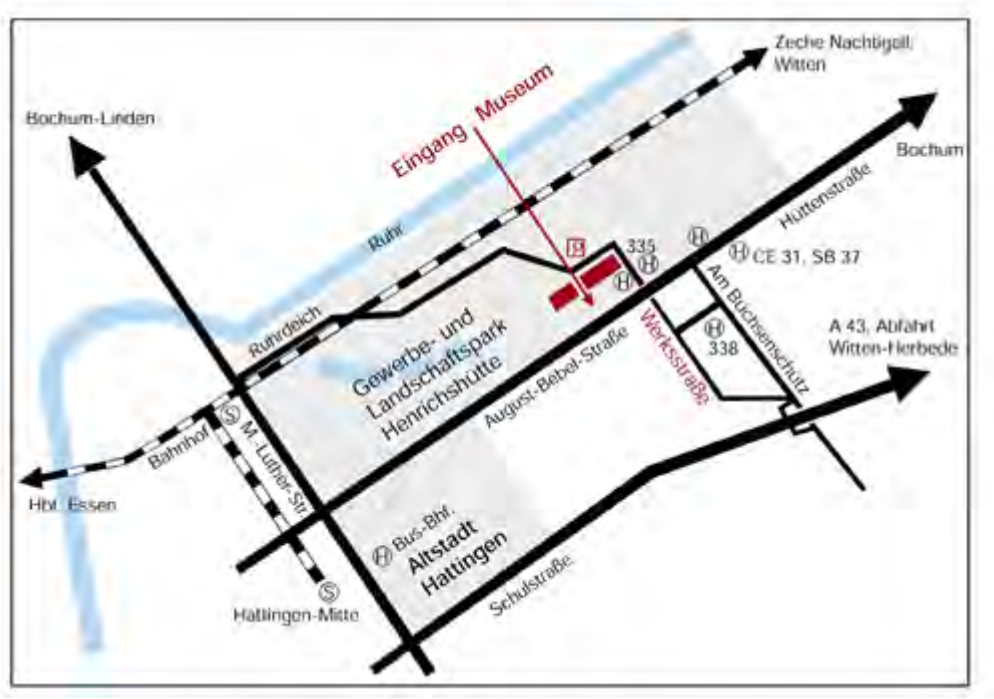
Meeting point for excursions and entrance to the lecture room:
Visitor entrance: Europaplatz (see added map)

Hotel acora: Location is marked with a **H** on the map

Public transport:
From “Bochum Hauptbahnhof (Hbf)” (central station) by Metro with line U 35 towards „Herne“, stop “Deutsches Bergbau-Museum” (two stops from central station), follow signs to exit “Deutsches .Bergbau-Museum”
Travel time is about three minutes, price (Preisstufe A* = 1.20 €),
for other public transport lines: http://www.vrr.de/en/index.html

Travel by car
Use motorway 40 (A 40) direction to Bochum, leave the motorway at exit “Bochum Zentrum” Drive towards “Zentrum” (about 0.8 kilometres), on the left side you will recognize the shaft tower of over the museum building, parking places are available around the museum building (no special car park)

“LWL-Industriemuseum Henrichshütte”



Useful information: http://www.lwl.org/LWL/Kultur/wim/S/hattingen/English_version/

Phone number: +49 - (0)2324 - -9247 - 0

Entrance to the conference location: Werksstrasse 25, 45527 Hattingen (‘Eingang Museum’)

Public transport (stops of different lines can be taken from the map):
From “Bochum Hauptbahnhof” take bus lines SB 37 und CE 31 to the Bus stop "Henrichshütte"
From „Hattingen-Center“ take bus lines 335 (stop “Industriemuseum”) or 358, SB 37, CE 31 (stop “Henrichshütte”).
For further details and timetables: http://www.vrr.de/en/index.html

Travel by car
Enter the motorway 43 (A 43) following the direction to Hattingen, leave the motorway at exit “Witten-Herbede”, take the “Blankensteiner Straße” towards Hattingen, then follow the road signs “Route der Industriekultur” and “Henrichshütte”.

Change between locations during conference:
There will be a free bus shuttle on September 12th and 13th which will bring all conference participants from Bochum (Deutsches Bergbau Museum) to Hattingen (LWL-Industriemuseum Henrichshütte) and again back to Bochum City. For depature times look at the conference program.

Airport Connections to Bochum City

Airport Dortmund – Bochum Central Station

Bus: Airport Express (hourly) to Dortmund Central Station: http://www.flughafen-dortmund.de/fahrplan.0.html?&no_cache=1&L=1
From Dortmund Central station take long distance or regional trains to Bochum Central station: For timetable information and fares:
http://bahn.hafas.de/bin/query.exe/en?ld=212.203&newrequest=yes&)
or: http://www.vrr.de/en/fahrplanauskunft/index.html
This trip will take a little bit less than one hour and cost 12 € (with regional train).

Taxi from Dortmund Airport to Bochum City will cost about 40 €.

Airport Düsseldorf (Dusseldorf International) – Bochum Central Station

Train: With its own railway station, Düsseldorf Airport offers a comfortable connection to other cities in the surrounding. Over 350 trains, from regional trains to the high-speed ICE, stop daily at the Düsseldorf Airport Station. It is located at the eastern end of the airport grounds. SkyTrain, a fully-automated cable railway brings you from the railway building directly into the terminal. For timetable information an fares:
http://bahn.hafas.de/bin/query.exe/en?ld=212.203&newrequest=yes&)
or: http://www.vrr.de/en/fahrplanauskunft/index.html
This trip will take also a bit less than one hour and cost 9.10 € (with regional train)

Taxi from Düsseldorf International to Bochum City will cost about 50 to 60 €

Car rental: http://www.dus-int.de/dus_en/mietwagen/

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