

3D modelization and the industrial heritage

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3D modelization is very well known today in industry and engineering but also in games. Its applications for culture and human sciences are more recent. However, the development of such applications today is quite important in archaeology with amazing results. The proposal of this communication is to show how 3D modelling, and more generally data knowledge, provides new perspectives for approaching industrial archaeology, between knowledge, conservation and valorisation, especially in museums. A new way for us to imagine contemporary archaeology: by the way not only new methodology but actually archaeology of contemporary objects. That is we are trying in Nantes associated laboratories (*Université de Nantes, Ecole centrale de Nantes*) in stretch collaborations with museums. This double point of view succeeds necessarily with interdisciplinary questioning between engineering and human sciences approaches for the development of digital humanities. We are trying today to enhance and develop our interdisciplinary methodology for heritage and museology in a new ANR resarch project, RESEED¹.

Interdisciplinarity for valorization

“When heritage becomes virtual”

Over the past 10 years, our research collaboration has focused on industrial heritage. It is an interdisciplinary approach between the *Centre François Viète*², a laboratory of history of science and technology from University of Nantes³, and the *LS2N*⁴, Laboratoire des sciences du numérique de Nantes, a mixt Research unity between CNRS , the *University of Nantes* and the *Ecole Centrale de Nantes*, and more precisely inside *LS2N*, the ex *IRCCyN*, a cybernetics laboratory from Centrale Nantes⁵.

We are developing our common and interdisciplinary research with bijection between historical archives analysis, on one side, and data management and visualization, on the other side. A such approach allows us to propose for historians, museologists and the whole public multiple and crossed narrations from and about heritage objects

We founded together with our student team an informal resarch group we named *EPOTEC, Etude des procédés et des objets techniques* (Study of technical objects and processes). It is possible to see our common production on our website⁶

¹ « Retro-conception Sémantique d'objets patrimoniaux Digitaux », <http://reseed.ls2n.fr>.

² <http://www.cfv.univ-nantes.fr/>.

³ <http://www.univ-nantes.fr>.

⁴ <https://www.ls2n.fr/>.

⁵ <https://www.ec-nantes.fr/>.

⁶ www.epotec.fr

Of course, we are not the first team to develop research for museology with new technologies and digital considerations. In France it is clearly possible to note some developments about these new preoccupations from the last 90's years. In 1996, an important congress organized by the *Ecole nationale du Patrimoine* held in Paris at *Bibliothèque Nationale de France* and permitted 400 hundred of scientists, museums and heritage specialists to listen forty communications on the subject⁷.

Of course, we are not alone too. One of the most notable recent researches about industrial heritage and 3D modelization is the ANR program *Usine 3D*⁸ supported by Alain-Pierre Michel from the University of Evry. Professor Michel held from years his scientific research about the story of automobile and especially *Renault* Company⁹. 3D modelization allows him to understand and explain the evolutions of the industrialization in the *Renault* factory in Boulogne-Billancourt and how really created and developed line work in the 20's. There are also other examples of automobile history in this project about *Citroën*, *Clement-Bayard* and *Peugeot*, with the collaboration of Paul Smith, Jean-Louis Loubet and others, who embraced different digital methodologies from technical and architectural 3D modelization to GIS (geographical information system).

More generally, 3D modelization is encouraged and supported by CNRS through the *Consortium 3D-SHS*. This group was initiated by Robert Vergnien, the creator of *Archeovision* in 1993 at Bordeaux, one of the best center in archaeology and 3D modelization in France¹⁰. *Consortium 3D-SHS* is one of the groups of the *TGIR HumNum*, which is dedicated to federate the digital humanities in France in all its diversities¹¹. *EPOTEC* at Nantes is an active member of the *Consortium 3D-SHS*¹².

All these researches proceed to develop an original point of view in the different approaches of digital humanities¹³. It is evident for all together digital studies must necessarily increasing in the same time than digital in the whole society, culture, economy and production. Human sciences are obviously for us in a central place. The originality of 3D modelization, not *a priori* a human science methodology, resides to insist on the complex relationship between material and immaterial culture in past and present, beyond the textuality.

"When industrial engineering becomes heritage"

Our projects are developed in a renewed interdisciplinary scientific approach. They are situated in the heart of the contemporary evolutions of the digital technology between

⁷ *Patrimoine et multimédia : le rôle du conservateur*. Colloque Paris, Bibliothèque Nationale de France, 23-25 octobre 1996, Paris : La Documentation française, Ecole nationale du patrimoine, 1997. For a recent example, Bernadette Saou-Dufresne (ed.). *Heritage and Digital Humanities. How should training practices evolve ?*, Zurich, Berlin : LIT, 2014.

⁸ www.usines3d.fr/. Alain Michel, Stéphane Pouyllau. *Rapport final du projet " Usines 3D "*. [Rapport de recherche] Centre Alexandre Koyré - CRHST. 2011. <halshs-01592432>, <https://halshs.archives-ouvertes.fr/halshs-01592432/document>.

⁹ Alain Michel, *Travail à la chaîne. Renault (1898-1947)*, Boulogne-Billancourt, ETAI, 2007

¹⁰ <http://archeovision.cnrs.fr/>.

¹¹ <https://www.huma-num.fr/>.

¹² <https://shs3d.hypotheses.org/>.

¹³ Anne Burdick, Johanna Drucker and alii, *Digital Humanities*, Cambridge, Massachusetts : the MIT Press, 2012. In French a short but very good synthesis by Serge Abiteboul and Florence Hachez-Leroy. "Humanités numériques". *Encyclopédie de l'humanisme méditerranéen*, 2015. hal-01120259

the human and social sciences and the sciences for the engineer. To make a complete study, to establish a model, it is for us the base of research for the documentary and historical point of view and a base for the public too.

Our ambition is to speak about technical objects, machines, factories or port relations in the city and territory, earth, river or sea. It is to speak as long from the point of view of the town planning, of the architecture, of the formal study, that from the point of view of techniques and networks. Objects and scales are multiple: factories, workshops, places of production, but also in a larger way, understanding and explanation of traffic, circulations, and networks, wider point of view of the "territory" and history of the "landscapes".

The *CFV*, the laboratory of history of science and technology, and the *LS2N*, the laboratory of engineering, collaborate for 10 years together. This collaboration baptized *EPOTEC* focused in its beginning on the industrial heritage. This approach was immediately voluntarily interdisciplinary¹⁴, but the separation between every specified domain remains still strong¹⁵: analyses and historical records on one side; management and valuation of data of the other one.

Highly rated engineering? You have to do specifications and format the data.

Highly rated historian? You have to understand in a double movement of separation / collaboration three bound problems around the very narrative:

- Within the narrative: the studied subjects (technical, network systems) question the classic linearity of the narrative as the exclusive representation of the history.
- Between narratives: the capitalization of the historic knowledge is essentially translated by the juxtaposition of autonomous and motionless narratives. When the production of the historian is natively digital technology, the hegemony of the book / article is questioned.
- After the narrative: the exploitability and the valuation of the "simple" historian narrative are complicated.

The modelization as a scientific approach

"From engineering to heritage"

Our scientific proposition is to reverse the time axis of the design process, using tools and methods of virtual engineering. The beginning of the methodology was clearly an adaptation of the "reverse engineering"¹⁶ used in factories and research and development. This new interdisciplinary, and reflexive, connection between history and

¹⁴ "La numérisation du patrimoine technique", *Documents pour l'histoire des techniques*, n°18, 2^e semestre 2009. A topical theme of eight scientific propositions, introduction by Michel Cotte: "Les techniques numériques et l'histoire des techniques : le cas des maquettes virtuelles animées », pp.7-21.

¹⁵ Florent Laroche, *Contribution à la sauvegarde des objets techniques anciens par l'archéologie industrielle avancée. Proposition d'un modèle d'information de référence muséologique et d'une méthode interdisciplinaire pour la capitalisation des connaissances du patrimoine technique et industriel*, Thèse, génie mécanique : Ecole Centrale de Nantes , Université de Nantes, 2007. [⟨tel-00382703⟩](#). For a first and short reading in English, Florent Laroche. "Advanced Industrial Archaeology and Techno-Museology: A new virtual life for industrial heritage". *TICCIH Bulletin*, 2008, pp.3-4. [⟨hal-00422346⟩](#)

¹⁶ *Reverse engineering*, also called *back engineering*, is the process by which a man-made object is deconstructed to reveal its designs, architecture, or to extract knowledge from the object, https://en.wikipedia.org/wiki/Reverse_engineering.

archaeology from one side and engineering and manufacturing on the other permits a new way to think the interactions between real object and virtual object¹⁷.

The central problematic is to extend life-cycle comprehension for heritage objects to obtain its specific PLM (product lifecycle management)¹⁸. It is a KLM methodology, (Knowledge Life-cycle Management), who is extended here possibly far away in the past¹⁹:

- Past information of a specific object
- Contemporary information of the same object
- Relations between those two pieces of information in the past and present

The case of an heritage object is considered in the same way, from ordinary life to heritage life-cycle extension with its own problematic and scientific proposal, from objectives and constraints to proposition:

- Objectives: Create connections between physical object, digital representation and context information
- Constraints: Take into account temporal, physical and multidisciplinary aspects. Encapsulate complex and multi-scale systems: product, tool, machine, plant, city
- Proposition: Extend ordinary PLM with the long life-cycle of objects to museological PLM (product life-cycle management). Finally, obtain a *Digital Heritage Reference Model*, an operational framework, with process view and product view

The Digital Heritage Reference Model

The difficulty of the historical narrative in space and time is to construct knowledge between the crossed consideration of synchrony and diachrony. The very specificity of heritage scientific consideration is probably to add the question of passed time to present time. If we compare those historian or museologist considerations with engineer considerations, it is in fact possible to ally its own questionings about product and process. It means to bind product view and synchrony explanation, process view and diachronic explanations, during all life since passed creation until our daily presentation or valorisation.

Product view

The DHRM operational framework is overall a consideration about the association of objects and relationships constituting coherent items, exploring them with the exploitation of data and documentations.

¹⁷ Florent Laroche, Alain Bernard, Michel Cotte. « A new approach for preserving the technical heritage”. *conférence VRIC - salon Laval Virtual*, Mar 2006, Laval, France. 11 p., 2006, ISBN 2-9515730-5-7. [<hal-00473008>](#)

¹⁸ “*product lifecycle management (PLM)* is the process of managing the entire lifecycle of a product from inception, through engineering design and manufacture, to service and disposal of manufactured products. PLM integrates people, data, processes and business systems”
https://en.wikipedia.org/wiki/Product_lifecycle .

¹⁹ Florent Laroche, Alain Bernard, Michel Cotte. « Knowledge management for industrial heritage”. *Methods and Tools for Effective Knowledge Life-Cycle-Management*, Springer, pp.307-330, 2007. [<hal-00412066>](#)

The object is considered in a large meaning to say process, product, components, Human or events we want to explore and valorise.

We have to consider two generic relationships:

- Direct, between real objects
- Indirect, between real object and abstract concept

The documentation is obviously composed of heterogeneous data, archives, papers, photos, sounds, videos, 3D scans ...

Taking into account space and time needs overall explanation and comprehension; that is why the semantic consideration is so important for the meaning. That is a crucial question who engaged not only scientific data consideration in computer ontologies, but in the same time the way we understand the actual meaning of the past creation, use, consideration and conservation or valorisation in the present .

Process view

The process view could be imagined as a simple roadmap in three steps²⁰:

- Digitalizing and Knowledge Management: the time to start from the real object, to consider and document its technical and industrial context as well as its socio-economic situation in use during its life cycle.
- Modeling: the time to elaborate the Digital Heritage Reference Model with the 3D modelization and reverse engineering; the object is necessarily contextualized with help of data and documentation.
- Dynamic used situations and virtual reality :the time to show, demonstrate and valorize the model in different possible cases, standalone use at home, standalone use in Museum, immersive System...

Some realizations

A machine: Batz-sur-Mer salt laundry

We first can talk about of the salt laundry of the *Musée des marais salants* of Batz-sur-Mer²¹. At the end of years 2000, the extension of the museum in a closer old workshop and salt warehouse from the beginning of 20th century was the opportunity to discover and study a salt laundry machine, essentially in wood. Its appearance was really a pity and it was just impossible to think to restore it cause of the wood irreversible degradation. Our first idea was to save not the machine itself but to model it and study it for best comprehension and virtual valorization.

But the mechanical re-engineering in CAD was so significant and meaningful for the curators they arrived to conclude a reconstruction was possible in the new museum, at the original place in the warehouse. That one reconstruction is now working since the reopening in august 2013!

It is important to say this not just a material copy of the old and destroyed machine but really the result of the archaeological and mechanical study. Because it is mechanically and dynamically exact, the CAD software use allowed to valid the whole functioning and efficiency not only of the machine but of the general surrounding process too. That

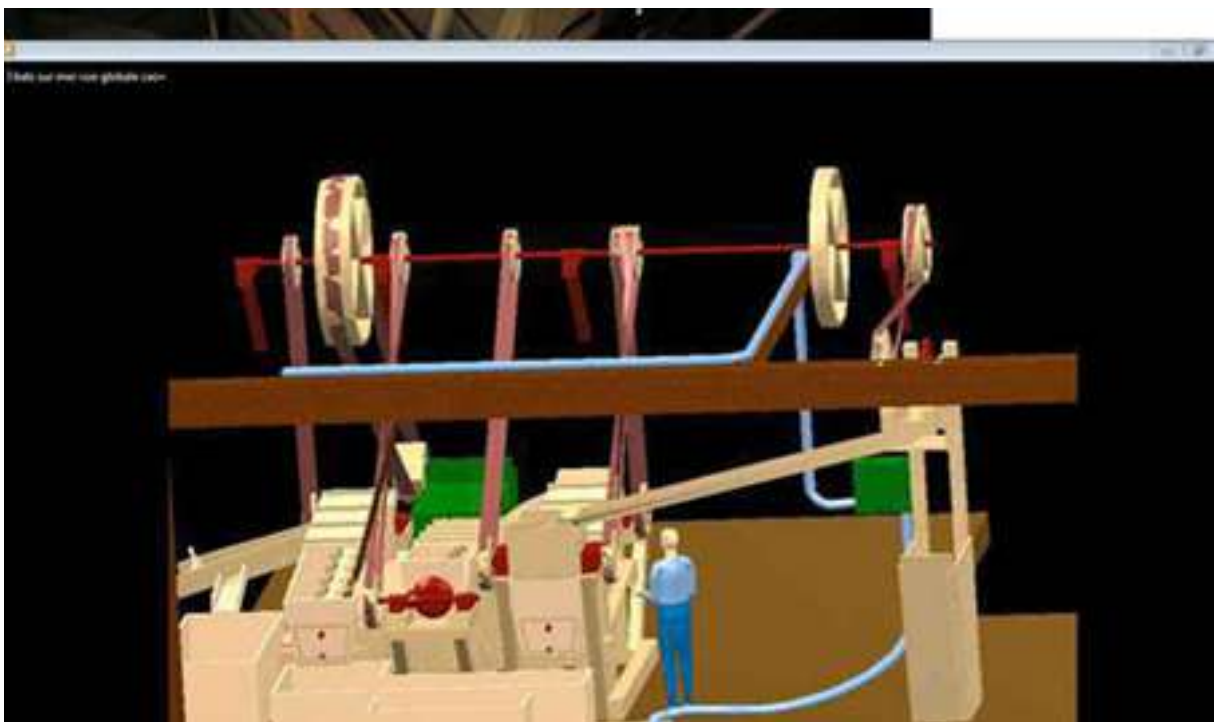
²⁰ The 3D modelization methodology has been precised recently by the Consortium 3D-SHS, Violette Abergel, Pascal Benistant, Laurent Bergerot, Jean-François Bernard, Hervé Bohbot, et al.. *Livre blanc du Consortium 3D SHS* : . France. 2017. [〈hal-01683842〉](#)

²¹ Florent Laroche, , *Contribution à la sauvegarde des objets techniques...*, op.cit, pp.265-349

constitutes a tremendous difference with video games or simples illustrations. Here we are in a scientific process, able to calculate, verify and transpose.



Batz-sur-Mer Salt Laundry, Cl. Jean-Louis Kerouanton 2004



Batz-sur-Mer Salt Laundry, Screen shoot 3D CAD Florent Laroche.



Batz-sur-Mer Salt Laundry, the new museum, Cl. Florent Laroche

A factory : La Ciotat shipyards

Our first visit in the La Ciotat shipyards was in 2007 on the invitation of regional representation of the Ministry of the Culture to make an expertise about the cranes. The question to have the good knowledge of the shipyard's technical installations yet in place was important to indicate a possible proposal for conservation and valorization.

Probably in history the second one in France behind the Saint-Nazaire shipyards, La Ciotat is a very important site reopened in a new economic model since 1995 after the shipyard closing in 1987 and seven years unionized workers occupation. Just interrupted by a short and ephemeral attempt of economic recovery, this movement is quite singular and effective in the work history in France. They actually saved the main functioning machines and overall the Titan and Goliath cranes from destruction and disease. It was just the only condition for a possible reopening and they succeed.

The first study was general²²; it consisted to inventory all the shipyard cranes, in operation or abandoned, from the smallest to the giant gantry cranes. The site contextualization was evident and the study immediately extended to the industrial landscape and the constructions of the whole factory, administration, workshops, warehouses and obviously maritime infrastructures as quays, dry-docks and slipways. Our proposal, closer to the objects notices, was based on database and GIS to map the

²² Jean-Louis Kerouanton, *Les chantiers navals de la Ciotat*, rapport de recherche : Centre François Viète, Université de Nantes, DRAC Provence-Alpes-Côte d'Azur, décembre 2007.

site evolution in time and space, to place the machines, to reference some old maps and plans in their geographical situation. It was our first digital approach²³.

The second digital approach proceeded to the necessity to study before its destruction a bending machine which appeared very original. The *Bennie* machine, with the renewed Ministry of culture support, could be the subject of our methodology. After work in place, 3D scanning, archives documentation, we could propose the mechanical modelling and then a video film for story and valorization²⁴.

Today, in the large difference of ten years ago where the closure memory was still painful, it is clearly possible to speak in the city about the shipyards past and story²⁵. In 2011, a public conference we did showing the video was really a success.

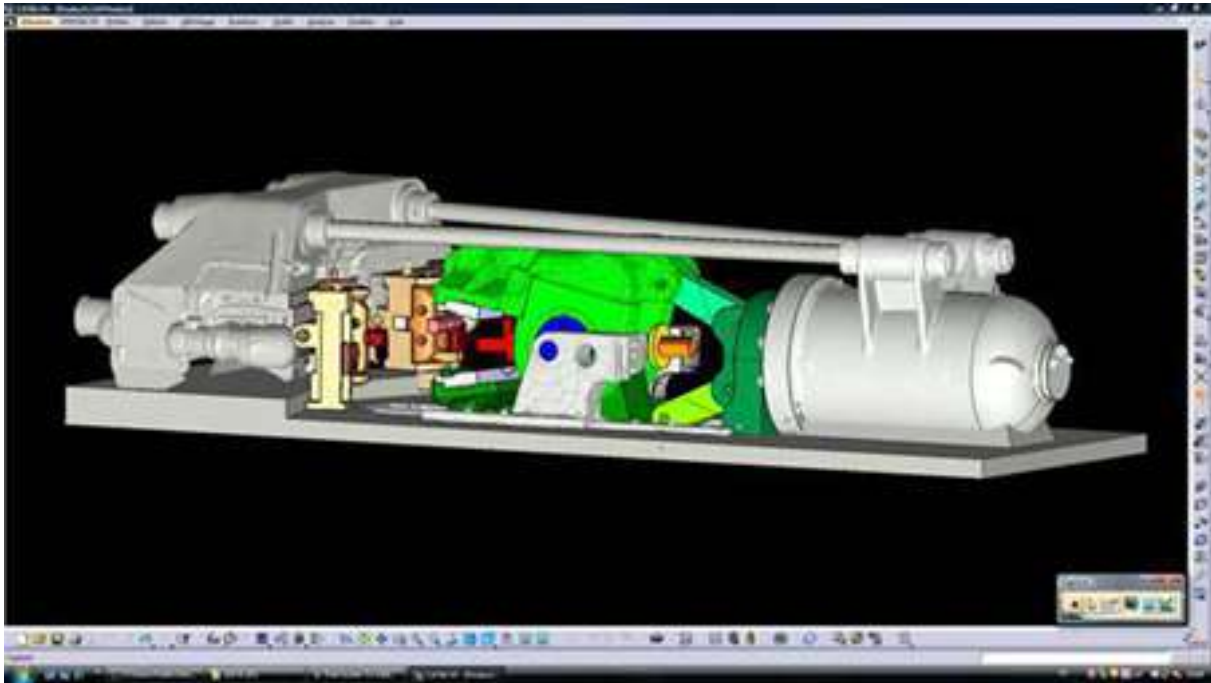


La Ciotat Bennie bending machine, Cl. Jean-Louis Kerouanton 2007

²³ Jean-Louis Kerouanton, « Pour l'utilisation des SIG (systèmes d'information géographique) en histoire des techniques : entre documentation et analyse spatiale », *Documents d'Histoire des Techniques*, n°18, décembre 2009, pp. 81-94

²⁴ Jean-Louis Kerouanton, Florent Laroche, Didier Serveille, *La cintrreuse à membrures Bennie*, video film, 2010 <https://www.youtube.com/watch?v=HvyPULjIRbs>.

²⁵ Sylvie Denante, Jean-Louis Kerouanton, "L'image virtuelle comme source de connaissance pour le patrimoine industriel : les chantiers navals de La Ciotat, espace et représentation technique entre port et architecture du XXe siècle", *RIPAM, Rencontres Internationales du Patrimoine Architectural Méditerranéen*, Marseille : CICRP, octobre 2013, pp.131-133



La Ciotat, Bennie Machine, 3D CAD Didier Serveille, 2010

A city industrial harbour : Nantes in 1900

The mock-up of Nantes harbor is one of the most important objects of the Nantes history museum, the *Château des Ducs de Bretagne*. Built by Pierre-Auguste Duchesne in 1899 for the 1900 Paris *Exposition Universelle*, but actualized until 1914, the mock-up is probably one of the best documents for the urban and economic history of Nantes around 1900²⁶.

The museum curators and the research team had together recognized its interest since a few years²⁷. Our common interest for new technologies into museology convinced us to imagine a new common project. We were together thinking to the innovative use of digital technologies to promote cultural heritage. The interactive device was first, and is actually today, a proposition to valorise the object itself.

The first step was to scan the entire mock-up in 3D; then the historical documentation was provided for the database. It was really a work in progress and a real academic experience with approximately one hundred and fifty students during several years, both engineering students and heritage students for the most part, learning from themselves to cross their own academic languages to make common sense.

²⁶ COURTIN, Ch. GUILLET, B., KEROUANTON, J.-L., LAROCHE, Fl., *Nantes 1900, la maquette du port. Une valorisation scientifique et muséographique innovante*. Nantes : Château des ducs de Bretagne — Musée d'histoire de Nantes, 2015. [\[hal-01243990\]](https://hal.archives-ouvertes.fr/hal-01243990)

²⁷ Bertrand Guillet, Laurent Huron, Jean-Louis Kerouanton, « La maquette du Port de Nantes », *Congrès national des Sociétés savantes « Des villes, des ports : la mer, les hommes »* (n° 124; 1999; Nantes), Paris : CTHS, 2001, pp. 143-155. The scale model is approximately 1/500 with 9.20m length for 1,85m large.

The scientific objectives were progressively fixed at the same time in permanent discussion with the museum team. They are analysed in the thesis of Benjamin Hervy²⁸. Our preoccupations were to develop the DHRM as defined by Florent Laroche in his 2007 thesis, insisting on semantic recognition of 3D elements, time integration (link past/present) in the knowledge database and on the "self-adaptable" meta-model for supporting updates in a sustainable life perspective.

The three interactive multi-touch screens are placed just in front of the mock-up, bounded to precise geo-referenced lightning when notices and thematic links can be read in the same time during navigation. The idea is to help visitor to understand the mock-up as an artistic production, a tri-dimensional town city plan²⁹, and of course an amazing document for the historians and visitors for the comprehension of the harbour and the city surrounding the river Loire, in its maritime part.

Model is not a simple mock-up !

Of course, this short presentation of our works is not exhaustive. If our research began with industrial heritage objects, it seems to allow some similar considerations on others heritage fields. However, our approach looks probably especially accurate on technical and industrial objects. The 3D modelization, with a real CAD methodology, is obviously operant with technic and past functioning, cause of its precise mechanical and dynamical aspects. But our first reverse engineering methodology drives us to increase the reflexion on data and permanent reflexive links with all their complexity for the historian narrative. We have now to improve it, to anticipate the integration of the outdated phases since the design phase, the reuse phases or recycling phases, to add layers for the present, including heritage life phase.

Our proposal about the *Salons Mauduit*³⁰, put on some developments in the answering with immersive and interactive situations, augmented reality, serendipity visit or "free but guided" visit. We want to test too the possibility for the visitor to be himself an author, a testimonial contributor *in situ* or on line, in link with the future Nantes City "wiki heritage".

Virtual 3D heritage objects can become a real tool for understanding our history. It is a present question to envisage new representations of the history and to facilitate the valuation by a reflection on the possibilities of the documentary analysis between narrative of the historian and network of knowledge. For the historian, the double crosslinking, within the narrative and between narratives, opens new opportunities of

²⁸ Benjamin Hervy. *Contribution à la mise en place d'un PLM muséologique dédié à la conservation et la valorisation du patrimoine : Modélisation et intégration de données hétérogènes sur un cycle de vie produit complexe*. Thèse : Sciences de l'ingénieur : Ecole Centrale de Nantes (ECN), 2014. <tel:01102311>.

²⁹ As such as the best well-known "plan-reliefs" of the frontier cities since the firsts produced in Louis XIV reign. Eric Deroo, Max Polonovski, *La France en relief: Chefs d'œuvre de la collection des plans-reliefs de Louis XIV à Napoléon III*, Paris : RMN, 2012

³⁰ Florent Laroche, Jean-Louis Kerouanton. *Muséologie, patrimoine, humanités numériques et 3D. Digital Intelligence*, Apr 2016, Québec, Canada. 2016, Conférence Digital Intelligence. <hal-01280767>. The *Salons Mauduit* is an art-deco well-known place in Nantes, destructed last year but rebuilt this one closer the primary place.

description and understanding. This transfer of the writing and the accesses goes to the sense of the Digital Humanities such as we analyze them from now on.

That is the reason we launched in 2016 our *ReSeed* project³¹, financed by the *Agence nationale de la recherche* until 2020, over the Florent Laroche responsibility. Semantic reverse-engineering of digital heritage objects: this present work is clearly the direct following of all the precedents³². With its multidisciplinary approach, the Digital Heritage Reference Model contributes to the scalability of knowledge, its interoperability, as well as the re-usability of the framework, independent from the nature of the project. It allows multi-dimensional relationship (belongings, history, geography...), as well as a renewed answering about the interaction between qualitative and quantitative.

Most of the time, 3D use drifts towards creation of perfect models that do not fit with heritage ethics. Because each object is unique, there are no unique methods nor unique tool or general technology to support those approaches. So, managing 3D systematically is a real challenge. Inside the field of the Digital Humanities³³, *ReSeed* project aims to invent a "new use of 3D model". This project meets an interdisciplinary consortium with industrials and universities coming from Human and Engineering Sciences domain. Federated by the Digital area, *ReSeed* put its skills for the cultural society of tomorrow. It will meet the four great challenges of heritage paradigm: knowledge, protection, restoration and enhancement.

³¹ <http://reseed.ls2n.fr/fr/le-projet/presentation/>

³² The most recent work, the specific approach on textuality of Matthieu Quantin, *Proposition de chaînage des connaissances historiques et patrimoniales. Approche multi-échelles et multi-critères de corpus textuels*, Thèse : Génie Industriel : Ecole centrale de Nantes, 2018. For a short view, Matthieu Quantin, Florent Laroche et Jean-Louis Kerouanton « Récit historique et objet technique : outil de valorisation mutuelle », *Cahiers d'histoire du CNAM*, vol.5, 2016, pp.93-121, or Matthieu Quantin, Benjamin Hervy, Florent Laroche, Jean-Louis Kerouanton. « Haruspex, Outil de Gestion de Connaissances non Structurées. » *Archéologies numériques*, OpenScience, 2017. [⟨hal-01617790⟩](https://hal.archives-ouvertes.fr/hal-01617790)

³³ While digital humanities, on that question of history and heritage, are rather turned on texts and archives. Bruno Bachimont. *Patrimoine et numérique. Technique et politique de la mémoire*, Paris : Ina, 2017.

Reconstructing Greece's Industrial Prime in Museum Exhibitions: 4+1 Examples

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Architect – Museologist, Exhibition Designer

Introduction

It was back in the late '80s that the renowned historian of Industrial Archaeology, Jacques Pinard wrote:

"...The remains of Industrial Heritage are not really valuable for the knowledge of the history of sciences and techniques unless they have been carefully recorded, studied and conserved, so that they became useful to the education of the future generations as well..."

Ever since the middle of the 20th century, when the term Industrial Archaeology first appeared in Great Britain, much progress has been made in every country, regarding the research tools and the broadening of the scientific field. Yet, one could argue that back in the late '80s, Jacques Pinard did not stress enough the importance of also interpreting all these sites, buildings, machinery, products and infrastructure at hand, to a broader public, in the form of "musealization" them and still keeping them alive and relative to our present and future.

In my country, the field of Industrial Archaeology emerged at a later time compared to central Europe. Two important efforts were made in the early stages of this scientific field in Greece. The first, took place in the 80s, and it was the preservation and renovation of Athens Gas Factory, one of the first Greek industries. The architectural interventions on the buildings are considered controversial; a museum was set to plan but never developed. The second effort appeared a decade later in the form of the preservation and reuse of a network of industrial ruins in Hermoupolis, Syros, the capital of Cyclades, in the Aegean Sea. Please note that Hermoupolis was the first industrial and commercial center of modern Greece, in the 19th century. The effort led to the creation of the Centre of Technical Civilization by a group of important historians and architects and ultimately resulted to the creation of Hermoupolis Industrial Museum. The renovations are to this day, considered of high architectural quality, but the museum comes short in offering visitors information on the socio-economic environment of the artifacts on display.

In the decade to follow (2000-2010), a very active foundation took action (almost all the action in this scientific field), by studying, preserving, exhibiting and financing thematic technological museums around the country. Its name is PIOP (Piraeus Bank Group Cultural Foundation). Only recently, the last 2 out of 9 such museums were inaugurated. All 9 museums are considered of the highest level of scientific and museological quality, yet one could express an argument concerning their liveliness.

Let me take you back in 2010, when, shortly after the completion of my studies in museology, I was commissioned with my very first museum of industrial archaeology. It belonged to the Hermoupolis network of industrial relics. One project led to another and now, almost ten years later, there is a range of such projects in hand that allows me to present you a concise body of work on the field of exhibition design of industrial heritage related museums. After briefly presenting each, I will conclude by sharing with you some thoughts on what life has taught me on the subject.

4+1 Examples

1. Anairousis Lead Shot Factory Experiential Museum

The George Anairousis lead shot factory is salvaged unaltered with a significant part of its original machinery and tools. It is considered to be the most complete unit of its kind in Europe. The uniqueness of the shot factory lies in the complete absence of mechanization as well as the existence of a cooling tower, which is not to be found anywhere else in the country. The lead shot factory appears to have already been in operation since 1889. It produced exclusively hunting shots, at a time when hunting was popular, and sold it nationwide, as apparently, the quality of the shots was excellent.



"Anerousis" Lead Shot Factory Experiential Museum, Hermoupolis, Syros island

Since 1999 it is part of the Hermoupolis Industrial Complex and it belongs to the Municipality of Syros Island, in the Cyclades. Hermoupolis' prime lasted from 1830s to 1930s. Apart from creating strong business companies in a variety of industries, such as textiles, machinery, shipbuilding and tanning, Hermoupolis was also a renowned commercial center in the Mediterranean and quite famous for its progressive social and cultural life.

By designing this exhibition, our aim was to convert this old factory and its remaining parts to a fully experiential museum space, combining authentic objects with digital technology, leaving the original building as unaltered as possible. Visitors are welcomed to see and set in motion the original machinery, listen to the last workers' oral testimonies; study copies of the firm's 70 years of business documents, learn about the products of this factory and gain information regarding other lead shot factories around the world. Most importantly, visitors can travel back in time and feel how it was like to work in this little old factory. The exhibition's highlight is a digital installation, explaining the function of the cooling tower to visitors, in a somewhat abstract way.

The museum was inaugurated in 2010, while at the same time we were asked to prepare a proposition for redeveloping the permanent exhibition of the Hermoupolis Industrial Museum, which at the time was 20 years old. The proposed restructuring attempts to present the island's industrial heritage through the inhabitants' entrepreneurship and ability to adjust to the vast historical and social economic changes taking place in the course of time.

Visitors are welcomed to experience a flowing change of atmosphere through the creation of a "live engraving" environment.

For each chronological period in hand, a background exhibition surface is provided offering the cultural, historical and socio-economical information. The main technological sector, one that thrived in the same period, is displayed at the center of each unit.

Materials are a key element of our exhibition design, as well as projections, soundscapes and a broad band of digital applications. The implementation of our proposal, already approved by the Greek Ministry of Culture, has been temporarily put on hold by the local municipality.

2. Temporary and permanent exhibition about the Greek refinery company "Hellenic Petroleum S.A."

The temporary exhibition was commissioned by the company and run for a year, at the Hermoupolis Industrial Museum, in 2012. Its goal was to present "Hellenic Petroleum", the largest Greek refineries, its 55-years of history and activities in an engaging and easy to understand approach.

The basic idea of the exhibition's design was to create a large oil tank, within which visitors could learn all about refining, a typical day at work, the company's structure through time and technologies that became obsolete due to progress etc. An impressive installation, made of pipes in colors used in refineries, led the visitors from the oil tank, on the ground floor, to the 2nd floor mezzanine, through the main stairways, where the exhibition continued, accompanied by a small auditorium and space for educational games addressed to school children.

Shortly after its completion, we were asked to prepare a proposal for creating a permanent exhibition and a little mediatheque inside the oldest refinery of the leading oil company in Greece and one of the biggest in Southeastern Europe. The facilities lay in Aspropyrgos, the western industrial zone of Attica, located between the cities of Athens and Elefsina.



Hellenic Petroleum SA – "Energy paths" exhibition

Our aim was to best demonstrate the company's rich collection, as well as to inform the public on its history and variety of activities. In a surface of almost 300 s.m. we designed a "box inside the box", in which, through oil pipes, visitors can walk in a number of thematic rooms and learn about various subjects, such as where does oil come from, or how does it reach our homes, what are the security procedures in a refinery, the company's future plans etc. The project is currently being postponed.

3. Industrial Gas Museum

The project was to examine the old Gas Factory of Athens, where a very popular cultural complex of the municipality of Athens, named Technopolis, in successfully functioning since 1999, and turn a part of it to a museum. Visitors can walk through a "path" of 13 stops, that we created and also visit some additional points of interest, like the old forge, the water gas building and some parts of the vast yard.

Presenting diverse aspects of the oldest gas factory in Greece by narrating stories about its production line as well as of the everyday life in the factory and the city of Athens, has been a complex and challenging, at the same time, task which opened to the public in 2013. Both the remaining in situ machinery and the production line are highlighted, whereas objects of the museum's collection and various topics regarding life in the old factory and its links to the city are addressed. A brief history of artificial lighting and the future of natural gas, are all topics that the permanent exhibition talks about.



Industrial Gas Museum, Athens

Some challenging aspects of this project were the co-existence of the museum's functions together with the various other, quite popular artistic events, as well as the discrete and distinct at the same time intervention of the exhibition inside a historical complex, already rehabilitated some decades ago. The main scenographical characteristics of our design are:

- Repetition of exhibition structures, such as lightboxes and showcases, screens and graphics, in order to offer visitors a necessary pace in a rather busy environment. A more theatrical approach, as variation to this repetition, offers an unexpected wit in the old forge's case.
- Cinema-size projections of rare footage, documenting the factory's production line in use, from the early 1950s, act as a story evolving in many chapters, throughout the museum path. This cinema feeling is yet another "texture" to be added to the final atmosphere created.
- Interactivity, hands-on discovering information, 3d animation videos explaining the obscure production process and graphic design plus signage, the language of which adds to the final atmosphere, are some other valuable tools of the design.
- Finally, inserting contemporary art inside the museum's scenography and storytelling was another important decision made by our team. The existing work of an important contemporary greek photographer, a lighting installation as well as the tailor-made metal constructions for the museum stops in the yard, by a renowned greek industrial designer, helped to give some added value to the project, mainly by connecting the museum to today's artistic reality.

All museum constructions are environmentally friendly and totally reversible.

4. "People and Factories; Industrial Elefsina" – temporary exhibition

The temporary exhibition attempts to create a flashback in the history of the city's industry, from the late 19th century to 1974 and the restoration of Greek Republic. Through the unfolding of the separate story of each significant factory of the area, there emerge stories of people who worked there, whether being industrial workers or entrepreneurs. Rare exhibits, accessible to the public for the very first time, along with oral testimonies, theatrical soundscapes and audiovisual material welcome visitors to reconstruct history, in an interactive mood.



"People and Factories: Industrial Elefsina" exhibition

Furthermore, visitors are invited to reflect on important issues such as working conditions and entrepreneurship today, through the example of significant yet unknown moments of the past of a historical place like Elefsina that holds a deep connection with cultural activities, yet at the same time remaining one of the most important industrial cities of Greece.

This temporary exhibition was the first public presence of the new Museum of Modern History of Eleusis, which is currently taking its first steps of formation. The exhibition was under the auspices of Aeschylia Festival 2016, a leading cultural institution in Greece.

5. "Made in Greece: 160 years of Greek industry and innovation" – upcoming temporary exhibition

The "People and Factories" exhibition produced an unexpected success, which led to the idea of creating a temporary exhibition demonstrating the whole of Greece's industrial history. The Industrial Gas Museum and Technopolis, in Athens, now undertake the task.

It is scheduled to open to the public on January 18th and an interdisciplinary team of historians, curators, 2d and 3d designers, is currently working on it. By now, we have come down to about 100 enterprises, of which some have long ceased their operation and others are still in production, counting more than a century of presence in the Greek industry. The show will present these enterprises by category (metal, construction, chemicals, energy, food and beverage, textile, tobacco), via 3d archival objects, be it machinery or packaging and 2d archival objects, such as stocks, price lists, books, photographs etc. A lot of hands-on activities as well as digital projects will help make the visitors' experience an enriched and diverse one, or so we hope.





Models for the upcoming exhibition "Made in Greece: 160 years of Greek Industry and innovation", at the Industrial Gas Museum, Technopolis, city of Athens, coming up on Jan. 18th 2018

Still, we feel that the most important thematic unit of the upcoming exhibition is a space that will host an interactive timeline table, as well as different aspects of the industrial and economic history of Greece, through a human-centered lens. This room will provide the necessary context for decoding the rest of the exhibition and provoke the necessary questions regarding Greece's industrial prime and fall, the present economic crisis and our ways out of it.

Epilogue

So, what about industrial heritage and its particularity in the museum world? Well, let me share 5 conclusions to which we have come up with:

- 1) An industry is made not only by buildings and machinery, but also by the work force behind it, a chain of employees, from the owner and the director to the last unskilled worker. And in this chain of people each one is as important as the next one, in order for the company to be viable and thus useful to the society it participates in.
- 2) A factory is much more than its production line. It is the lives of people working there; it is the interaction with the city and the society where it finds itself situated. The socio-economic and cultural context is of vital importance in the interpretation and reconstitution of its stories.
- 3) In the world of industry nothing gets wasted. You can use economic and social circumstances to get to the sources of raw material, to the use of waste in the form of by-products and in incorporating contemporary innovation.

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- 4) Greece' s industrial prime has only lasted for brief periods of time, because of the State's reluctance to create institutions and adopt policies that would protect and support industrial activity. Moreover, societies proved to be very slow to adapt to new data, by re-investing their profits to cutting edge technology.
 - 5) Today, turning industrial complexes to museums of themselves, does not seem to be of any importance to people's lives,
 - unless you present the story of the enterprise through a socio-political and economic lens of its time,
 - Unless it explains the way it worked in easy to understand and interactive ways, using a contemporary language,
 - Unless, finally, the story you want to tell involves today's main reflections on economic growth, social sustainability and values, environmental issues, creativity and innovation.

So, apart from simply restoring deserted buildings and attributing new uses to industrial relics, the necessity of the use of a vivid museological interpretation implementing its full band of contemporary tools clearly arises. The spirit of such an interpretation can be best summed up as the recognition of the important role industry plays in our society and cities, in their social and financial function, its planning and history, and thus our commonfuture.

Villa Petrolia – Nobel Brothers Heritage in Baku

Amina Melikova

Azerbaijan National Museum of Art

Winston Churchill once said that *"If oil is a queen, then Baku is her throne"*. Azerbaijan's oil wealth has a long and storied history enough for several museums.

Almost every country has a certain "brand" for which it is known. And for Azerbaijan the unmistakable, internationally known "brand" is oil. It is because of oil that Azerbaijan and, in particular, its capital, Baku city is known throughout the world. The existence of oil in Azerbaijan has been known since time immemorial. It is impossible to imagine the general history of both ancient and modern Azerbaijan without its oil history. And while in the early twentieth century, Azerbaijan acted as a major exporter of oil, at the beginning of the twenty-first century Azerbaijan is a strong exporter of not only oil but also gas. Let's make a little digression into history. How did the city of Baku look in the middle of the 19th century?

Prior to 1844 oil on the Absheron peninsula was extracted by hand, i.e. it was drawn from wells in leather bottles, and raised by hand windlass. In 1844, ten years before the wells of Colonel Drake were drilled in Pennsylvania, the Russian engineer Vasily Semyonov began drilling in the Bibi-Heybat, near Baku. And in 1848, the first oil was extracted using wooden drill rods. From then on, the oil boom took off as the field of oil production expanded immediately. In a relatively short period Baku turned from a small province in the Russian Empire into an industrial, fast-paced city with its own unique atmosphere and cultural life.

The names of Robert, Ludwig and Alfred Nobels are well known to many people in the world. For the majority, they are primarily associated with the Nobel Prize.

However, a few of us would think that the major part of the Nobels' heritage is composed of the capital gained as a result of activities in one of the largest companies of the past – the Nobel Brothers Petroleum Production Company. In this regard, 7-12% of the Nobel Fund is formed thanks to the capital earned by these oil barons in the oil field of Baku and Absheron. Thus, it would be fair to say that the history of the Nobel Prize is closely linked to the oil production history in Azerbaijan. Most importantly the importance of the Nobel brothers in the development of oil production at global level is obvious for anyone. The first oil tanker, the first oil pipeline in Caucasus, the whole series of other innovations linked to the oil and gas industry: all these elements were brought by the Nobel brothers and their activities in the Absheron oil fields.

Many interesting stories have been told and untold to us by historians about Nobel Brothers in Baku (scenario for a brilliant movie) but the real evidence to the live history became a building that was restored after decades of years and turned into a unique museum in 2004. The building is restored by the owner of Nobel Oil Club Dr. Togrul Bagirov, passionate historian for Nobel History in Azerbaijan.

"Villa Petrolea", which was well known as a "green haven" or "green oasis" among the oil derricks. It long attracted the interests of oil industry executives, workers and visitors.

“Villa Petrolea” was, in fact, not a single villa but a planned community located in the village of Keshle on the outskirts of Baku. The “Villa” was established on the initiative of Branobel’s founders, with Branobel funding. The community was built especially for the employees of the company.

The community occupied a considerable area, well over 20 acres, with a series of substantial houses for company employees. One building, especially designed for entertainment, consisted of a huge hall for performances and concerts, a restaurant, billiard tables and a library.

Entrepreneurs made a considerable contribution to modernizing the environment (with the construction of buildings, roads, postal stations, telegraph, etc). By implementing Western standards and taking into consideration the employees’ health, Branobel aimed to improve conditions in the very tough environment around the oil fields. The plan proved noble but difficult to realize. The natural conditions around the industrial region were very harsh. Alfred Nobel himself conceded that he never wanted to visit the Baku Oil fields given the depressing environment.

Branobel did not limit its activity to the construction of houses. The most distinguished feature of Villa Petrolea was the transformation of the site into a luxuriant garden with rare and valuable plants, hothouses and a nursery. The company’s systematic efforts led to observations from many contemporaries that “the houses were sinking in the greenery”.

The Baku Nobel Heritage Fund’s first project was restoration of Villa Petrolea. ‘To be more exact, it wasn’t restoration work, it was reconstruction work, because at that time only the walls remained, everything else had either been stolen or destroyed,’ there was nothing here at all. The house was home to stray dogs and cats and the homeless. There was no roof. All that Dr. Bagirov managed to find were beams from that time, the cast-iron staircase and two out of three of the original fireplaces. They kept the exterior as it was, restored it step by step, worked in the archives looked at photographs. Of course interior changed, because it was a residential house and now it isn’t. It took two years and was finished the project in 2007; it took almost a year to find the exhibits. Some came from private collectors, antiquarians in St Petersburg and Baku. Others came from Batumi, where there is another Nobel house. It’s also a museum. The architecture is similar but the house is smaller than Villa Petrolea, as the family did not actually live there. A few items were given by the Nobel family and brought from Sweden. Villa Petrolea is the first Nobel family museum in the world, because there is a museum dedicated just to Alfred Nobel, whereas this museum is dedicated to the two other brothers, and their descendants, i.e. Robert, Ludvig, Ludvig’s son Emanuel, who ran the business empire, and the other Nobels. So BNOC practically restoring historical justice because to keep quiet about the other brothers and to concentrate on Alfred alone, isn’t right.

Although it was Robert and Ludvig Nobel who played the major role in developing Baku’s oil, Alfred was involved too. ‘Alfred Nobel was a shareholder in the Nobel Brothers’ Baku Oil Company, a major shareholder, and at the very beginning of the project he gave the start-up money, i.e. he played a no less important role,’ ‘But it was Ludvig who realized at that moment that Baku and the oil industry were something fundamental, that they

would change the whole world. Ludvig was not simply an industrialist and a businessman; he was a systems man, a researcher and a scholar too. He was a member of the Russian Imperial Technical Society, a technical academy of sciences. He was a friend of Mendeleyev, creator of the periodic table, and was presented to the tsar. It was thanks to Ludvig's efforts that the monopoly on Baku oil was lifted.'

The Nobels and Baku's first oil boom

In the 1860s and 70s oil extraction was still a novelty and many people did not understand the value of oil and its potential as a resource. Those who did understand tried to make money out of it. At that time, there was a monopoly on the oil industry in the Russian Empire and Baku was not developing. Kerosene was imported here from America – this was Rockefeller. Although oil was first produced industrially here, in 1848, Pennsylvania in the USA was the second place where production began in 1853. And the Americans were more entrepreneurial and they worked quickly; they began to produce kerosene and kerosene was imported to Russia. Russia was a very promising market at that time, kerosene was used in lamps and so on. Thanks to the efforts of Ludvig Nobel this monopoly was liquidated. Through Mendeleyev he gained access to the tsar and the tsar took the decision to lift the monopoly and signed a special decree.

At around that time Robert Nobel travelled south from the Nobels' industrial base in St Petersburg looking for timber to make rifle butts for the Nobel armaments factory. He went to Baku and Lankaran, in the south of Azerbaijan, but wrote to his brother, 'This place is desert, I've found wood, but I've also found oil. Everything is burning all around Baku.' Robert visited the Atashgah, the Fire Temple outside Baku, and was impressed by it, 'That's when he had the idea of making the Atashgah the symbol of the company. He wrote to his brother Ludvig, who although he was two years younger was head of the Nobel's industrial empire in St Petersburg. Ludvig, told him to invest the 2,000 gold roubles he had given him for timber and Robert bought a small oil refinery and a small plot of land where there was oil. After this Robert came to Baku only once more because he was rather fussy and didn't like the desert, the heat, the humidity. At that time Baku had not been developing because of the oil monopoly, it was the back of beyond.

Thanks to their efforts, Ludvig's and Robert's, did the first oil boom begin. The first capitalists appeared and big money came with them, bringing architectural masterpieces. Everything that was built during the first boom by Taghiyev, Asadullayev and other oil barons The brothers set up the Baku Nobel Oil Company in 1879. The company became known as Branobel, an abbreviated version of the Russian name, Bratyev Nobel, meaning Nobel Brothers. 'In Russian it was called a Tovarishchestvo or partnership, 'They didn't call themselves pure businessmen, pure capitalists, because their lives show that they had a social conscience. They gave a lot away. They built houses, schools, hospitals for ordinary workers. They were the first to do this. It's still very rare.

Villa Petrolea and this whole park were created in two years. In 1882 they spent almost six months on the architectural plans; Swedish and Italian architects were involved. The French created the park. Soil was brought from Lankaran; fresh water was

brought from Astrakhan; trees and shrubs came from Italy and France. A corner of paradise emerged here, an oasis, with 10 buildings. The house was the central building. This is where they lived and received guests. They held all kinds of Swedish receptions here. They had an air conditioner, as they brought in 800 tons of ice and in the summer the climate here was like in Sweden, plus 15 or 18 degrees Celsius. They had the first telephone in Baku here, a Bell. Many books have been written about the Nobels – in Sweden, England, the USA, Russia and Azerbaijan, including a book by Brita Asbrink which dedicates a whole chapter to Villa Petrolea.'

'The Nobels devised the first oil pipeline, the first oil tanker, called the Zoroaster. Thanks to their innovations and new technology they improved oil refining and the Nobel Company was the only one in the world that was vertically integrated. That's when everything from wells to distribution is part of one company,' they had an oil pipeline, tankers, a refinery, distribution. All of Russia and all of Southern Europe were supplied from here. Kerosene went via Russia to Finland and Sweden. The oil was here, nowhere else. Oil wasn't found in the North Caucasus and Tatarstan until early last century.

At the start of the 20th century, 50 per cent of world oil extraction was centered on Baku and some 40 per cent of that belonged to the Nobels. The remaining 60 per cent was divided between the Rothschilds and the Rockefellers. They were also rivals. Standard Oil of New Jersey, Rockefeller's company, was the largest in the world, like ExxonMobil today. The Nobel Oil Company was the second largest, 10 million tons in 1900, 76 million barrels per year. The Rothschilds, Shell, were third.

'In 1888 Ludvig died in Cannes. He had lived in Baku, but unfortunately after building Villa Petrolea in 1884-85, he was ill. He had practically sacrificed himself to his work and died young. His oldest son became head of the oil and industrial empire. It did not go down all that well here, because both Alfred and Robert thought that they should head the empire, not 29 year-old Emanuel. But clearly they decided not to disobey their brother's will, especially since Ludvig had trained his son as his right-hand man. At the age of 29, Emanuel became head of the most powerful industrial empire not only in Russia but throughout the world. He was presented to the tsar, received Russian citizenship and a passport, spoke Russian very well and could even have become a state secretary for his services to the fatherland and to industry. But Emanuel preferred Baku to St Petersburg, especially at the start of the 20th century. He was frequently here and oil was now the most important part of the Nobels' business. There were the armaments and so on, but these were less important. In Baku there was constant competition, the Rothschilds, Rockefellers, etc., the great countries were here, Great Britain, Persia, Russia. Everyone was fighting for Baku oil. And Emanuel was practically a patriot for Azerbaijan and Baku.

Emanuel loved Baku, he loved Villa Petrolea, because here he felt growth. St Petersburg was already a museum centre; it had its palaces, its society life, but all this was just beginning in Baku. The main years of the oil boom were 1900, 1905, 1910, when enormous luxury houses, theatres and so on were built. Baku was also becoming a centre of entertainment, a city of pleasure and even of debauchery, because of course with money came everything else – luxury goods, cars, clothes, high fashion, ladies including ladies of the night. Emanuel Nobel liked to visit his friends. For example, he would go to see Haji Zeynalabdin Taghiyev who had built a fabulous palace which is now

the Academy of Sciences. Taghiyev gave the palace to his first wife, held balls there where Emanuel was a frequent visitor. Emanuel fell in love with Taghiyev's daughter Leyla, who was an Eastern beauty. But the age gap was too great, he was 51 at the time, she was just 21, I think, and nothing happened. Who knows, if the revolution hadn't happened, maybe something would have come of it.

Revolution

Emanuel was to some extent a romantic, he was naive, and he lost almost everything, because he did not believe that people could be so destructive. He did not appreciate what the Bolsheviks were, although by 1914 he had already experienced for himself the disease of Bolshevism. Stalin was in Baku and led labour unrest, sabotage at enterprises and so on. Emanuel wrote to his sisters that he thought common sense would triumph and people would not destroy each other. He thought that the workers were too well paid to opt for revolution, while Rothschild and Rockefeller were the opposite, more pragmatic and cynical. They managed to sell up and leave, but Emanuel Nobel lost everything. When the Bolsheviks came to power, the Nobels' industrial empire was destroyed; both in Baku and St Petersburg, and all the oil fields were expropriated. Anyone who had money was arrested. The Nobels tried to go through the courts and to make contact with Lenin, but they got nowhere. They were left with hardly anything – a house, and some minor accounts in Western banks.

Emanuel Nobel left Baku in 1919. He and the oil company's chief manager were saved by the workers, who told the Bolsheviks and Red Army soldiers not to touch them as they were good bosses. They left Azerbaijan via the North Caucasus, through Yessentuki. According to one story, Emanuel and the manager left St Petersburg dressed as women and crossed the Finnish-Russian border to reach Europe. Another theory is that Emanuel somehow managed to get out via Poland and reach Germany and went from Germany to Stockholm. Emanuel was not broken, strange as it may seem. He continued his life as a bon vivant, something of a playboy. Emanuel had many girlfriends, but never married. He died in 1932, when he was almost 73, having lived nine years without oil and his business empire. All this time he continued to fight and created an entente against Bolshevik Russia to stop the supply of new technology and equipment.'

The other Nobel prizes

'Alfred Nobel wrote to his nephew, Emanuel, to say that he was proud of him and his achievements as head of the Nobel empire,' Alfred was very unhappy in his old age, depressed practically all the time, as he realized the harm his invention of dynamite had caused. Alfred bequeathed everything to his foundation, the special foundation in Stockholm. Many people think that this was because he wanted to redeem himself somehow. I agree, but his brother Ludvig's fate also pushed him to take this step. Ludvig died in 1888 and the first Nobel Prize was established in his honor in St Petersburg, under the auspices of the Imperial Russian Technical Society.

The Ludvig Nobel Prize was funded with money from the Baku Nobel Oil Company. A Gold Medal and some 100,000 dollars in today's money were awarded for the most outstanding invention or scientific achievement with a practical application in the oil industry. There was an independent jury and Board of Trustees.

'So Alfred knew about this, when he bequeathed all his money to his foundation. The family, his nephews and nieces, were categorically opposed to this. Alfred's nephews had expected to inherit this money and started a campaign in the press. It was Emanuel, who as head of the empire, spoke in favour of his uncle's bequest and convinced his cousins that the will should be respected. It was Emanuel who transferred the first money to the foundation. Alfred had been a share-holder in the Baku Nobel Oil Company, with approximately 25 per cent, and received dividends and lent money to his brother and to his nephew Emanuel. So the first 18 million pounds were transferred by Emanuel Nobel to the foundation's account. The prize was not awarded until 1901, so there was a battle for four years after Alfred's death. We have only recently begun to investigate this in the archives in St Petersburg but we can say that between 20 and 30 per cent of the funds which Alfred left to his foundation he either received from Baku in the form of dividends or after his death as contributions from Emanuel. This makes Baku, Azerbaijan, a co-participant in this great venture. That's the second Nobel Prize.

'Then there's a third Nobel prize, which not many people know about at all. This was a purely Azerbaijani, Baku prize. It was created in 1907 in honor of Emanuel Nobel, while he was still alive, which is very unusual. This was a prize for development in the oil industry, rather than for scientific achievement. The prize could be awarded to specialists, managers and soon. It was founded here in Baku, initiated by the Rothschilds and funded by their company Mazut, under the auspices of the Baku branch of the Imperial Russian Technical Society. The prize was awarded four times before the revolution, and like the prize in honor of Ludvig, it was awarded with some intervals, presumably because money was not always available.'

Reviving the Emanuel Nobel Prize

'Reviving the Emanuel Nobel Prize for the Oil Industry is another objective of the Baku Nobel Heritage Fund, 'The Nobel family is supportive. The Nobel committee and foundation understand that we are restoring a historical prize, not inventing a new one.

The restored Villa Petrolea was officially opened on 25 April 2008. The ceremony was attended by 25 members of the Nobel family, led by Michael Nobel and Thomas Tyden, the current chairman of the Nobel Family Society, and by a special representative of the Swedish Foreign Ministry. Dr Bagirov and a delegation of 12 family members were received by President Aliyev. During the meeting it was agreed that the Baku Nobel Heritage Fund would work on various projects – the museum, the Emanuel Nobel Prize and a project to recreate the medical centre that was established at Villa Petrolea by Marta Nobel, one of Ludvig's daughters from his second marriage. Marta was a famous doctor and health care philanthropist.

Visiting Villa Petrolea

Visitors are advised to telephone the museum in *advance*. Entry is free. The ground floor of the restored Villa Petrolea is home to the museum and a conference centre, while upstairs is the Baku Nobel Oil Club. It is an exclusive private business club with membership service, international and national cuisine, wide choice of fine wines, whiskey and cognacs, great cigars and kalians.

Post-Medieval Agsu Town Industrial Heritage

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Introduction

The name of Post-Medieval Agsu town, near Ulguj village of Agsu region is known since 16-17th century. Ottoman traveler Evliya Chalabi writes about Agsu as a prosperous settlement. In 1735 Nadergulu khan (after 1736 he is called Nader shah) moved the population of Shamakhi city which was damaged from earth-quakes and wars, to Agsu and re-built the city on the basis of serious design.

Zaki Velidi Toghan, who wrote the history and geography of Azerbaijan, notes that "after the capture of Shamakhi in March, 1735, Nader shah moved central power (city) of Shamakhi to the settlement of Agsu, 30 km southwest of Shamakhi city and moved the people of Shamakhi to that place. In 1767 the power center was recovered from Agsu to Shamakhi for a short period of time, but in the same year it was brought to Agsu and remained here until 1795" (A.Z.Validi 2009).

Local authors lived that time and afterwards - Hashimi Shirvani, Zulali Shirvani, Agha Masih Shirvani, Shakir Shirvani, Haji Zeynalabdin Shirvani, Abbasgulu aga Bakikhanov, Seyid Azim Shirvani and others named this city Agsu as a rule in their works.

Mainly Russians, especially Russian merchants named the new city Yeni Shamakhi after the city's removal as they had been previously in Shamakhi and made trade. Because the expressions of "Yeni Shamakhi" (New Shamakhi) and "Old Shamakhi" are sounded in the Russian sources, including the works of European authors, inspired of them and Azerbaijani authors. However, Persian sources show Agsu with "Jalalabad" name.

The formal name of the town was Agsu during the reign of Nader shah, Haji Muhammadali khan, Mohammadsaid khan and Mustafa khan. The city's name is not Kharaba (meaning ruins) as it was entitled after becoming ruined. Yeni Shamakhi has no formal importance since was said relatively with Shamakhi.

Agsu name's relation with Oghuz tribes is associated with mention of Sinjan name like Eastern Turkistan and Anatolia. In fact, it is known from official documents that Sinjan abode existed near Agsu settlement till early 20th century. Agsu is presently one of the largest cities in Sinjan-Uygur Autonomous Republic of China.

So, Oguz Turks brought Agsu name to this region and used as toponym because of its fluid water in summer.

Archaeological explorations in Agsu

The first archaeological explorations were led by Fazil Osmanov in 1983 in Post-Medieval Agsu town by Agsu-Ismayilli expedition. The explorations showed Agsu town is one-layer (18th century) monument and very important from aspect of studying khanate period.

Agsu archaeological expedition under guidance of Prof.Dr. Gafar Jabiyev launched wide-spread archaeological explorations in Post-Medieval Agsu town since March, 2010 and lasted till late 2012. 1,5 hectare field was displayed as a result of 3-year archaeological excavations and interesting finds for Azerbaijan and the world history, were revealed. Though being built in a short while, town-planning was applied there in the highest level. During the excavations, planked roads and streets, water and sewerage lines, special wells for garbage, craftsmanship shops, etc. were revealed.

Upon elaborating topographic plan it became known that there is 10-meter height from the sea level between north and south of the town built in rectangle form and towards Mecca. Archaeological explorations in the town showed this difference played important role in supply of houses and estates, with water.

Slopes canals through bath houses prevailed in the town's communication network. Such a line was displayed in 4th excavation site and defined to be laid up from public underground bath to north and outside from the town's fortress walls. Drinking and useless water lines are laid up with river stones from side walls and consist of wells sand poured and planked large raft stones over that. Water lines joined large and small wells and large store-houses.



3rd excavation site, Post-Medieval Agsu Town

All roads of the city are planked with river stone. The roads are laid up parallel with one another in east and west direction. A large street was fixed in one place in north-south direction. Along with the streets, the small and large squares paved with the river stones were also revealed. The squares were displayed in 3rd excavation site in front of the dye shop, in 4th excavation site near the bath house and in 5th excavation site near Juma Mosque. Hollows of trees grown one time and have no root were revealed in the squares.

The basis of all houses of the city is built of the river stone and walls from raw bricks. Rostrums or hearth were revealed in one corner and in the middle of the houses. All contours of one room of the two-room house adjacent to the northern fortress walls are clearly defined. A well supposed to keep food and having 6 meter depth was revealed in the middle of the other room. It is known that the well's wall and room floor are firmly strapped. The roof of all houses are tightened with wood and reeds and solid soil was laid on them. The soil roof was strapped with stone beads in various seasons. Some of them were displayed during the excavations. The house's inner and external walls, floor, roof, tendirs and hearth are dyed with the solution got from special rock and called shaft in Shirvan. Gray dye stuff gives special beauty to houses and created a layer to protect them from rain. This dye stuff is clearly seen in northern wall of the decorated houses.

Craftsmanship shops are built mainly in the form of houses and had sometimes attics. One of them was fixed in 3rd excavation site in blacksmith workshop. There revealed rather many ovens, hearthes, stone machines. Along with these devices, there collected over 150 kg iron items in the excavation site that shows the intensive functioning of the workshop. Small brazier workshop and bone shop were revealed near this large blacksmith shop. It was defined that blacksmith masters had prepared splinters for copper coins along with articles. The masters making bone used mainly bovine animals' spout bones, horns of gazelle and deer. Comb, knife and dagger handle, decor items, bottoms, etc. were made of bone. One of the most interesting workshops is a dye shop. This find verified written tax documents proved that tax from the rural population came from dyeing. The revealed dye vessels and dye dusts shattered around were sent to Marmara University to Professor Receb Karadagh to be analysed. The analyse showed that the dye was of natural origin and called madder (in Latin *Rubia Tinctorium* L.). Production and export of madder are important even in 18th century and it is thereby called madder century.



4th excavation site, Post-Medieval Agsu Town

Large public houses with interesting architectural solution were revealed along with houses and shops of the city. Underground hamam, Juma Mosque and cooler can be especially noted. Entrance door of the underground hamam, the hamam staircases, cobbled way, subsidiary rooms adjacent to the hamam, a stone planked wide square opposite the rooms and pool were explored. The hamam consists of pool in the middle, recreation room with cell-like sections, wardrobe and bath-houses. The hamam has perfect heating system trimmed under the floor. A network of accurately hewed mine stones and raw brick for movement of smoke and heat. The heating system taking its beginning from the hearth on the hamam's eastern edge and covered up in arch-like form stretches from the bath-rooms till western wall of wearing room and two little smokes raised on the building. The bath-room's upside is almost knocked down. Only existence of some building rests says that the building is covered with coverage like arch from raw brick. The upper side of cells around the pool in recreation room, also other parts of the bath complex were tightened with vault made of raw brick. The upper part of passage from wardrobe to resting room is also tied with raw brick in vault form. The hamam was illuminated via sun light through the windows-hollow carved in stone cupol over that. One large, one small stone dome were displayed in the bath-complex from the explorations. The explorations, observations, comparisons and analyses substantiate saying that bath complex with perfect architectural solution, inner structure, pool inside, recreation room, elite buldings around and the square found in 4th site belong to rural elite.



5th excavation site, Post-Medieval Aghsu Town

General capacity of relatively grand building, which we conditionally call Juma Mosque of the city revealed in 5th excavation site, is 576 sq/m (36x16 m). This is larger construction remnant revealed in Aghsu so far. The base of the mosque walls was built from river stone and the walls from raw brick. The size of the raw bricks used in the construction is 20x20x5 cm. A number of wooden materials were used in the construction of the mosque. During the searches there fixed the remnants of wooden column of the mosque, door soles and many rests of wooden materials consisted of stools. Wooden materials are tightened with big iron nails and hooks. The mosque building was erected on wooden columns in 2,3 meters distance along with magnificent walls. This is proved by stone column soles revealed inside the mosque. Let's note that, 56 columns soles hewed accurately were found from mine stones. Column soles consist of main part, small nest where there is smooth part along the whole wooden column and the columns' projection. According to experts, the columns of the mosque were from the oak tree. In Shirvan region, indigenous residents also use more oak, lime, and pine materials for columns to build individual houses. The floor of the mosque was well forged and plastered accurately. The altar was revealed along southern wall of the mosque. The mosque windows are like arch form and built mainly of baked brick and alabaster. Upon continuing the excavations a number of tiles remnants were displayed along the outer walls of the building. All of them are like gutter. The tiles were shattered around the building upon destroying the mosque. Though there are few complete tiles, there are thousands of broken ones. The weight of the tiles is 800-950 gram on average, length 30 cm, width is 12 cm in wide part and in narrow part 8 cm. The thickness is 2 cm. To note, the mosque building is the first building found in Aghsu city area and covered with tile from upper part. Approximately estimations indicate that 60 000 tiles were used for

covering Agsu Juma Mosque. This means 50 tones load. As it is seen, it is not so easy thing to build such a magnificent building from engineering-technical aspect. Existence of this building proves high-level of engineering and technical solution of construction civilization in Agsu in 18th century.

Upon excavations in 5th excavation site a large yard of the mosque opening to the north side was revealed. It is interesting that the yard was planked with large plates hewed from limestone. The mosque's yard was enclosed with limestone and baked brick in west and a fence built from river stone in east and north sides. There was fixed a special well in the middle of the yard for ablution of those coming to the mosque before divine. A grave stone of the mosque mollah was revealed in a little north of the mosque. There are some children graves around that.



Ice store ruins. 7th excavation site, Post-Medieval Agsu Town

Cooler was revealed during the exploration conducted in the hollowest part called 7th excavation site. That site is clearly followed in the photos taken from the space. Total length of the cooler is 30 meter and width 8 m. There are many stone remnants inside. All of them were used in the construction, i.e. they are stones at least only one side of which was hewed. It was known during the explorations that eastern wall of the edifice was accurately plastered with alabaster from inner part. The ruins of stone stairs belonged to building's entrance was revealed in north part. The number of the cleansed stairs is 20. The width of the staircases is 1, 3 meter. The ruins of the wall were revealed in the west and south directions during continuance of excavation work. We must consider that wooden pipeline was done in some sites to provide solidness of the building

walls. Later when the wall was plastered, that pipeline was remained under that plaster. Firstly, the building's inner part was cleansed up to the floor in the north part. Upon continuing the cleanse work, it was displayed that the construction's floor consisted of the baked brick. Sizes of the bricks are 22x22x4 cm and 22,5x22,5x4 cm. A silt layer of 70-80 cm thickness was fixed on the brick floor when excavations continued in the north of the construction. It was defined that silt layer covered the whole area in other stages of the research. It means that the building was filled with slimy water in late 18th century as a result of heavy rains and streams. After water drawn out, sediment of thick silt layer remained there. Rather much amount of cannon-balls and bullets were found from the construction and its surroundings prove that the building was destroyed thoroughly during attack of the Russia troops to Shirvan.



Golden Dukaat Holland Coins. 7th excavation site, Post-Medieval Agsu Town

Naturally, the expedition staff could hardly cleanse the ground of the site covered with magnificent walls from 4 sides, being in 7 meter depth from the earth and also the rubble and bricks. After the inner part cleaned thoroughly the general view and all capacities of the cooler were defined totally. Thus, general capacity of the building is: 243.3 sq/m. inner length 30 m, outer length 34.6 m, inner width 8 m, outer width 11.7 m, thickness of the walls 1.9 m. Generally, 4318 bricks were used on the floor in arch row cobbled 34 bricks on width and 127 units on length. It is supposed to be main cooler of the khanate and was used for keeping strategic products, also foodstuff, under disposal of directly the city or khanate. As is known, Agsu is situated in the area with sufficiently mild climate. In summer it is especially hot there. It is very difficult to keep foodstuff especially daily food in such a hard climate place. It is known that in antique and medieval age in order to keep food of this kind such underground edifice and devices were widely used. The cooler

of 18th century uncovered in Aghsu is the hugest and the most perfect construction type in Azerbaijan.

Copper pot, coppery bucket with sides pressed in, basin, tray, bowl and a narrow jug are of particular interest among the finds of the ice store-house. People controlling them used mostly these things as the dishes of measurement. Two golden and silver coins treasures found in ice store-house.

Conservation and coverage

Though archaeological explorations were conducted in Azerbaijan for long years, conservation and restoration work remained beyond attention. Thus, the archaeological explorations had no traces today in large cities like Gabala, Ganja, Beylagan, Shamakhi where archaeological explorations conducted. Big grooves displayed by the archaeologists turned to sites which economy and household wastes are sometimes thrown.

Post-Medieval Aghsu town archaeological tourism complex created the opportunity to study medieval history of which importance was not paid attention from archaeological aspect in Azerbaijan and to bring to agenda the issue of covering and conservation of archaeological sites of edifices, main part made of raw brick.

In the first stage Turkey's Chatal-Hoyuk sample is taken as a basis, project was worked up and it was decided to cover 3rd excavation site, i.e. handicraft estate. As compared with Chatal-Hoyuk, concrete belts and plastic coverages are excluded in the excavation sites; iron-concrete columns and metal constructions were used. The recommendations of known architects and engineers were taken into account, all projects are agreed with the Cultural Heritage Department of Ministry of Culture and Tourism. Handicraft estate project created the opportunity to show archaeological building remnants, as well as archaeological finds. The visitors following the exposition along the wooden floor can get information about the panels, too.

4th excavation site was covered with metal construction in 2012 included hamam. The purpose was to bring to notice the grandiosity of the excavation site and to introduce graphically the rural topography being conserved edifices uncovered. The remnants are as though presented on one plane from houses till craftsmanship shops, parallel streets till small blind alleys, quarter walls till northern wall, drinking water supply till sewerage lines, underground hamam till city square and public catering institutions.



3rd and 4th covering site. Post-Medieval Agsu Town

In order the soil layer not to be made dusty where excavation ended in the whole area it was mud plastered, lounged and glazed. This approach created the opportunity to present ethnography of the region to visitors.

The wall of the bath house is made conservation with participation of members of Conservation and Restoration Department of MIRAS Organization with Italian Professor Luigi Scrinzi's advice. The walls were cleansed due to modern conservation methods and the parts inclined to etching and destruction were tightened with solution.

In late 2012 Juma Mosque was covered up with metal construction and it is intended to prepare exposition entitled "Culture in Post-Medieval Agsu Town" inside that.

The raw brick wall of the mosque is fortified with the solutions and river stone basis, and mine stone columns are kept as original. The edge of the mosque yard is trimmed with alabaster and water resistant and transparent and Germany made solution is made over that.

The conserved sites being main part of Agsu experience of MIRAS Organization, also created the need for the preservation and management of the complex. Special workers were defined to keep conserved and non-conserved parts of the complex, they carry out cleanse work regularly there.

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Industrial heritage in central Serbia and its Museum repurposing

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Material traces of industrialization roots in Serbia are related to the first half of the 19th century and the central State regions (Šumadija and Pomoravlje). Military industrialization, along with the development of the mining sector, were accompanied by a series of compatible activities and expansion of related crafts, thus textile mills, carpenters' workshops, tanneries etc. The Cultural Heritage Preservation Institute Kragujevac (CHPI) is the regional institution in charge of heritage protection and conservation which territorial competence is spreading on the mentioned districts, comprises of the city of Kragujevac and 12 more municipalities. Proud to be a caretaker of such exceptional industrial and technological heritage, this institution is also aware of its responsibilities in this respect. Moreover, following the latest trends concerning the conservation and protection of such heritage it is important to mention that industrial archeology, as a relatively young scientific discipline, and the practice which included special treatment of industrial heritage as a cultural monument of exceptional value, were early introduced in Central Serbia. Research and legal protection of industrial heritage, matches in time with the same processes in most developed countries of the world. As a consequence, several facilities in different locations were conserved in integrative way between 1953 and 1980, when this activity was most intensive. The best examples that illustrate this, are:

- The Old Cannon Foundry (Museum building) with the Tall Chimney and the Old Cartridge Case Plant were declared as cultural monuments by the official Government decision in 1953, then in 1979 categorized as the monuments of exceptional importance, and finally in 2015, enactment as the heritage of the highest value for the State.
- Alexander's Shaft (belonging to Senje Coalmine), declared as cultural heritage of exceptional importance in 1975, together with other facilities - Museum of coal mining and Mechanical workshop .

The CHPI Kragujevac fosters modern approach to conservation and protection practice. During the '90s molinological heritage was gaining more and more importance in the world, and being aware of such trend the Institute quickly joined this mainstream. In this context, a number of watermills, fulling mills and sawmills still stand on the riverbanks as the material witnesses and the crown jewels of this heritage. After the year 2000, the CHPI has expanded its studies to the conversion of facilities classified as the industrial/technical heritage in terms of their sustainability. The following examples should be mentioned as the most recognizable:

- Revitalization of Senje Coal Mine, a project funded by the European Commission; this old coal mine will be converted into an eco-museum;
- Military - Technical Institute of Kragujevac - some buildings within this historical complex belongs to Old Foudry Museum and other will be converted to suit the needs of the Faculty of Arts.

The most valuable pearl of the Serbian industrial heritage is the Military - Technical Institute, the oldest preserved urban industrial landscape complex in this part of Europe. It is unique for its pioneering character (from the historical, sociological, architectural and esthetic point of view). A complex of custom, administrative and residential buildings was built in the second half of the 19th century and first decades of the 20th century, with a visually distinct evolution of the architectural concept. Those buildings, as the most powerful symbol of late industrial revolution in this part of Europe were categorized as a cultural monument of highest importance in 2015 by the Decision of Serbian Government. This complex is spreading on the 52 hectares, but only the frontal line of buildings that verge the City center is open for the public.

This invaluable industrial compound, offers an extremely wide range of opportunities for future repurposing. Consequential in 2011, CHPI Kragujevac launched activities for its preservation and put into practice strategic documents for reusing some buildings in the context of self-sustainable development, into a university center, museum compound, cultural-tourism attraction etc...



Old Cannon Foundry ("Old Foundry Museum")

This is the most valuable building inside the complex of the Military Technical Institute. Original building where the first cannons were cast was built between 1851/1853. Thanks to the benevolence of French Emperor Napoleon III, who made Army Major Charles Loubri the factory's first director, Serbia forged strong ties with modern European states and embarked on a path of technological progress. Replaced by the present one structure in 1881/83, it was mainly done in the same architectural style with slight modifications, designed by the Serbian engineer Todor Selesković. The new building is in the distinctive

architectural style characteristic for the developed industrial centers of Europe (The famous Austrian travel writer of that time Felix Kanitz informed us about that), with the use of new materials - iron, concrete and glass combined with decorative elements. The organization of the interior is defined by the form of the hall with high central nave, which receives daylight through skylights overlooking the playful roof area. The building formed almost basilical shape, and often was called on the part of researchers - "Temple of industry". The eastern "main" facade with wooden staircase and two stores high vertical sides upon which two chimneys rely is visually the most impressive part of the building. The facades represent successful composition of red brick, wooden beams and plastered walls while decorative elements are - columns, pilasters, decorative elements made from brick. The foundry is connected under earth with an **Old Chimney** installed in 1882, which is confirmed by the inscription on the frontal side. It is an unavoidable element of industrial scenery. The Foundry was in operation until the 1968, than, after the relocation of the manufacturing processes, the building **was converted into the museum** which displays the industrial heritage of the factory. The present exhibition was created as the composition of Nikola Kusovac - art historian, curator of the National Museum in Belgrade. Exhibition was installed in 1971, and consists of:

1. Weapons and Equipment - 440 items
2. Machines and Tools - 202 items
3. Photos - 3527 items
4. Archive material object - 1548 items
5. Art Works - 18 items
6. Seals - 87 items
7. Medals, badges and dies - 46 items
8. Bowls and plates - 80 items
9. Charter, plaques, diplomas, letters of thanks and other items – 534 items

After decades, the Old Foundry Museum needs modernization and active participation in public life through attractive exhibitions, as well as through interaction with Art faculty students (eg. hands-on workshops, fostering old trades and crafts and open-air exhibitions). Other possibilities are related to the revival and development of traditional crafts and trades linked to the core function of the site. Here, we primarily refer to the art of engraving and gun smiting, manufacturing of harnesses, of optical equipment, blacksmithing and others. Many of the most skilled craftsman are now retired, but willing to pass their knowledge on to the younger generations.

Another immediate structure is the **Old Cartridge Case Plant**. The original building, although of important historical and technological significance, was short-lived. The first electric power plant in Serbia was installed here in 1885, even before the Royal palace in Belgrade. It was the 5 h.p. dynamo steam engine, made in "Suker fabrique" in Nuremberg. The existing, architecturally far more accomplished building was built on the same site between 1909/1911. Complete planning documentation for the building was provided by the French engineers. Architectonic is based on the aesthetic of non-ornamental industrial design of neighboring "Foundry" building, but with atypical applications like attic roof and other ornaments that reflected general trends of civil society. The edifice is efficiently merged into the ambience with which it creates an inseparable whole. According to the mentioned strategic plans, the future purpose for this building will go toward the transformation into the exhibition space, modern gallery, concert hall etc.

The last one building of interest is the **Machine Workshop** built completely of bricks during the last decades of the 19th century. All the facade plastics, wreaths, roof cornices, as well as pilasters are made of the same material. The massive architectural structure located on the circumferential line of the factory complex, encompassing the most impressive buildings with which it forms an integral and unique ensemble. According to the records previously mentioned travel writer F. Kanitz from 1897, this plant for production of rifles and shells looked very modern for its time with a glass facade of the "drawing room" and specific shed roofs. Machine workshop is one of the most representative and in the term of reuse most valuable building. Its 6300m² will be transformed into the Faculty of Arts.

There is genuine public interest in opening a Car Museum other vicinity buildings, considering that the Military Factory in Kragujevac is also the founder of the car industry in this part of Europe (factory owned a workshop for the manufacturing and repair of cars even before World War I; between the two wars *Chevrolet* trucks; after World War II – *Zastava/FIAT*).

Attractive as the film location, served as the scene for the drama series *Titanic: Blood and Steel* which was filmed here, generating a 2 million euros investment into 12 weeks. Some facilities have already been listed in the database of film locations (www.filmlocationserbia.com). The unique environment with splendid museums, as well as the energy and circulation of students, will further attract general population to access public galleries, bookshops, theatre, artistic ateliers, craft shops, cafes, restaurants, etc.



Senjski Rudnik (Senje Coal Mine)

Senje Coal Mine is the oldest mining complex in Serbia, established between 1853/1860, distance 87km eastern from Kragujevac. The construction of "Foundry" in Kragujevac, and the military industry at all, could not develop without essential raw materials, so efforts were made to discover exploitation deposits of coal as the most powerful fuel known at the time. Those two activities started almost simultaneously in 1853, due to skillful organization of that time Government. It is the first mine with organized exploitation, unlike other pits of the time, characteristic for totally primitive and anarchic ways of production. Ore was at first transported to arms factory using wagons towed by cattle. Later, tendency towards more efficient provision of production facilities with raw materials led to the construction of narrow railroad in 1892 (completely closed during 1960's).

Over the time this mine has become an important center and focus of numerous mining families from all over the Balkan Peninsula, who had brought there all the characteristics of their entities. Eclectic, multi-cultural cohabitation of workers families created a specific community which has survived up to the present day. The final effect of such historic and ethnographic circumstances was creation of folklore, social and aesthetic ambience, specific in every sense of the word. As a result of such a comprehensive, some of the facilities were listed as cultural monuments by the decision made in 1975:

- First administrative building of the mine above the entrance into the Aleksandar's Shaft (1853);
- Workshop and Smithy Building (1900);
- Old Depot (1930), nowadays the Museum of Coal Mining;

In addition to the mentioned facilities, legal protection also covers the Steam machine for transport of people and material J. Korosy Gratz MHT with tower and steam installation constructed between 1871/73, registered and recorded as a piece of technical culture by the Museum of Science and Technology in 2005. The elevator with mechanical installation – most important steam machine which permanently and highly reliably drives mining elevator – is the only functional one in the world, representing a rarity which fascinates every visitor.

At the beginning of this century, the Senje Coal Mine industrial complex, amongst the oldest ones and closely related to the mining beginnings not only in Serbia, but all over this European region, was recognized as such through studies developed by national and international expert teams – especially by perceiving it within international frameworks. Based on the conducted evaluation of individual facilities and urban structures formed in this area between mid-XIX and mid-XX century, beside previously mentioned, the following structures have been detected: Mine Director's Building – "Hofman's Villa" (1898-1900), St. Prokopije Church (1900), Restaurant "Proleće" (1900), Railway Station (1905), Elementary School (1905-1907), Old Directorate – Administration Building (1910), Solidarity Fund Building (1928), "Sokolski Dom" - Cultural Centre (1930), Local office (1947) and Workers Street (1898 – 1910).

The Museum of Coal Mining was opened in 1980, and settled in the building of Old Depot constructed in 1930. The Museum was established for the presentation purpose of the mining historical development in Serbia. Inside the 550m² display areas, the visitor can view storage simple mining tools from ancient and Roman times, several collections of lamps for lighting in coal, machinery for mechanized coal excavation, geological mining map, collection of photographs from mining motifs and collection of archival material. At

the display shows a documentary path of development of the mine, the workers and the syndicate union movement, postwar socialist self-management and construction.

The European Parliament selected the project for renewal, restoration, revitalization and technical equipping of these facilities for eco-museum, as well as development of institutional human capacities which should manage heritage of this area in the future, especially upon the full stoppage of coal exploitation. This project is internationally supported as pilot project based on exclusive orientation to service providing industries, primarily to cultural and creative tourism.

The focus for interpretation of the Senje Coal Mine, both tangible and intangible heritage, is through the restored museum and workshop buildings. Mechanical Workshop and Depot (Museum of Coalmining) are transformed in museum exhibits through current project, while third one – free areas, used as the open air museum. It is important to say that numerous machines, tools and other industrial artifacts relevant for exploitation processes are accumulated within the unit, and give tremendous contribution to overall industrial – archaeological valuation of this place. Tourist information center provide the “gateway” to the settlement and wider surrounding. Postcards, books, souvenirs and other promotional material is available and attractively displayed. Technical status of old Aleksandar’s shaft, which has been planned as a specific touristic treat of Senje Coal Mine, goes towards an abstract setting which would run along the whole underground tunnel, then it would continue by exiting to a vertical axis of currently functional mine shaft, wherefrom further transport to the surface would be carried out by the means of unique steal elevator. Unfortunately, in safety terms only 70 meters of the shaft have been cleaned and are in good condition. Access to the remaining 450 meters is closed due to various barriers and problems. Farther exhibit circulation would be going all along the shaft (main accent on the mine shaft authentic atmosphere), fully equipped with helmets, lamps...etc. The end of exhibit would be in existing shaft, from whence the visitors could be able to come up with steam engine.

The reconstruction of narrow railroad which opened this area to the world in 1892 could do that again, thanks to a couple of conserved steam locomotives, which could be possibly rehabilitated. Another possibility of reuse 5 kilometers long trace, going toward the recreation path, as for example – cycling, hiking and networking with existing routes are much more realistic. This railway network was also an engineering achievement, with several specific construction structures enabling access to trains in such a difficult terrain, with inclination of even 46‰ in certain sections. Railway network by itself is the basic value of international importance, and its role was described in numerous academic articles from all over the world.

The uniqueness of such landscape experience, created in combination of human and nature activity, fully meets the meaning of term – Cultural Landscape. The co-existence of sublime and low structures, are strongly creating contrast between sophisticated mechanical structures and poor workers’ sheds and buildings of their social life. None of the significant facilities within the unit is not a replica, but the authentic segment of settlement.

Senje Coal Mine distinguished itself as an example of good practice – thanks to funds from the European Commission, it entered into the program for development of re-arrangement project which should turn the place into a museum site. In this way the

rehabilitation and the conversion of the Senje Coal Mine into a museum complex become one of the most successful and transparent projects in this part of Europe.

Also worth mentioning is another special unit which is considered as the potential museum and exhibition space, and at the same time it is the valuable part of Serbian industrial heritage network:

Sokolana Complex of the entity "Old Workers' Colony" (Kragujevac)



It was founded between 1924/1931 as a war compensation that arrived from Germany in the form of building material and the mapping of the first 296 flats. Old Workers' Colony was a unique example in both the Kingdom of Yugoslavia and entire region. Global planning with the concept of compounding of daily activities within a community and making a direct contact of a man and nature, opposed to Modern urbanistic style of the time. Within the context of cultural heritage, only a few, the most representative buildings survived until today. Pictorial and architectural value of these central edifices is undoubted, as well as their authenticity, socio-economic, and urban uniqueness. According to such values they were declared as cultural heritage by the official Government decision in 2014.

In the context of their future reuse, many solutions in the term of the self-preservation are planned. Some of them refer to the opening of new museums. As for example *Sports Museum* in "Sokolana Building", *Museum of Old Workers Families* inside the "House of

the Colony Director", as well as the *Pedagogy Museum* in the "House of School Caretaker".

Another valuable cultural heritage which reflecting the technical and agrotechnological culture are transformed in museums and exhibition space.

Kings Winery in Oplenac



The town of Topola with the Oplenac slope, are 40 km northern from Kragujevac. They have always been known as a quality wine-producing region, even in the Ancient Romans times. Alongside the construction of the Royal Mausoleum, King Peter I commissioned a small winery to be constructed behind the church. One item was preserved from that first King's Winery until the present times – a huge barrel of over 4 000 litres from 1909. King Alexander I continued his father's and grandfather's enterprise by planting over 50 hectares of seeds purchased in France, but also local sorts. In time, famous wines were created and they were served at the official visits by European heads of states and found their way to the dining tables of foreign courts.

"Wine cellar" was built 1927-1931 in cooperation with the German company *Adolf Abel und K. Boehringer* according to the French model. The building has been preserved and it is still an extraordinary example of a modern wine-cellar. It is 45m long and 15m wide and has a ground floor and two underground floors, with constant temperature of 8°C. There are 99 oak barrels, including three in the ground floor museum exhibition, received by King Alexander in 1922, as a wedding gift from the people of the Serbs, Croats and

Slovenians. Each barrel has capacity of 2 000 liters, and on the front side carved inscription of the national anthems' first verses.

The museum exhibition has some of the bottles from the period of the Winery's foundation, as well as the equipment that was used in the wine processing (mash tanks, presses, crushers, and apparatus for preparing bottles). The King's Winery also contains archive wines, which are certainly the oldest national wines in Serbia. Among others the White Burgundy from 1931, in uniquely shaped bottles with the Royal coat of arms. All the structures on the Oplenac hill was categorized in 1979 as the monument of great importance together with other amenities in complex.

Old Watermill in Despotovac



Old Watermill is situated in the beautifully landscaped park-like setting of the Despotovac, small town 67km eastern from Kragujevac. The exact year of the construction is unknown, however, this watermill was included in an inventory list dated 1836 as the propertie owned by *Manasija Monastery* (from the beginning of the 15th century). It represents valuable architectural achievement and during its long history minimal modifications of both its exterior and interior were made which, fortunately, did not affect its authenticity. During the two-century long history, watermill became an integral part of the identity of the local community. Old Watermill has regional significance in historical, architectural and ethnographic terms, so he was declared as the cultural monument by the decision of the Government of Serbia in 2001.

It was built from rubble stone above the rectangular base of 7.8x18.5m, with five water wheels, three arched openings on the upstream side and another two on the downstream side. The roof is gabled and covered with *ćeramida* (clay roofing tiles). Four millstones (out of original six) were preserved, as well as large wooden chest where the flour used to be stored. Grinding apparatus was positioned along the upstream wall and placed upon two massive longitudinal beams.

Watermill was in operation until the 1960s, and in 1996, after extensive rehabilitation works, was converted into exhibition space. Municipality of Despotovac is the owner of the Old Watermill, while the users are local Cultural Centre and the Association of Visual Artists. The space is also used for organizing literary events, theater performances etc.

However, as a society, in terms of the general attitude towards industrial heritage and the awareness of its importance, we are still lagging behind developed countries where the factory chimneys have long become acceptable elements of visual perception in urban environments. All efforts of industrious and progressive people of those central Serbian provinces, who had a clear vision of the future and to this end built, developed and introduced innovations in industrial production, are still trapped in numerous material evidence waiting to be explored and preserved for future generations. This script aims to reveal all the beauty and strength of the buildings built by our ancestors and passed to us as an exceptional legacy which to our great fortune was spared from the destruction so frequently caused by the turbulent "Balkan's fate". Although rather late, efforts and aspirations of the people from this region to catch up with modern trends and accede to the progressive nation's are undeniable.

Makhana: Witnesses of an industrial heritage recognized yet unvalued

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Industrial heritage in Africa

The African territory is strewn with wasteland of various industries (railway, agricultural, agro-food...). If not recovered for reuse or recycling, they are discarded, or ignored. Most are therefore in a state of abandonment and advanced decay.

This communication focuses on an industrial heritage found in Senegal; A West African country bordering Mauritania to the North, by Mali to the East, Guinea to the Southeast, and Guinea-Bissau to the southwest.

The industrial heritage examined in this presentation is located in Makhana (16.0877780 N; 16.3705560 W), a small village of 900 to 1000 inhabitants, in the region of Saint-Louis, a former French colonial city, in northern Senegal. The Makhana site houses an architectural and industrial heritage that witnesses the technical and manufacturing prowess of Europe in the mid-nineteenth century and the (diverse and varied) striving of governors, engineers who have helped the people of the colony to benefit from new technologies. Makhana is indeed the first steam factory in Africa.

Saint-Louis: birth and transformation of a counter in colonial city

Founded as a French colonial settlement in the 17th century, Saint-Louis was urbanized in the mid-19th century. It was the capital city of Senegal from 1872 to 1957 and played an important cultural and economic role in the whole West Africa.

Located at the mouth of the Senegal River, the island of Saint-Louis consists of a narrow strip of land, 2500 meters long by 300 meters wide, surrounded by both arms of the river. On the topographic level, its relief is characterized by a flat surface, just above the level of the sea and the river.

In 1633, the French founded the first "Company of Senegal", and in 1638 was built the first dwelling on the island of Bieurt. From this date, they developed the trade of gum, slaves, gold, leathers, wax, and ivory. To protect this trade, they built a fortified post in 1659 around which was born the city of Saint-Louis.

An Order of November 29, 1815, endowed the Colony of Senegal with a Governing Board to assist the Governor for administrative and commercial matters.

The importance of trading around the fort was going to promote the settlement of migrants who came to take advantage of the economic situation and the protection of the place. From 3018 individuals numbered in 1779, the population grew to 12011 inhabitants in 1837.

Census of the population (Brigaud F., 1966)

Years	1779	1794	1818	1832	1837
Number of inhabitants	3018	3398	6000	9030	12011

In 1853, Father David Boilat "counted in Saint-Louis about 12336 inhabitants including 177 Europeans..." (Boilat, 1984: 207)

Between 1817 and 1854, 32 governors succeeded one another in Senegal. In spite of the instability of the governors, ambitious projects made it possible to endow the city with lasting buildings and adopt a plan in 1828 which gave the city its rigorous alignment. These constructions and developments created coherent sets. The island was covered with two-storey houses, with a garden inside and a balcony outside. This urban homogeneity which is the product of the colonial heritage, earned it the inscription, in 2000, on the World Heritage List for two criteria (II and IV) by UNESCO:

- Criterion (II): The historic town of Saint-Louis exhibits an important exchange of values and influences on the development of education and culture, architecture, craftsmanship, and services in a large part of West Africa.
- Criterion (IV): The Island of Saint-Louis, a former capital of West Africa, is an outstanding example of a colonial city, characterized by its particular natural setting, and it illustrates the development of colonial government in this region.

Policy of colonial expansion and first metal infrastructures

The French who have been staying in Senegal since the 17th century remained in the fortified islands of Saint-Louis and Gorée. But on September 7, 1840, a Royal Ordinance reorganized the settlements and created administrative structures. Thus, with the institution, by that same Ordinance of a Government of Senegal and Dependencies, French governors undertake to extend the influence of France in Africa by conquests and sustainable development emphasizing the territories. One of the artisans of the creation of the colony of Senegal, Louis Faidherbe, governor from 1854 to 1861 and from 1863 to 1865, develops a policy of colonial expansion materialized by the creation, on July 1857, of the first battalion of Senegalese riflemen, the conquest of Sudan, the creation of shopping centres to promote peanut cultivation, the installation of the first bridges over rivers, and equipment of colony:



Figure 1: 20 tons steam crane, 1883



Figure 2: Faidherbe Bridge, 1897

In 1880, France decided to build a railway connecting Kayes on the Senegal River to Bamako on the Niger River. It was essential to have a lifting tool in Saint-Louis that could raise very heavy burdens, like locomotives.

For the raising of heavy parts, a first crane was sent but the ship carrying it sank on Banc d'Arguin in Mauritania. A second one was sent; it arrived at its destination in spare parts and was assembled in 1883 by two soldiers: Peyssoneaux and Tellier... It is one of the rare steam catamaran in the world in perfect state of conservation (Fig.1)

- Between 1883 and 1885: construction of the Dakar-Kayes and Dakar-Saint-Louis railway lines that reach distant regions (more than 700 km to the East).
- Functional, from 1885, the railroad carried the same year 24438 tons of goods and 100.877 travellers. In 1894 he transported 67,492 tons of goods and 206,787 travellers "after Villard (quoted by Brigaud, 1966: 61).

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- The Faidherbe Bridge, a steel bridge, was inaugurated in 1897. This bridge, crossing point over the river to reach Saint-Louis, measures 515 meters long, for a width of 6.20 meters (Fig. 2).

Water Issues in Saint-Louis

The population, growing from year to year, faces the situation of an island where the river regime is characterized by the alternation of a period of flood (fed by the rains from July to November) and a seven months dry season. During this period, salt water sometimes invades the lower reaches to Dagana. Thus, for seven months, the water that is available to the population is brackish.

Various methods have been used to supply fresh water for the island of Saint-Louis:

- Recovery of rainwater in tanks,
- Drawing water from the holes dug in the sand of the beach,
- Transport of water brought upstream of the river by boat or canoe...

In 1859, the French governor of Senegal, Louis Faidherbe, began studies and worked on the implementation of a water supply system for Saint-Louis by building a dam on the Kassak River. But the flood carries away the dam. Faidherbe could hardly solve the water problems of the island; and until 1866, Saint-Louis was fed fresh water during the dry season by the methods above mentioned.

The stages of construction and implementation

After a failed first attempt to water supply by Faidherbe in 1859, the Colonel of genius Pinet Laprade proceed with the construction of a dam on the Kassac in 1866, with a detachment of 100 men : « Tirailleurs sénégalais » (indigenous troops) and Navy infantry). To bring the water to Saint-Louis, a preliminary project dated 1879 describes the work to be done:

- a water intake is established at Kassak, near Lampsar;
- elevating machines at Makhana;
- a cast iron pipe twenty-five (0.25) cm inside diameter, from the lifting machines to Saint-Louis;
- Two reservoirs (one in Sor and the other in Saint-Louis) to ensure water distribution in island and its suburbs.

Two sketches show the preparatory works of a freshwater canal, which is to supply Saint-Louis

The excavation of a six kilometre long canal from Kassak, about three hundred meters above the dam, will lead to the foot of the hill, at the top of which is the fort of Diaoudoun.

By means of steam-engines, the water that arrives there will be raised on the hill, placed in reservoirs from which it will get out by pipes, to Saint-Louis, twelve kilometres from it.

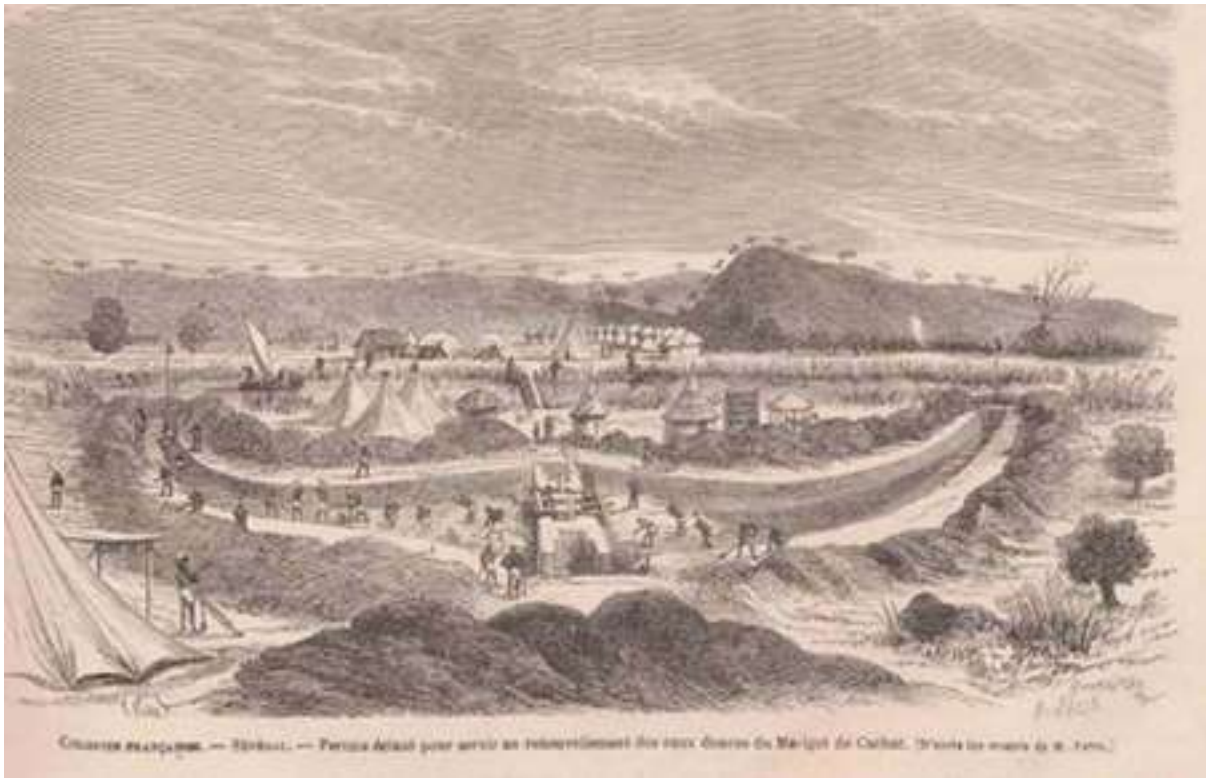


Figure 3 : Camp of the “tirailleurs”

The success of this project was guaranteed; and it was anticipated that before 18 months the city of St. Louis would be traversed in all directions by conduits that would distribute water in each house.



Figure 4: Sluice gate for fresh water renewal. Dam of Lampsar, June 29, 1868, according to Mr. Favre (in “Le Monde illustré, 1868, p. 85)

Work execution

In 1880, the pipes for the discharge pipe (400,000 kg) were manufactured by the Marquise in Pas-de-Calais (France).

In 1882, the seventeen kilometres of pipeline are laid; the machinery building is made, as well as the chimney. The boilers are installed.

In 1885, the two water towers, the standpipes and the taps on the way of the pipe are completed. The pumping machines are installed. Makhana's first pumping station, today known as the "old factory", was commissioned in 1885 with a daily flow of about 1500 cubic meters. This old factory is characterized by its vaulted ceiling, pillars with capitals, a brick floor in two colours, a spiral staircase, and cast iron gargoyles. It has a machine room of 120 m², three windows totalling 10 m².

In 1899, Malenfant, head of the public works department, proposed the construction of a second pumping station. The new factory, built in 1903, has a double-sloped tile roof, with straight masonry staircases, gutters, a 140 m² machine room, large windows and glass windows with a surface area of 42 m². It ran from 1906 with a daily flow of about 2500 cubic meters.

After several years of operation, the city's water supply system was completely modified by the adoption of the Dakar-Bango project developed in 1917 by engineer Aldebert. The project, aimed at improving the quality of water, provided for the creation of a new reserve located southwest of the kassak to prevent the contact of salt water from the mouth of the Senegal River.

The Makhana factory operated for 67 years before being finally shut down in February 1952.

Makhana site today

When the factories closed in 1952, the machines were in very good condition. Today, the two factories are much degraded and in ruins:

Pieces were taken and sold;

- Machines are completely rusty,
- Fireplaces and walls are cracked;
- Buildings are occupied by domestic animals...
- The cast iron spiral staircase of the first factory had been stolen (with the certain complicity of the inhabitants). It was then recovered in Holland and brought back today to the site;
- The 600 meters of iron beams constituting the roof structure of the new factory has been sawn and taken away.



Figure 5: Current view of the old Makhana factories



Figure 6: First factory



Figure 7: Interior of first factory



Figure 8: Interior of second factory



Figure 9: Second factory

For this industrial heritage of Makhana, a real reflection must be undertaken to ensure a restoration and a real tourist exploitation of the site.

How to preserve and promote this heritage taking into account the advanced state of degradation in which the factories are today? It's quite obvious:

- The local population does not know the importance and the usefulness of this industrial heritage, and as such, it contributes seriously to its degradation.
- The Makhana factories are part of Senegal's history heritage; but the people never perceive them to be an integral part of their cultural heritage.
- The Senegalese authorities, even if they have proceeded in the classification using historical, technical and architectural values, neglected to make the populations more aware in the context of a policy of valorisation, restoration, protection and conservation of this industrial heritage.

In the conclusion of his study on Makhana, G. Thilmans (1999) writes: *"The Makhana factory is the oldest in black Africa, and in Europe such facilities are centres of tourist attraction and are protected and emphasized by the authorities ... Makhana's machinery falls into the most interesting category, that is, machines with an original frame and not, as is often the case, isolated from their context and placed side by side in a museum. Their rehabilitation is then more than desirable."* The theme of the museums of site or outdoors can be used for a reconversion of this heritage witness of a technical and industrial history in Africa.

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Refunctioning of Industrial Buildings and Some Examples in Turkey

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What is industrial archaeology

Industrial Archaeology is a discipline that aims to preserve the out of date mechanical systems which are established in order to produce merchandise or services and the authentic architecture which is developed with this aim, as a whole. (Tanyeli, 2000)

Industrial archeology studies the all buildings, settlements and urban landscapes, constructions and machines made for or made by industrial manufacture. It investigates all tangible or intangible remains and documents.

Therefore, industrial buildings are important not only in terms of their architectural and historical characteristics, but also in terms of technological development processes and their effects to the urban development. They are also important in terms of giving information about the economic, social and cultural history of the society. (Köksal, 2005)

Nonetheless, industrial archaeology is the common activity of the disciplines of history of technology, history of architecture, archaeology and preservation. The reason for this is that data is about each and every one of them, however is not directly relevant to any one of them. (Tanyeli, 1998)

Process of the emergence of industrial archeology

1955 – In Britain, during city renovations, a concept of Industrial Archaeology has emerged in form of an NGO, as a result of concerns for preservation of the remains of industrial revolution (Michael Rix)

1959 – Council of British Archaeology-CBA has established a research committee.

1963 – Industrial Monuments Survey Council has been established in Britain, with the aim of registering the industrial heritage. First records have been started under the name of National Record of Industrial Monuments-NRIM.

1973 – First Industrial Archaeology Congress has been held in Ironbridge.

1973 – The Association for Industrial Archaeology-AIA has been established.

1973 – The International Committee for the Industrial Heritage-TICCIH has been established.

1999-2001 – The European Route of Industrial Heritage-ERIH has been established with the aim of announcing the transformations of industrial areas, and to create tourist attraction.

2003 – Nizhny Tagil Charter has been prepared by TICCIH

2006 – ICOMOS has announced the subject of the World Monuments and Sites day for 2006 as "Industrial Heritage".

TICCIH is an international organization, which has been established with the aim of preservation, research and documenting of industrial heritage. The field of operation for

this institution includes; industrial buildings, machinery and equipment within these buildings, industrial products, and industrial settlements. (<http://ticcih.org/about/>)

The Nizhny Tagil Charter for Industrial Heritage, which has been prepared by TICCIH in July 2003, underlines that this heritage must be evaluated within a wide scope. In the declaration, it is said that industrial heritage composes of industrial ruins having historical, social, technological, architectural and scientific value. These ruins include; buildings, machinery, plants, production areas, factories, mines, processing and treatment plants, warehouses, places where energy is produced, transferred and consumed, transportation and all of its infrastructure, and besides these, places that are used for accommodation, worship, education, and etc. in connection with all of these industrial facilities. (<http://ticcih.org/wp-content/uploads/2013/04/NTagilCharter.pdf> ; 2017)

ERIH has determined a "route of industrial heritage" in the member countries and various "stop points" within this route. The route was completed in 2001. Although Turkey is not one of the member countries, Santralistanbul And Rahmi Koç Museum have taken their places in stop points within this route as samples which form the subject matter of this presentation. (<http://www.erih.net/> , 2017)

In time many Eastern European countries, have started to give importance to their own industrial heritage too, as a result of their contact with Western Europe.

Voluntary and individual efforts in Europe and the United States, and institutions like TICCIH, ERIH, AIA, ICOMOS have important contributions for the preservation of industrial heritage.

Re-use of industrial buildings

By mid-18th century, there had been fundamental transformations in the lives of western societies, as a result of industrial revolution, and there had been drastic developments in production, and in transportation vehicles. Production has left plants, and gone beyond manufacturing and was shifted to mechanization. Production has reached vast quantities, which was unseen until that time. Great factories, industrial buildings and zones, and around these, habitat for workers have emerged.

(<http://www2.aku.edu.tr/~hozutku/sayfalar/sanayi.ppt> > ; 2009)

As for the situation in Turkey; in this period, while industrial buildings are developing fast in the west with industrial revolution, they could not develop in Ottoman Empire, due to economic, political and religious reasons. Few Industrial buildings which have been constructed during Ottoman era, were simple buildings, which were weak with relevance to their like in European countries as a result of many reasons like; deficiency of technology, limited number in choice of materials, time spent in production and assembly, drawbacks in workmanship and costs. They were usually masonry buildings where iron or wood were also used as building materials.

When the Republic Era has started, development of industry and protection of local industries was supported. The building system that was generally used in this period was concrete. (<http://www.sanayiden.com/bilgi/turkiyesanayi.asp?kID=1>, 2006)

However by the second half of the 20th century, this rapid industrialization had come to a halt. Reasons like; inadequate raw material and labor-force, ecological harm caused to the environment, changing social expectations, increasing wealth and technological development, industry has changed location and method. Thus, large scale industrial buildings and sites, which were left in the center of developing cities, turned into idle spaces.

Most important reasons for the re-use of industrial buildings may be listed as:

- Development of cities,
- Lack of useable empty spaces in city centers, increase in the land values of industrial buildings and/or sites which are dis-functioned, due to their central locations,
- Development of the social consciousness about that it could destroy the historic texture of city if the old industrial buildings are demolished,
- Development of the idea that preserving industrial buildings and/or sites would be possible by using these buildings through re-programming them,
- Appearance of concepts like "sustainability" and "transformation". (Atagok, 2000)

Re-evaluating all these industrial buildings and sites- from small/building scale to bigger scales, from an ancient flour mill to an industrial plant, within the concept of industrial architecture, would both answer the needs of the city in which they are located, would secure that the city would come forward in the international platforms, and also would contribute to the cultural tourism of the city.

Today, in cities where new spatial structures are in the agenda, transforming industrial sites with appropriate methods and providing new functions for them, contributes to the image of the city. Also when regarded from the point of view of competition between touristic cities, it would contribute to its differentiating from others with its authentic historical and cultural values, and step ahead of them.

In this direction; the below issues should be considered during preparation of functional transformation projects of historical industrial areas:

- The primary goal should be the preservation of industrial heritage. Intervention to the authentic texture, features and elements should be kept at minimum.
- Buildings should not be regarded as mere architectural components. Their industrial and cultural identity should be taken into consideration; and their historical, cultural and sociological backgrounds should be evaluated, too.
- The site that will be created after transformation should be well-integrated with the city. Requirements of the city and city plans should be taken into consideration during the process of re-functioning.
- All industrial heritages which the city possesses should be taken into consideration, and design should be carried out with a wholistic approach.
- Applications chosen should increase the quality of urban life, and should form new focal points.
- Functions which would serve only to a limited section of the city should be avoided. Transformation should aim creation of recreation zones open to public.
- Joint interdisciplinary study environment should be maintained with local administration, NGO's, societies, building owners, citizens and experts from various relative disciplines. (Atamturk, 2008)

Examples in Turkey

Re-functioned examples

These transformations which have been evaluated with the building and its equipment, are from İstanbul, which is the most prominent city of Turkey in terms of industrialization.

Haskoy Shipyard and Lengerhane (Rahmi Koc Industry Museum)

In Istanbul Province, Haskoy district, two industrial buildings, one of which has been constructed to produce anchors (lengerhane), and the other has been constructed for ship building, were redesigned as an industrial museum. Both buildings have ceased production with the development of relevant technology, and relocation of the industry at the outskirts of the city. Museum is composed of two complexes.

Lengerhane Building; has been constructed in 1700's, over 12th century Byzantine foundations. Its restoration has started in 1991, and in 1994, it was re-functioned as museum. Lengerhane Building, a small building with wooden roof, and a courtyard which is surrounded by stone walls are situated within a 2100 m² land. Restoration work was tried to be applied without intervening the characteristic features of the building and its environment. The mezzanine floor of steel frame construction has been constructed as a floating floor, without touching the stone walls. When existing exhibition areas were insufficient, Hasköy Shipyard too has been renovated to be added to the museum complex.

Shipyard of Haskoy; is a U-shaped building complex which is composed of 14 buildings, and which was built with the function of maintenance and repair of ships in 1861. The shipyard covers an area of 11,000 m² area. It was functioning with steam power in 1884, while it was transformed to electrical power in 1910. Turn Benches, a construction plant and a carpentry plant were established.

In 1996, restoration of the shipyard was started. In 2001, it was opened for visit. It is located in between two buildings, in Haskoy Street. Its connection to the primary museum was maintained at basement level, through a transparent gallery, which is connected to the shipyard.

During the re-use project of the building, later additions like reinforced concrete floors were moved. Mezzanine floors were designed as galleries, and in this way, scale of the building and roof trusses could be perceived from lower floors. Stone-brick masonry system of the walls were revealed, wooden trusses were kept as they are. Functions of the museum were chosen later on, adequate to spatial qualities (area and height) of buildings. In the museum, old automobiles, locomotive, plane, submarine, and etc vehicles are exhibited in real scale. Apart from this there are exhibitions telling about production processes and mechanical hardware The museum has been awarded with a success award by Union of European Museum. (*T+ Müzeler*, Tasarım Publishing, 2003 ; <http://www.rmkmuseum.org.tr/default.aspx>, 2017)

REFUNCTIONING OF INDUSTRIAL BUILDINGS AND SOME EXAMPLES IN TURKEY

HASKOY SHIPYARD AND LINGERHANE (RAHMI KOÇ MUSEUM)

Construction Year: Lingerhane: Based on 12 century, 1700's
Hasköy Shipyard, 1861

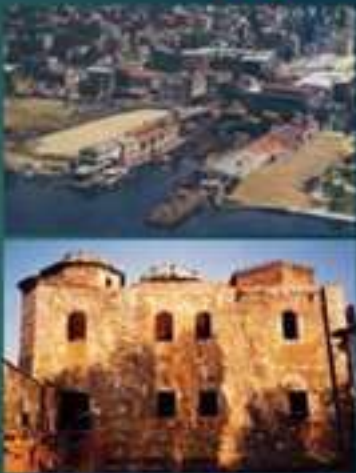
Function: To produce anchors (linger), to repair of ships

Re-functioning Year: 1994, 1996-2001

New Function: Rahmi Koç Industry Museum

Restoration and Exhibition Principles:

- ✓ ERIH stop point
- ✓ Later additions (new buildings, concrete floors etc.) are removed.
- ✓ Mezzanines and galleries due to perceive the historical details of building.
- ✓ Educational facilities about mathematics, astronomy, printing press, energy...
- ✓ Special areas and educational workshop for kids.
- ✓ Traditional production modelling in real scale.
- ✓ Nostalgic railway journey of Golden Horn shore.
- ✓ Historical golden horn tours by old tugs.



MUSEUMS, COLLECTIONS AND INDUSTRIAL HERITAGE ANNUAL CONFERENCE, ICMAH 2017, BAKU

Silahtaraga Power Plant (Santralistanbul)

Silahtaraga Power Plant has been established in 1911 by Ganz Electricity, a Hungarian company, with the aim of providing electricity to the European side of İstanbul. It is located at a 118,000 m2 area by the mouth of Alibeykoy and Kagithane Streams, considering that transportation of coal would be easier through water ways.

The plant has first provided electricity for the tram line of the city in 1914. During the process of manufacturing, new engine rooms have been added to the plant, while some sections were removed out of function. In 1931, the plant started to provide electricity for the whole city. Big industrial plants too were provided electricity by Silahtaraga Plant. In 1983, it has been closed down because various reasons like; water for raw materials and cooling processes could not be acquired, technical hardware was old, production was not efficient and electricity could be provided by new Power Plants which were established at the outskirts of the city. (Ensari Kara, 2001)

The plant is an important heritage of history of technology, because it is the first thermic Power Plant of Turkey, and its authentic equipment were intact. Besides this, it is also important in terms of social history and architecture with its characteristics like; the new identity and quality of life that it had provided for the area, the fact that it is the second building of the country which was constructed with foundation piles, and with its architectural style.

The plant has been given to Bilgi University in 2004. Prominent architects of the country like Nevzat Sayin, Emre Arolat and Han Tumertekin played a role in the transformation project of the Power Plant into a space of culture and art. The buildings which compose the plant are listed below.

Museum of Contemporary Arts (Architect - Emre Arolat): It is a space which was constructed in place of two furnace structures which were pulled down after electricity production was ceased. It covers an area of 7,000 m², and previous form of buildings was preserved.

Energy Museum (Architect- Han Tumertekin): The museum is in the main building of the Power Plant. This building has been preserved mainly as how it was when the plant was in function. Here, an energy-game room too has been located, where visitors could produce electricity themselves.

Library and Information Centers (Architect- Nevzat Sayin): Old furnace rooms of the Power Plant were transformed into library and information center.

International Residence: Staff Houses (lodging) of the old Power Plant have been transformed into residences where artists, architects, designers and philosophers could stay for various periods of times.

Education Zone (Architect- Nevzat Sayin): It is the space which has been established for locating departments connected to Science, Literature and Communication Faculties of Bilgi University.

Recreation Zones: Gardens and cafeteria areas which answer the rest and recreational needs of visitors of Santralistanbul.

(<http://www.santralistanbul.org/pages/index/about/tr/2017>)

REFUNCTIONING OF INDUSTRIAL BUILDINGS AND SOME EXAMPLES IN TURKEY

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SILAHTARAGA POWER PLANT (SANTRALISTANBUL : BILGI UNIVERSITY AND ENERGY MUSEUM)

Construction Year: 1911

Function: To provide electricity

Re-functioning Year: 2004

New Function: University complex and energy museum

Restoration and Exhibition Principles:

- ✓ ERIH stop point
- ✓ Well-protected buildings with original architectural style and unspoiled equipments
- ✓ Providing new identity and quality for the area
- ✓ Functional diversity: Concert hall, contemporary art museum, international residence for academic researchers
- ✓ Energy game room: visitors could produce electricity themselves
- ✓ Cocukistanbul: Special areas and educational workshop for kids

MUSEUM, COLLECTIONS AND INDUSTRIAL HERITAGE ANNUAL CONFERENCE, ICOMAH, 2017, BAKU

Cibali Tobacco Factory (Kadir Has University and Rezan Has Museum)

Kadir Has University has chosen the dysfunctional Cibali Tobacco Factory as its campus, due to its location, advantage of transportation, and it's appropriate structural

characteristics. They have restored and re-functioned the factory complex as a university campus.

The factory was constructed in 1884, with the aim of producing tobacco produces. The complex was a small-scale city in its own, with its own police officers, social officers, hospitals, social building, shops, schools, a fire department, syndicate building and restaurants.

The factory lost its function in 1970, when factories producing cigarettes with advanced production technology started functioning in İstanbul. In 1995, it was cleared out of its services completely, and was given to Kadir Has University with a build- operate-transfer model to be re-functioned as an educational institution. Today, the Tobacco Storage Building near the factory complex too was restored and it is being used by the Fine Arts Faculty and at the same time Rezan Has Museum. Also, The Tobacco Storage Building has the remains of the Byzantine cistern, which depends on the 12th Century under its walls.

The factory complex reflects the architectural styles and construction techniques of its time. Post industrial revolution materials like brick, iron, pig-iron columns and glass, which were used in the western states, were used in these buildings. It is thought that authentic roof tiles of Marseille, pig-iron columns and INP steel I-beams which were used for floors were brought in from France and applied. Their spatial qualities and dimensions and neo-classical architectural style, differ the complex from classical period buildings.

The first local cigar in Turkey (1947) and first local cigarette brand, Samsun (1959) were produced here. The re-functioning criteria of the building are listed below:

- First of all, determination of the historical accumulation of the building. Use of the building parts with authentic style, material, and technical properties without pulling them down.
- Purging unauthentic and poor quality annex which do not possess any values.
- Furnishing the building with high technology in accordance to its new function, with minimum intervention.
- Consolidation of the structure.
- Reminding the original of the building with details used (globe lamps and tobacco colored walls) (Alper, 2004)

REFUNCTIONING OF INDUSTRIAL BUILDINGS AND SOME EXAMPLES IN TURKEY

HURSAH ASMAKUR,
CULTURE AND TOURISM EXPERT, ARCHITECT

CIBALI TOBACCO FACTORY (KADIR HAS UNIVERSITY AND REZAN HAS MUSEUM)

Construction Year: 1884
Function: Tobacco Factory and Storage Building
Re-functioning Year: 1995
New Function: University complex and museum
Restoration and Exhibition Principles:

- ✓ Well-protected buildings with unique architectural style.
- ✓ Later additions (concrete floors, subsequent adding buildings etc.) removed.
- ✓ Protecting original structure details.
- ✓ Galleries and courtyards due to perceive the historical details of building.
- ✓ Providing new identity and quality for the area.
- ✓ Modern annexes to the old main building.
- ✓ Museum, protecting Byzantine cistern



MUSEUM, COLLECTIONS AND INDUSTRIAL HERITAGE ANNUAL CONFERENCE, ICMAH, 2017, BAKU

National Textile Factory (Adana Museum Kompleks)

The National Textile Factory of Turkey was established in 1907. The restoration was initiated in 2013 by the Ministry of Culture and Tourism of Turkey. In 2017, the Archeology and Mosaic Museum of the Museum Complex was completed and opened.


When all is finished, the museum complex will be consisted of archaeological museum, city museum, agricultural museum, industrial museum and mosaic museum. It is planned to be among the biggest museum complexes in the World with its 68.500 m2 area.

REFUNCTIONING OF INDUSTRIAL BUILDINGS AND SOME EXAMPLES IN TURKEY

HURSAH ASMAKUR,
CULTURE AND TOURISM EXPERT, ARCHITECT

NATIONAL TEXTILE FACTORY (ADANA MUSEUM KOMPLEX)

Construction Year: 1907
Function: Textile Factory
Re-functioning Year: 2013-2017
New Function: Archeology, Mosaic, Industry, Agriculture, City Museum.





MUSEUM, COLLECTIONS AND INDUSTRIAL HERITAGE ANNUAL CONFERENCE, ICMAH, 2017, BAKU

***In-situ* protected examples**

These examples which were preserved in-situ and turned into museums are selected from the Aegean area, where culture of olive goes back to ancient times.

Klazomenai Plant Of Olive Oil

Klazomenai Olive Oil plant is a unique sample of evaluation of industrial heritage dated before industrial revolution. It is the oldest olive oil factory in Anatolia and it is dated back to 6th century before Christ. The ancient olive oil plant was constructed and used by Ionians living in Klazomenai city. Having different architecture than other ruins in the Klazomenai ancient city, it has stone walls with mud plaster and flat roof covered by reeds. After archaeological excavations, the factory has been reconstructed in 2005.

The plant section of the Klazomenai Olive oil plant is constructed by carving the bedrock. The entrance is by steps take down inside the plant. 16 holes with various depths and forms were detected at the bottom of the plant. As a result of interpretation of these holes, it was concluded that there were a olive mill, an olive oil segregation system with three wells, crane and two separate press tables (polima). It is detected that an oil segregation system which functions according to combined container principal.

Plan scheme of the olive oil plant, location of rooms and similar data reveal production of two different techniques at two different periods. The first period of use of the plant is 600/580-546 B.C. The second period of use is dated at 530-500 B.C. While in the first period production was aimed for answering the needs of the city and nearby vicinity, second period the plant had started mass production, and had become a factory. In this respect, it has an important place in the history of olive oil production.

After the reconstruction of Klazomenai Olive Oil Factory, traditional techniques were carried out with success, and after 2600 years, olive oil was produced here again. (<http://www.klazomeniaka.com>, 2017)

REFUNCTIONING OF INDUSTRIAL BUILDINGS AND SOME EXAMPLES IN TURKEY

KLAZOMENAI OLIVE OIL PLANT

Construction Year: 6th century B.C.
Excavation Studies: 1992-2004

Function: Olive Oil Plant and Factory



Re-functioning Year: 2004

New Function: In-situ Museum

Restoration and Exhibition Principles:

- ✓ In-situ refunctioning
- ✓ Oldest olive oil factory in Anatolia
- ✓ Producing olive oil by traditional technics after 2600 years later

KURBAN ATAMURU,
CULTURE AND TOURISM EXPERT, ARCHITECT

MUSEUMS, COLLECTIONS AND INDUSTRIAL HERITAGE ANNUAL CONFERENCE, ISMAH, 2017, BAHU

Adatepe Olive Oil Museum and Store

The museum is established in a two storied stone masonry building which was constructed but had never used as soap manufacturing building in 1952. In 2001, the owners of the traditional Adatepe Olive Oil factory have restored their abandoned antique soap factory building and re-designed it to serve as a traditional cold press olive oil factory which will also display various precious artifacts related to olive culture, collected from the local villagers. Those fortunate visitors who stop by the museum in late autumn and winter months will be amazed at the very simple procedure of olive oil extraction by the traditional methods.

The museum was emerged by awareness and as a result of concern about vanishing industrial heritage. So it is an important re-functioning sample in terms of being a non-governmental organization. It had been the most important reason to establish a museum that; many machinery and equipment used in traditional olive oil production were rapidly disappearing.

Various equipment and tools used for olive, olive oil and soap production were gathered from nearby villages in time and they have been exhibited in the factory building. In the museum, production of olive oil, keeping, transportation filtering, and etc. phases are explained. Besides, olive oil production with dry press technique is continued. The fresh 'extra virgin olive oil' and hand-made olive oil soaps are sold in the store. (<https://www.adatepe.com/StaticPages/adatepe-zeytinyagi-muzesi/145/>, 2017)

NURSAH ATAMTURK
CULTURE AND TOURISM EXPERT, ARCHITECT

REFUNCTIONING OF INDUSTRIAL BUILDINGS AND SOME EXAMPLES IN TURKEY

ADATEPE OLIVE OIL MUSEUM

Construction Year: 1899

Function: Soap Manufacturing

Re-functioning Year: 2001

New Function: Olive Oil Museum and Store

Restoration and Exhibition Principles:

- ✓ In-situ refunctioning
- ✓ Emerged by awareness and as a result of concern about vanishing industrial heritage
- ✓ Producing olive oil by traditional technics
- ✓ Store in that you can find traditional olive oil products



MUSEUM, COLLECTIONS AND INDUSTRIAL HERITAGE ANNUAL CONFERENCE, ICMAH, 2017, BAKU

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The Stone Chronicle Museum: From Industrial Facility to a Museum

Dr. Shirin Melikova

Director of Azerbaijan Carpet Museum
President of ICOM Azerbaijan National Committee
Docent of the Azerbaijan State Academy of Fine Arts

The era of industrialization, which began with the invention of the steam engine of James Watt from Glasgow, forever changed the course of human history. This invention strongly influenced the formation of not only a new architectural and engineering solution for buildings but also the emergence of a new artistic language, which was capable to reflect unprecedented changes in people's lives and the rapid development of society as a whole.

In Azerbaijan, the era of industrialization began with the drilling of world's first oil well in 1847 at Bibi-Heybat oilfield. This iconic date became the beginning of the new era in the life of the city in the history of Baku. In those years on the wave of starting oil boom was created the catchy beauty of bourgeois Baku: inconceivable decorative and constructive solutions reflected the era, which was full of contradictions. The new ambitious generation of Baku, dreaming of worldwide recognition, claiming independence, invited prominent architects of that time. Within a few years, palaces and profitable houses, the first building of the Opera and Ballet Theater (architect Nikolai Bayev), gymnasiums, green squares and parks, as well as a Seaside Boulevard that outlines the arc of the Baku bay, made Baku the most beautiful city in the region. Famous painters and artists, billionaires and art patrons came to Baku. The Rothschilds, the Nobel brothers, the brothers of Siemens and many others have multiplied their capital here; the local elite sought to integrate with the European.

The energy development was connected with the rapid growth of oil production in that period. At the end of the 19th century, in Baku was established a joint-stock company named *Electric Power*, the owners of which were the daughters of Karl Siemens. This joint-stock company filed a petition for permission to build a power station in the Bayil settlement. In 1900, the director of the *Electric Power* joint-stock company and the head of Baku oilfields electrification project Robert Classon, the Russian and Soviet engineer-technologist, inventor, and also one of the biggest Russian power engineers of his time, invites Leonid Krasin to Baku to build a power plant in Bayil. In 1901, the Bibi-Heybat power plant was completed and put into operation. The State District Power Plant (SDPP) supplied the electricity to shipyards, oil rigs and residential building. The Bibi-Heybat power station was one of the largest in Russia.

After the revolution in 1920 the station was nationalized. In 1923, it was named in honor of the revolutionary Leonid Krasin (SDPP named after Krasin). The expansion of the Bibi-Heybat power station in those years allowed Azerbaijan to increase oil production. In the 1940s, new power capacities were put into the operation at the state district power plant. During the Second World War, Baku was the main supplier of fuel to the front. In 1941, more than 40% of the consumed electricity was produced at the Krasin's SDPP. Hence, the station played an invaluable role, providing uninterrupted electric power to all industrial facilities.

Postwar years are characterized by a rapid increase in the consumption of electricity by the national economy. According to the published statistics, the station increased electricity production by reducing the degree of expenditure. Workers of the station were awarded orders and trophies. The station was a forge of cadres.

Until the end of the 1980s, the station operated uninterruptedly, providing power to mills, factories, the oil producing and residential sectors.

After the collapse of the Soviet Union, most of the productions fell into decline. By 2000, this territory turned to the abandoned industrial zone. In 2012, single preserved enterprises were transferred outside the capital, and in their places were decided to build a park. It is important for us that far from being demolished, the surviving buildings were kept in authentic form. Thus, the former berths of ships, shipyards and abandoned power plants became a part of a new architectural landscape. Museums and restaurants were placed here. This part of the seaside Boulevard acquired a completely new look, becoming a zone of cultural rest. Three industrial buildings after restoration and partial reconstruction appeared in a new guise: indoors of the shipyard named after the Paris Commune was arranged a Museum of Painting of the 20th - 21st centuries, within the walls of the State Power Station named after Krasin was opened The Stone Chronicle Museum, and the warehouse for military ships of the Caspian flotilla was turned into the Center for Contemporary Art – YARAT.

Two more energy-industrial buildings were redesigned – now they contain the club restaurants, such as Enerji and Elektra. The industrial heritage of the Baku bay is also reminiscent of the exhibits preserved on the Boulevard: elements of SDPP power plants, the old locomotive, transmission lines that harmoniously fit into the modern architectural and park ensemble. The works of sculpture are also placed here. For example, on May 17, 2015, in the framework of the 3rd World Forum on Intercultural Dialogue was held the opening ceremony of the monument *The Tree of Peace* by famous sculptor Hedva Ser, the UNESCO Artist of the World. The opening ceremony was attended by Mrs. Mehriban Aliyeva, First Vice President of Azerbaijan, President of the Heydar Aliyev Foundation, UNESCO and ISESCO Goodwill Ambassador; UNESCO Director-General Irina Bokova and a number of guests who arrived in Baku to participate in the 3rd World Forum on Intercultural Dialogue.

This sculpture, symbolizing the peace and tolerance is also considered the official symbol of tolerance, the world of UNESCO. The sculpture is located opposite the entrance to The Stone Chronicle Museum, which will be discussed in this speech.

The Stone Chronicle Museum opened on the eve of the 1st European Games in June 2015, occupied the building of the former power station. On the initiative of the Heydar Aliyev Foundation, it was decided to arrange the museum and exhibition area here. The project's curators are Emin Mammadov and Shirin Melikova, experts in the art field of the Heydar Aliyev Foundation. The design belongs to the Austrian architect Christian Sturminger. A group of companies "A + A" and "Azimport" were engaged in all the reconstruction works of the building.

The architecture of buildings represents a typical example of industrial architecture of the early 20th century. The buildings are executed in Art Nouveau style with elements of Eclecticism. The special character of the hulls sliding looks very interesting. Massive stone walls without any decorations, stylized semi-circular arched windows, gable roof with high forceps, metal roof trusses with glass lanterns, round dormer windows – all these are characteristic features of the industrial architecture of that period.

A bright, spacious space is two-level in plan and consists of two zones, for which is provided with a separate entrance. At the moment, as an exposition is used one zone with a central entrance from the avenue's side. The entrance from the side of the Boulevard is not used. These two zones have different interior design. The zone

involved in the museum consists of two levels of the same size. The floors are joined by an iron staircase, branched into two spans. The second floor is a spacious, bright room, with an area of 688 square meters and a height of 13.5 m, with wide opportunities for exposure. The left part of the building is temporarily not operated under the exhibition area. Here, the center of the first floor is divided into two parts by a series of concrete pillars. The floors are joined by an iron staircase, a spacious premise of the second floor, with an area of 366 square meters, in the plan is smaller than the hall on the right side of the building. A beautiful panorama opens on both sides of the building: on the one hand – to a rapidly developing metropolis, on the other – to the space of the Seaside Boulevard.

The architects were tasked to preserve the industrial spirit of the building in the interior, so they kept the ceiling iron structures, construction hooks, ventilation system. The museum exposition area is used for various kinds of events: fashion shows, as well as the presentation of the Islamic Games in 2017.

These premises have colossal exposition possibilities: voluminous installations, sculpture, and contemporary artworks can be installed here. This is an excellent platform for contemporary art projects.

The placement impresses with its scale. The industrial past that managed to be preserved in architecture and partly in the interior can be an excellent example, which is already widely used in the world for the reconstruction of abandoned and collapsing industrial buildings that are given a new life, new functions. Thus, several tasks are being solved at once: preservation of the industrial heritage, development of ecologically unfavorable territories, and creation of new exhibition and museum spaces.

In this case, this project in Azerbaijan is the first successful project in this direction. And we hope that this is not the last one, because our country has always been and remains to be one of the largest industrial zones in this region.