The key for understanding of the cultural properties is the set of their associated values. There are many ways of talking about those values; they range from historical to commercial and have tangible or intangible nature. It is a duty of researcher to discover, describe and interpret those values. The presence of certain values should lead to the protection of cultural heritage resource. The crucial question of that concern is an assessment of importance of each discovered value. Any answer causes practical approach to the safeguarding strategy. It is an obligation of cultural heritage managers to preserve those values and pass them to the future generations: this statement applies consideration of sustainable development idea. There are various topologies of cultural heritage values, have been developed since the middle of the nineteenth century. Traditionally that evaluation was associated with an objects of art and monumental architecture. It seems necessary to define methodology of value assessment for the purpose of technical, industrial and engineering heritage. The saline in Ciechocinek combines features of monument of industry and construction engineering. In October 2002 that enterprise celebrated the anniversary of 170 years of production. Basic reference book about the history of Ciechocinek was published by Marian Raczyński, the Chief Director of the Spa (1896–1928), before the WW II. Many of the original archive sources vanished in course of the war and today contemporary authors often have to refer to that book (Raczyński 1935). The method chosen for presentation of the saline in Ciechocinek is based on methodology proposed by the International Centre for the Study of the Preservation and the Restoration of Cultural Property in Rome (Feilden 1993). All pictures were taken by the author.

LOCAL TRADITION OF SALT PRODUCTION

Kingdom of Poland was supplied with salt from the royal salt mines in Wieliczka and Bochnia, the places situated not far from the past capital city of Cracow. Situation had changed dramatically after the first partition of Poland in 1772, when the access to those old salt mines was lost. Southern part of the country became incorporated by the Austro-Hungarian Empire. Therefore, the Polish Great Parliament lasting for four years (1788–1792) turn attention to the necessity of searching for the new sources of salt. It was stressed to look for a salty rock rather, than for brine springs. The city of Ciechocinek is situated in the Kujawy region on the left bank of the Vistula river of the two to four kilometres wide proglacial stream valley, at an average altitude of 44 m above sea level. Archaeological traces of manufacturing salt from brine springs run back to the second century BC. The documents of the Roman-Catholic parish in Słonik – the town once upon the time existing on the area of the present salt works of Ciechocinek being now only known by name —from 13th century mention
production of salt from the local springs. The first bore hole on grounds of private village of Ciechocinek nearby Slonsk was completed in 1791 and gave a brine of very low concentration. For that purpose a drilling equipment was borrowed from Farhwwasser in Gdansk. In 1795 Poland had lost independence completely and disappeared from the map. The state of Prussia took a rule over the land of Kujawy and had started drilling in 1798. Until 1801 the brine of 3.8 per cent concentration was obtained. Polish national interest on salt production had had to stop until the Vienna Congress in 1815 when state of Poland so-called the Congress Kingdom was proclaimed. Poland received a certain measure of independence from the Russia linked by the personal union of vice-king appointed by the Emperor. Poles again approached the exploitation of the salty springs at Kujawy. That challenging project received support of Stanislaw Staszic (1755–1826), pioneer of mining, and the noble Franciszek Ksawery Drucki-Lubecki (1778–1846). Secretary for Treasure and pioneer of industry. Stanisław Staszic, scientist, statesman and one of the leading minds of the Polish Enlightenment movement, described a concept of graduation tower, well known after the book on «Gradierwerk» by Janderson published in 1720 in Magdeburg (Iwanowska-Jeske 1983, 61).

CULTURAL VALUES OF SALINE IN CIECHOCINEK

Identity value based on recognition

Construction works had started in 1824 and set of graduation towers No. 1 and No. 2 was completed in 1827. Industrial production of salt in Ciechocinek started on October 21, 1832, after period of trials. The concept of exploring salty water for health treatment purpose emerged as early as in 1827. In 1836 Dr Roman Ignatowski, physician, arranged on his own expenses an extension attached to the austere with 4 bathtubs made of copper. In 1842 the Chief Committee for Ciechocinek Health Resort Development was established in Warsaw. Its activity resulted in erection of the new Spa House made of brick with 36 bathtubs in 1847. It was a starting point for making profit from new kind of services — spa business, particularly whereas the profits obtained from the patients were installed successively into the new investments: the Bath House No. I, II, III, and IV with all necessary infrastructure and facilities.

In the middle of the 19. century three parks were laid out, drinking house erected and the Müller’s Hotel constructed as timber framed three-storey building. Accommodation was offered by private sector by means of small wooden pensions and mansions. Railways approached the salt works in 1867 passing by the way the passenger station; it was siding 7 km long off the main track from Warsaw to Aleksandówr Kujawski. In course of time the income from salt production became smaller than that one obtained from the spa services. In 1905 the Spa incorporated the Salt Works. Ciechocinek received a status of the town from the Russian authorities, confirmed by the authorities of independent Poland in 1918. In 1932 the hot spa of 37 C was found and the open air swimming pool of dimension 100 × 40 m was constructed between the graduation towers. Its opening ceremony was held with the presence of Prof. Ignacy Moecicki, the President of the Republic. Interwar period established good reputation of the Spa in Ciechocinek. In 1939 Ciechocinek was named Hermansbaden and converted into the luxury spa for Nazi dignitaries and wounded German soldiers, closed for Poles. After 1945 many investments enriched services and enlarged potential number of patients according to the public health strategy of socialistic state.

Figure 1
Ciechocinek, Graduation Tower No 3 (listed monument, register No. 424, 1958); state after renovation completed in 1997
Relative artistic value based on research

Saline buildings and structures hardly applies for artistic recognition. The salt works were recently reconstructed, i.e. entire brick masonry and roof trusses were redone following original shape of ca 1890. Directly connected with the history saline are: old engine room made of red brick laid in decorative pattern, ca 1896, recently converted into grocery store (listed monument; register No. 343/A, 1994); brine fountain «Mushroom» in a very heart of the city, designed by W. Noakowski, 1926, supplied form the spring No. 11 drilled in 1909–11. Most prominent in terms of architecture is thermal swimming pool designed by arch. R. Gutt and Eng. A. Sznolis, an example of functionalism, 1932, with changing room capacity for 1500 bathers. On the other hand the image of graduation wall serves as a local logo of curiosity and often arrives on souvenirs. Example of such application is visible at the top of facade of the New Bath House for Poor, constructed in 1913 (listed monument; register No. 59/496/A, 1964). The city code-of-arm presents a graduation tower, as well. Moreover, numerous buildings of the city posses features of architectural details typical for historicism style: Neogothic Roman-Catholic church according to design by E. Ciechocki, 1884; wooden Spa Theatre by arch. Schimmelfennig, 1890; Old Bath House No. 2, arch. J. Majewski, 1898; modernistic building of the Post Office, arch. R. Gutt, 1935; reinforced arch and shell structure of market hall, functionalism, 1938.

Relative historic-technical value based on research

The whole saline project was developed by the Konstanty Wolicki, the pioneer of Polish Mining. He bought a land from settlers in villages of S?onsk, Siarzewo and Wo?uszewo and incorporated those lots to the state owned grounds. Structural drawings were supplied by Eng. Jacob Graff, professor of Mining Academy in Kielce. Parallel graduation towers No. 1 and No. 2 were executed by builder K. Knake and completed in 1827. Graduation Tower No. 3 was erected in 1859. The table below shows a basic data of graduation towers (Table 1).

Those towers are built of thick logs supported by wooden blocks sunk deep into the ground. The brine tanks are elevated 120 cm above the ground. The tank structure serves as a base for frames of the graduation tower. Posts are made of long timber, thousands of several meters long pine trunks were delivered on site from the state Kampinos forest and private owners (Tloczek 1958). That entirely wooden framing

![Figure 2](Ciechocinek, New Bath House for Poor, facade, 1913; architectural detail made of plaster depicting the scheme of graduation tower)

Table 1

<table>
<thead>
<tr>
<th>Graduation Tower</th>
<th>Length [m]</th>
<th>Height [m]</th>
<th>Width [m]</th>
<th>Tank volume [m³]</th>
<th>Contents of brine [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>No 1</td>
<td>648</td>
<td>14</td>
<td>9</td>
<td>5.800</td>
<td>up to 10</td>
</tr>
<tr>
<td>No 2</td>
<td>719</td>
<td>16</td>
<td>9</td>
<td>6.300</td>
<td>20–22</td>
</tr>
<tr>
<td>No 3</td>
<td>333</td>
<td>12</td>
<td>9</td>
<td>2.900</td>
<td>up to 16</td>
</tr>
</tbody>
</table>
system, narrower at the top, is filled with horizontal layers of blackthorn sheaves. Those sheaves are spare elements and they have to be changed every 5–10 years. For that purpose a plantation of blackthorn was layout nearby. Several meters over the ground on the top there is a gallery along which run wooden channels with brine pumped from the spring. From beginning there were discussions whether it should be powered by wind mill or modern steam engine, thus various solutions were applied including both media at the same time. While the brine drops down through the blackthorns then the wind increases a process of water evaporation, and oxygen in the air changes into ozone due to the sun radiation. Along that permanent process a healing aerosol rich in iodine is produced particularly intensively on sunny and soft-windy days.

Due to that phenomena the temperature near the graduation walls is lower and humidity is higher that remains a sea-like climate enriched with brine-iodine-bromine-ozone particles. That aerosol heals slowly respiratory sufferings and improves results of many other treatments. The brine percolates down the tower’s wall to the bottom tanks, increases the salt concentration from natural initial 4.5 to 22 per cent, and then it flows through a pipe to the salt works. It was experimentally discovered, that if concentration exceed over 22 per cent then the salt crystals are developing on the blackthorn walls, and the gust can remove them. Circulation of brine is operated by master of graduation wall called «graduator» whose decisions are based on assessment of the current weather conditions and the brine concentration.
measured by means of salt aerometer. After relevant number of cycles the brine reaches concentration around 20 per cent and becomes ready to be transferred for the further treatment in salt works located around 2 kilometres to the east. In the past the piping system was made of wood, and example of such pipe is exhibited on site. Brine is collected in two sedimentation tanks made of wood around 1840. They are situated 2 meters above the ground on wooden posts and they reach high of 8 m; their length and width are 59.6 10.75 m and 15.6 8.8 m, respectively. Such arrangement protects a brine in case of flood, and creates an opportunity for gravity inflow of brine to the preheating tanks inside of salt works building.

Winds in Ciechocinek are blowing mainly from the west and south-west, thus salt works were located on distance from graduation towers in order to avoid brine pollution caused by smoke. Another reason was to move the plant near to the Vistula river for the purpose of transportation. A canal was dug in the old river bed between production yard and the river bank. After railway access to Ciechocinek that solution became abandoned. Salt works were equipped with the sets of preheating tank and pan made of riveted iron sheets sealed with special lime putty that harden while heating. After destruction of that site by flood in February 1871 the new building for salt works was erected on the same lot but about 200 meters to the south, and old pans were reused. At the present the rectangular preheating tank is 10.7 m long, 7.4 m wide and 1 m deep; here concentrated brine is heated up to 45 C. After reaching that temperature the brine
is pumped to the pan 14.5 m long, 8.0 m wide, and 0.6 m deep. It takes one day to rise a temperature up to 104 °C and to form the salt crystals. The whole technological process is conducted by the “cooker”—the man who supervises preheating tanks, fire pans, salt crystals collecting, drying and their transfer to salt depot. As well, he menages the production of the side-products: slime and bathing lye. Two chimneys of the Salt Works became a dominant of the landscape being visible over earthen works intensively developed in order to protect fields and settlements against the flood. Area of the spa including Graduation Towers is surrounded by ramparts 6.4 km long in total. Since the 18. century many holes were drilled, and among them the seven are exploited now; the deepest source runs from the depth of 1450 m.

**Rarity value based on statistics**

In the 19th century several projects of graduation towers were executed in area of Poland, but only the enterprise in Ciechocinek lasts for so long. However the profit from salt production had lowered successively and in 1853 brought a deficit, the plant was kept into operation. It may be seen as an action against the capitalistic rules, but from historical point of view it is a marvellous example of cultural added value enhancement. Development of the spa business was based on wise maintaining the public image of miraculously health giving Graduation Tower. At the present the saline in Ciechocinek is only in Poland example of industrial plant from the first half on the 19th century has been still in use.

**CONTEMPORARY SOCIO-ECONOMIC VALUES OF SALINE IN CIECHOCINEK**

**Economic value**

There is modest demand for saline products: salt, bathing lye and slime. The Graduation Towers operate in small percent of their productivity. From one technological portion of concentrated brine of 80 cubic meters—equal to the pan capacity— it is produced 240 kg of salt. Forecasted Saline efficiency assessed in the thirties was 10,000 tons per year. At the present the salt production did not exceeds one thousand tons. Half of the historical installations of the Salt Works was already dismantled. Income from all products is far too low to cover the cost of keeping in operation and proper maintenance the whole saline system, that combines three graduation towers, installations, and the Salt Works.

**Functional value**

The geological structure of Ciechocinek is known from around sixty holes drilled from 18. century with the deepest one of 1825 m. Today nine sources are in use including three artesian warm brine springs of 37 °C, called thermals. The Ciechocinek waters are composed of chloride, sodium, bromine, iodide, and iron. They serve as a raw material for the production of salt, mud, medical lye, and table mineral waters marked as «Krystynka» and «Kujawianka». According to present tendency of market demands, the sector of leisure, rehabilitation and health improvement seems to be one of the leading streams of services and job demands. Under those circumstances the potential of Ciechocinek is promising: valuable brine natural products, clean air free from industrial and urban pollution, parks and green areas well arranged for walking, places of natural beauty and cultural monuments in neighbourhood environment. Moreover, the thermal swimming pool is an attraction for the families from...
Wooden masterwork of saline in Ciechocinek, Poland

Educational value

Well preserved structure of graduation towers made entirely of wood is an unique example of long lasting performance of that structural material has been explored properly under certain self-preserving conditions, i.e. being permanently moisten with brine. It may serve as evidence of the past building craftsmanship and traditional art of the carpentry. The Ciechocinek saline is rather unknown and rare example of industrial investment developed by the state in the first half of the 19th century (Gerko 1998). That contributes a lesson on national economical history and the first faze of the Polish industrialisation. Spatial progress can be studied on site, and the town fabric development from the nucleus point of the Graduation Towers up to the modern health resort facilities may be observed.

Social value

The Graduation Towers and the Salt Works have been kept in operation continuously for 170 years. That emerged professions, tools and know-how being expressed by certain words, names, and procedures. Oral tradition of that specific craft is not recorded and can be abolished very easy. More than 200 workers and foremen were employed in saline around the middle of the 19th century; records from the great flood in 1871 say about 170 workers who lost a job due to distraction of Salt Works caused by water; at the beginning of the 20th century less than 50 workers were employed; before the WW II saline employed up to 82 men (Gerko 2001). Majority of the Ciechocinek families was and is related to the spa services and receives income thanks to visitors coming here for few weeks of treatment or just as oneday tourists attracted by the curiosity — enormous in

the whole region as a place of summer leisure; the installation of thermal fountain cascade-like is exploit intensively by visitors as a natural massage.
size Graduation Towers seen in operation. To walk along those permanently wet blackthorn walls was a symbol of middle class habit during the real socialism period, and even a popular humorous song was devoted to that behaviour. In our days both the clients and the spa offer have been changed. There is no visible evidences of mass interest any more. New private development of housing estate and luxury beauty clinics is addressed to nourishes.

Political value

On the land of Poland there is no similar to Ciechocinek example of long lasting industrial production and related spatial development. Due to specific history of that country there is no way to omit the relations with Germany, Russia, and their citizens. Additionally, a role played by Jewish population should be taken into account. Taking about European dimension recalls traces of international co-operation in the past. In the 17th century Mennonites came to that area and settled in Slonsk-neighbourhood of the Salt Works site; document of 1776 issued by the Polish king Stanislav August confirms their right. In spring of 1798 Alexander von Humboldt (1769-1859), mine inspector, came to Ciechocinek as scientific consultant. He assessed positively the discovered brine sources and recommended their further exploitation (Gerko 1995, 155). During the Napoleon period the fields with brine springs were given to the French marshal Nicole Jean Soult (1769–1851), Duke of Dalmacia. He tried to establish a private monopoly for salt production by means of restriction addressed to local population. It was prohibited to «cook» salt within a radius of 4 km counted from the church in Slonsk-standing there from the 15th century; that lot exactly is occupied by the present Salt Works. Present saline project emerged under auspices of the Russian Emperor Alexander I, and for its execution the Polish State hired Eng. Jacob Graff (1780–1854), alumnus of Bergbau Academy in Freiburg, Germany, professor of Mining Academy in Kielce, Poland. Another engineers and the state officers of German origin involved in saline development were: Becker, Hann, Englert, Rost, Stark, Ullmann, and others. From the very beginning the saline was insured at the English Insurance Society «Alliance». The State Bank ownership of saline expired in 1870, and then Ministry of Revenues in Moscow took a rule. From 1887 the saline went on lease to hands of Russian general Boris Glinka-Mawrinow, who established a stockholding in 1890. In that time the present building of Salt Works was erected and equipped with four sets of preheating tank and cooking pan.

Present Challenges

Today the technological system of saline consists of: spring No. 11, drilled in 1909–11, source of 4.55% brine; set of three Graduation Towers of total length 1741.5 m; the Old Pomp Station located between the Graduation Towers (listed monument, register No. 322/A, 1993); main and secondary pipe system for brine transportation; building of Salt Works of 1890 with two sets of pan and preheating tank; two reservoirs for brine impurities sedimentation, capacity of 823 m³ and 3011 m³ entirely made of wood ca. 1840 (listed monument, register No. 424, 1958). Local people are tied emotionally to the Graduation Towers—a famous landmark of Ciechocinek. Motive of that structure often appears on local souvenirs. However there is certain number of unemployed, and services connected to health recovery and rehabilitation activities are almost the only possibility for fulfilling the jobs desire. Unfortunately, the most accessible for general public element of the complex-thermal swimming pool has been closed for summer season of 2002. Older generation keeps in mind images of the flourishing spa resort from several years ago. Author of this paper has undertook promotional measures for the saline—a prominent monument of industry and engineering; the Saline in Ciechocinek is proposed as an entry in the atlas of structural and civil engineering monuments of the «Visegrad Four» States published by the national professional chambers and societies of building engineers in Poland, Slovakia, Czech Republic and Hungary. It is expected to have it printed in a middle of 2003. Moreover the lecture about cultural values of the Ciechocinek Saline was given by the author during the 5th Forum of Conservators in Torun, Poland, February 2002, and the poster on «Salinepolis of Ciechocinek» was presented during the European Union Conference on Cultural Heritage Conservation, Cracow, Poland,
May 2002. The rarity of wooden structure of graduation towers is doubtless within the country, however the world wide recognition would be much helpful for their strategic safeguarding and prospect of application to the World Heritage List. In terms of industrial heritage the whole group of saline buildings, structures and installations is an unique example of early industrial site has been in operation for 170 years until now.

CONCLUSION

The city of Ciechocinek has grown from saline on exploitation of brine sources. The features of related technology and healing treatments have shaped the landscape through the years. In nowadays Ciechocinek is still the biggest health resort of Northern Poland. The Spa Company owns numerous sanatoria and the saline — monument of brine mining with immense masterwork of carpentry — the Graduation Towers, that operates in the same manner as it was at the very beginning. To keep up reputation of the spa in Ciechocinek means to conserve its heritage and to keep on going saline-alive monument of industry. This is only way to pass its cultural values to the future generations.

REFERENCE LIST


