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Conditions in the Idrija Mercury Mine at the end of the 16th Century and Measures for its Restoration

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Introduction

The extraction of mercury in Idrija was begun around the year 1490. Sufficient information is available in archives on the conditions in the Idrija Mine in the 16th century as regards its technical equipment, excavation conditions in the pit, energy supply, and working conditions. There is, however, no information from this period on the geological conditions in the mine, because geology did not yet exist as an independent science in the 16th century. The first reliable data on Idrija's rocks and cinnabar ores were not recorded until 1761 by mine physician SCOPOLI. As in other European metal mines, mining activities in Idrija in the 16th and 17th centuries were also performed on the basis of practical experience and a knowledge of the basic characteristics of cinnabar ores and mineralized rocks, as well as accompanying rocks in the Idrija ore deposit. Mining activities were therefore not systematic or planned. Excavations were directed by direct tracing of mineralized rocks. The spatial location of rich cinnabar mineralisation in the Idrija ore deposit was complicated due to tectonics. This led to the formation of a nonsystematic and complicated web of shafts, galleries and jack pits, which in all aspects strongly worsened the mining conditions. Unfortunately there exist no mine maps from this early period of mining that could clarify the spatial conditions in the pit. It is only on the basis of archival data and our present-day detailed knowledge of the conditions in that part of the ore deposit being excavated in the 16th century that we have been able to reconstruct quite faithfully the conditions in the pit (Fig. 1).

Conditions in the Idrija pit in the second half of the 16th century

In the 1580's the conditions in the pit of the Idrija mine were extremely unfavourable. Mining was performed exclusively in the very richly mineralised, soft and black *'Idrija shale'*, also rich in native mercury, which was later named the *'Skonca beds'*. The mine was open in only one daily shaft - St. Achacius' Shaft -, which was 61 metres deep and reached all the way to the water-bearing, Cretacious base. It was equipped with a horse-driven *'gepelj'* used to lift ore and pit water from the pit, transport miners into and out of the pit, as well as to lower wood supports and other materials into the pit. It was also the only path for the entry of fresh air into the pit and the release of contaminated air from the pit. Because the mineralised Skonca beds descend from the northwest towards the southeast, three jack pits were made on the bottom of Achacius' Shaft and connected with the intermediate horizontal shafts. This provided access to the then final depth of the mine - 156 m, which was located at a distance of 243 m from Achacius' Shaft. The excavation areas expanded in all directions throughout the mineralised beds. Every day miners had to descend along ladders to their worksites. They carried wood and ore along the galleries or transported them in wooden trams (*truhce*) along the shafts, and raised or lowered them using a winch. One of the problems in the pit was the constant inflows and frequent inrushes of water. Because the mine was not equipped in this period with pumps for raising water (*kamšt*) from the pit, this was done manually using buckets. One of the main obstacles to the work in the mine was the unregulated ventilation of the pit. Given the fact that at the end of the 16th century the Idrija mine was accessible through only one daily shaft (St. Achacius' Shaft), it was not possible to provide for effective ventilation of the pit in that period.

A solution to all the above-mentioned problems was the construction of a second, new shaft leading to the deepest excavation areas which would be used for ventilation and equipped with a pump (*kamšt*) and a lifting device (*gepelj*).

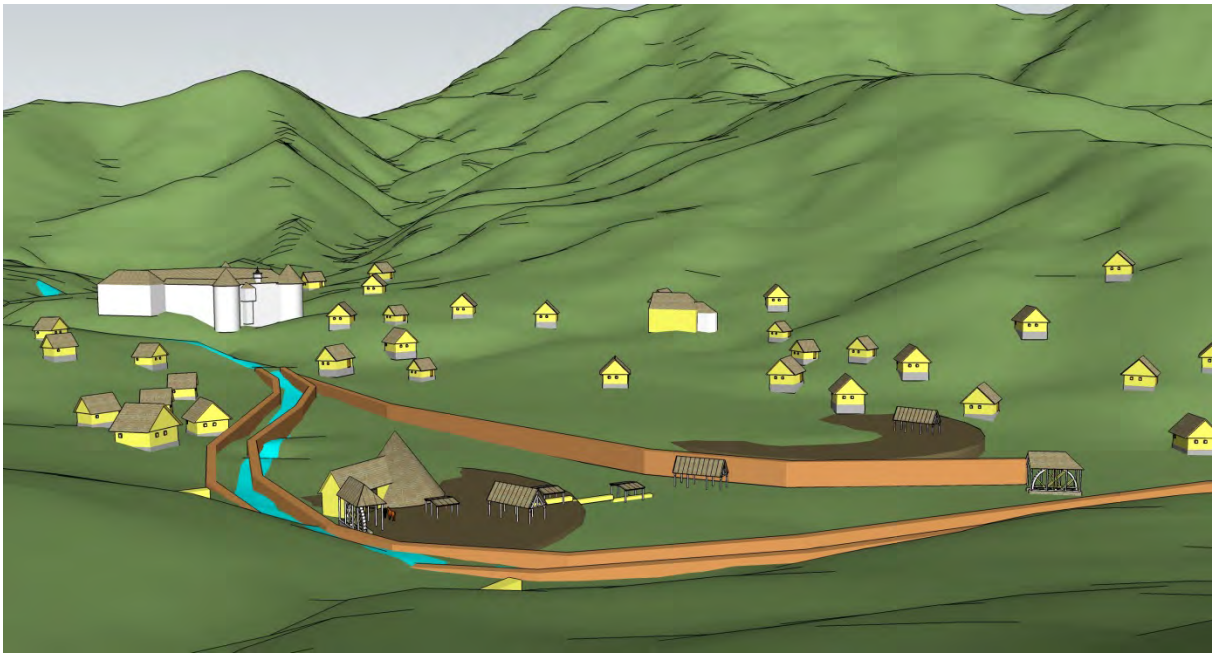

Fig. 1: Reconstruction of Idrija at the beginning of the 16th Century (BIZJAK, 2013)

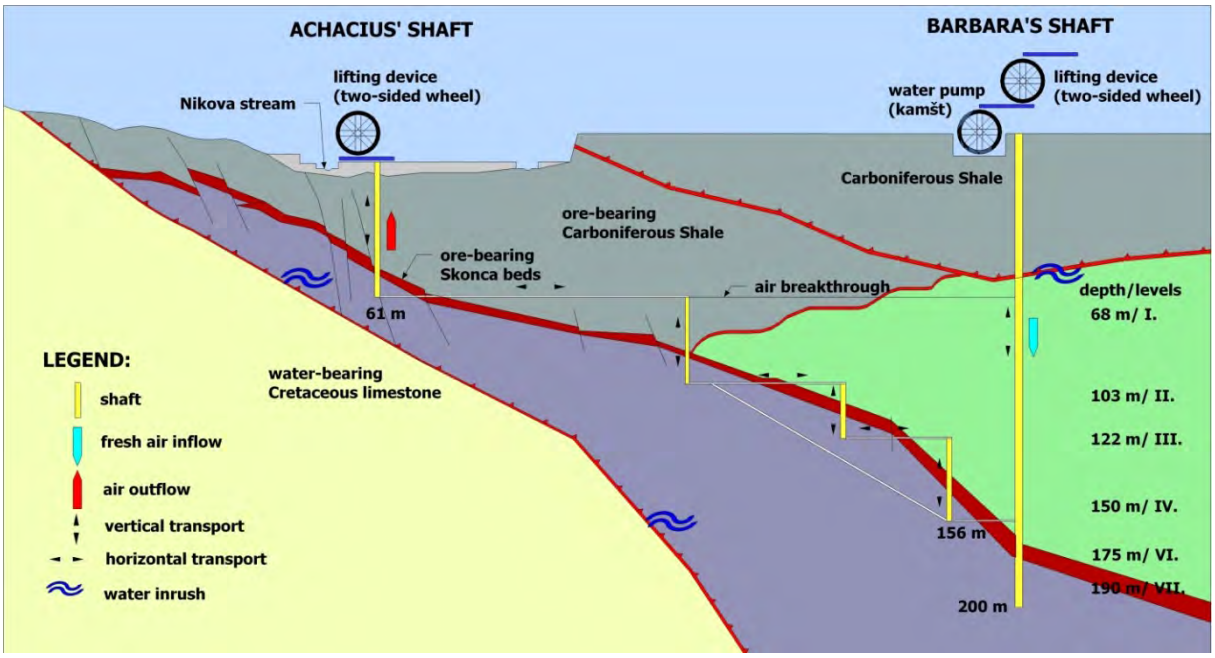

Fig. 2: Conditions in the Idrija pit after its restoration in 1596 (ČAR 2011; BIZJAK 2013)

Measures for restoration of the mine under the administration of Gregor KOMAR (1586 - 1596)

In 1586 the Vienna Court recalled the indecisive and aging Urban AINKHÜRN after having administered the mine for 37 years, and appointed as its administrator the highly qualified Gregor KOMAR, who had excellent organisational skills. After acquainting himself with the conditions in the pit and on the surface, KOMAR set to work. In the very same year (1586), he managed to convince the land prince to send Hans HUEBMAYER, Supreme Mine Master of the Austrian Lands, to Idrija in order to determine

the condition of the mine together with the new administrator and other mine employees, and to propose appropriate measures. They found that it was urgently necessary to construct a new daily shaft leading to the deepest part of the mine, i.e. up to a depth of 90 fathoms (170 m). The shaft was to be modernly equipped with a *kamšt* (water wheel) for lifting water from the pit and a two-sided wheel for raising and lowering loads. This would essentially simplify the transport of ore and wood, as well as improve the ventilation of the entire pit, particularly the excavation areas. By abandoning the complicated transport of ore in the pit and the raising of loads from the pit with a winch, the labour costs would be considerably reduced. The construction of a new shaft was in all respects a highly demanding investment that required qualified experts and sufficient energy sources. At the time, Idrija had neither of these. The construction of a *kamšt* above Achacius' Shaft began with the arrival of *»kamštarji«* (*kamšt* builders) from German mines. In October 1587 the complex pumping device was installed above Achacius' Shaft. The construction of Barbara's shaft was begun in the spring of 1588. The *kamšt* above Barbara's Shaft began to operate in 1593, followed one year later by the two-sided wheel for the transport of ore and wood. The shaft was completed in its entirety, i.e. up to a depth of approx. 200 m, in 1596. The simultaneous construction of horizontal connecting shafts in the pit also significantly improved the ventilation of pit areas. In the second half of the 16th century, the Idrija Mine had an extremely poor and inadequate energy supply. Concurrently with the construction of Barbara's Shaft and the connecting shafts in the pit, the energy supply in the mine was also improved. The only available energy source in Idrija was water power. The water intake at nearby stream catchments was improved, and later on more distant streams were dammed and the water directed along wooden channels for as far as 2 km. In the spring of 1595, the renovator of the Idrija Mine, Gregor KOMAR, had quickly to leave Idrija because of his Protestant beliefs (period of the Counter-Reformation). He was replaced by an equally hard-working administrator, Gregor ADLER (1596 - 1602), who completed the works already commenced. By 1604 the Pri Kobili dam was completed and the 3.6 km-long Rake water channel leading to both daily shafts in Idrija was constructed. The mine was thus provided with necessary and sufficient energy.

Conclusion

After its modernisation was completed in the late 16th and initial years of the 17 centuries, the Idrija Mine became one of the best equipped mines of that time in Europe. Its comprehensive restoration enabled the undisturbed operation of the mine for the next 150 years. By damming the Idrijca River at *'Pri Kobili'* and constructing a water channel to the shafts as well as catchments at nearby streams, the mine was fully supplied with energy for the next 250 years, until the introduction of steam-driven machines in the mid 19th century.