

## Plans, Manuscripts, Books: The Library and Mining Archives of the “Montanwerke Brixlegg AG” (Tyrol)

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Since March 2009 the project “Erschließung der Bibliothek und des Bergbauarchivs der Montanwerke Brixlegg” (“Indexing of the Library and the Mining Archives of the Montanwerke Brixlegg”) has been in progress. The aim of this project is to preserve, arrange systematically, and make accessible the library stock and mining archives of the “Montanwerke Brixlegg”, which is a relatively old Austrian company. The first existing record of the Brixlegg copper and silver refinery is a document dated 1463, which was found in the Bavaria State Archives. Since at least this date copper and precious metals have been produced at this place in Brixlegg. Duke Ludwig IX. the Rich, Pfalzgraf bei Rhein, Herzog in Lower and Upper Bavaria, is considered to be the founder of the works (Mutschlechner, 1987, p. 60; Metzler, 1960, p. 17). When it was first founded, the plant was situated on Bavarian territory; in 1504 it became part of the Habsburg territories and became soon thereafter property of the government. The smelting works were originally dependent on the vicinity to the mines of Brixlegg, Schwaz and Kitzbühel which supplied it with silver and copper. Brixlegg coin plate was delivered to the Mint in Hall and the Mint headquarters in Vienna, Venice, and Milan. Hammered and rolled products from Brixlegg – a hammer mill was built around 1717 and a rolling mill in 1819 – were requested goods (Scheidle, 1997).

Due to the rise in use of electricity and the subsequent introduction of electrolysis, as early as in 1885 very pure copper was produced. Despite a large decline in copper and silver mining in Tyrol, the continued existence of the refinery, which belonged still to the state, was guaranteed at the beginning of the 20<sup>th</sup> century through a change in production to the recycling of copper from scrap metals (Bäcker, 1963). After the so-called “Anschluss” in 1938, the Montanwerke became the possession of the Third Reich. Because of the importance of the metal industries in the war, the smeltery was enlarged and production increased, therefore, prisoners of war were forced to work in the plant who lived in shanties which were built in front of the company grounds beside the river Alpbach. The plant suffered the heaviest hit, however just before the end of the Second World War in March and April 1945, when the allies flew bombing raids over Brixlegg, which were primarily targeted on the near railway bridge over the river Inn. During 28 waves of attacks, 1500 bombs were dropped which damaged and destroyed a major part of the plant and the village centre. Immediately after the end of the war, “Montanwerke Brixlegg” was reconstructed (Scheidle, 1997).

Presently, pyrometallurgical and hydrometallurgical refinery processes are being used in the production of high purity copper, which is recycled solely from secondary raw materials. In the pyrometallurgical refinery stage the raw material is charged into the shaft furnace. The shaft furnace melts the raw materials of approximately 30 % copper content at temperatures  $> 1000^{\circ}\text{C}$  to “black copper” which has a copper content of 75 %. This “black copper” converges with scrap alloys such as brass, bronze, and red brass in the converter furnace where it is refined by means of oxidation of the accompanying elements to “raw copper” containing 97 % copper. This raw copper is further refined in the reverberatory furnace. Finally, the molten mass, containing at least 99 % copper, is casted into anode plates. Now the second stage in the copper production begins – the hydrometallurgical refining process in the tankhouse. Here, the casted anodes are hung in cells filled with a watery sulphuric acid solution of copper sulphate which work as electrolytes; the cathode is a thin high-grade steel sheet. When a continuous electric current is applied, the copper at the anode is dissolved, as well as other precious metals such as silver and gold. Whilst the copper ions are attracted by the cathode, the noble metals settle to the bottom of the cell as anode slime. At the end a machine strips the cathode-copper from the steel sheet. The copper content is now more than 99.99 %.

Details about this process and how it has developed through time are found in a wealth of documents in the library. The collection includes some very important and unique sources of history of the Tyrolean mining and metallurgy from the 17<sup>th</sup> century to the present which are of high scientific and social interest. The library houses 70 journals and over 2500 monographs, encyclopaedias and collected editions on mining engineering and copper metallurgy, in addition to literature on the business practices of a copper producing company. The oldest and most precious printed volume is the “*Speculum Juris Metallici*”, edited by Sebastian Span, from 1698. In addition there are small books, published by Michael Wagner in Innsbruck, with printed tariff lists from 1794 and 1796 showing how much the company paid for different sorts of ore of various qualities provided by the various mines in Tyrol. These lists are based on the chemical works of Martin Eyberger, who smelted small amounts of the different ores and analysed each assay. He was employed as scientist for metallurgical chemistry and managed the enterprise from 1770 to 1804 (Mutschlechner, 1888). Also belonging to the inventory of the library are the historical archives of the “*Montanwerke Brixlegg AG*”, containing 200 records and lithographs from the 16<sup>th</sup> to the early 20<sup>th</sup> century. This holding consists of descriptions of the smelting process, books with chemical analyses of the ore (“*Probierbücher*”), technical descriptions of furnaces and machines, registers of the staff (19<sup>th</sup> and 20<sup>th</sup> century), administration acts such as official regulations, payrolls, production-statistics, tariff lists, leasehold contracts, acts of sale, and inventory lists. A manuscript of particularly high historical value is a fragment of a description of the smelting process from the early 16<sup>th</sup> century.

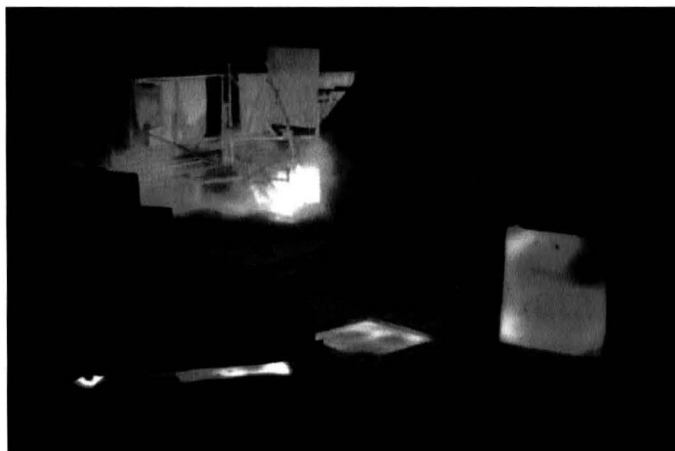
There is also one chest with 350 plans from the early 19<sup>th</sup> century up to the 20<sup>th</sup> century. There engineering drawings of furnaces (i.e. “*Krummofen*”, “*Saigerofen*”), site plans of the smelting works, construction plans of the hammer mill, the rolling mill and of an ore processing mill which was built in 1876, can be found. A typical example of these types of documents follows: A drawing from 1872 shows the designs for a zinc smeltery. Ore for this new facility came

from the mines of Schneeberg, near Sterzing, Italy, where sphalerite deposits are present. In the late 1860s, the mining department in the ministry of finance decided to reinvest in mining and to reactivate the extraction of ore in abandoned mines such as Schneeberg. The resumption of the work near Sterzing became possible due to radical technical changes following industrial revolution: New processing methods allowed the refining of sphalerite and the railway line from Innsbruck to Sterzing over the 1374 m high Brenner Pass, which opened in 1867, significantly lowered the transport costs (Tasser, 1994, p. 61). Despite the promising outlook, zinc refining in Brixlegg was stopped only a few years later because the losses were higher than the profits. In comparison to the smelting of copper ore, the smelting of sphalerite required significantly more energy. After this economic defeat, a copper sulphate facility was installed in the building of the zinc smeltery. Over 40 plans in the archives document the change in the function of the building.

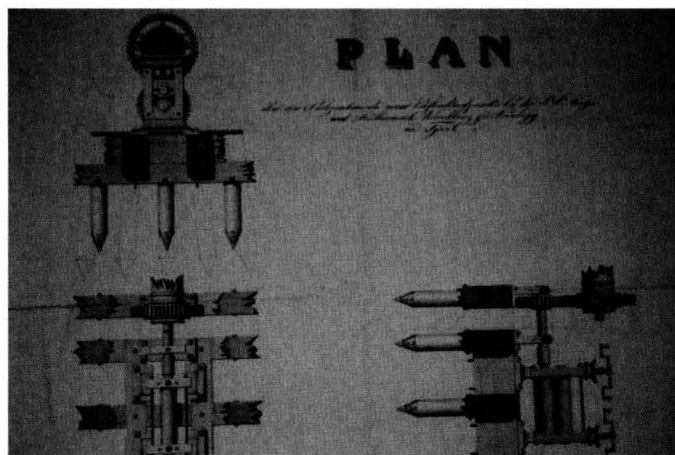
The neighbouring room houses the mining archives with its core of five chests containing 1160 mine plans and geological maps, as well as construction plans and engineering drawings of ore processing facilities, stamping mills and hoists from the late 18<sup>th</sup> century to the 20<sup>th</sup> century. The focus lies on the mining areas around Schwaz, Kitzbühel, and Brixlegg, and of high importance are the overview plans ("Hauptkarten") of the mines "Falkenstein" and "Ringenechsel" from the beginning of the 19<sup>th</sup> century. Of particular interest are documents from the 18<sup>th</sup> century to the Second World War, containing official mining reports ("Visitationen") of the mining areas around Schwaz, Brixlegg, and Kitzbühel from the 18<sup>th</sup> and 19<sup>th</sup> century, acts of sale, invoices, inventory lists, employment records ("Mannschaftsbücher"), documents concerning the social insurance of the miners (Bruderlade), books with mine-surveying data ("Zugbücher"), geological reports and records of the "Gewerkschaft Schwazer Bergwerksverein" (statutes, reports, protocols, invoices), which was a private company running the mines in Schwaz from 1856 to 1957. Since 1957, the "Montanwerke Brixlegg" extracted dolomite from the mines in Schwaz; however, a rockslide in 1999 temporarily halted this work (Bodner & Haider, 2008). For this latest phase of mining history of Schwaz there is a collection of 340 folders with operational documentation (from the second half of the 20<sup>th</sup> century) and 20 cartons containing data from the administration department (covering the entire 20<sup>th</sup> century). These collections offer a wealth of material on the history of the small business, which employed up to 18 people. It shows not only the economic and technological basis of the operations, but also aspects of professional awareness. Of high historical value are the materials which are related to the rockslide at the "Eiblschrofen" in 1999. Their analysis is of particular interest for the ethnographic project part of the special research area HiMAT. While the major part of the archives documents the history of dolomite mining at Falkenstein, a small stock relates to the mines of "Kogl" in St. Gertraudi: after the extraction of fahlore ceased and the mechanical processing of barite was introduced in 1927 (Bäcker, 1963; Mutschlechner, 1984), barite was extracted at this location until the 1960s.

However the question arises: Why are there almost no records older than 250 years in the library and the mining archives? The explanation is found in events occurring in the years 1809, 1875 and 1945. In 1809 the revolt of the Tyroleans against Bavaria occurred. Schwaz, where

the directory of the Tyrolean mines and smelterys was situated, was set on fire and the archives with records from Brixlegg burnt down. In 1875 a fire in the factory destroyed many documents and in 1945 parts of the collections were ruined or became lost due to the previously-mentioned bombing raids (Metzler, 1963, p. 13). Therefore, it is of importance to conserve and make the remaining archives accessible for research and available to the public.



*Fig. 1: Casting of copper anodes.*



*Fig. 2: Detail of a rolling mill.*

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