

Innovative technology invented and used worldwide

UNESCO World Heritage Erzgebirge/Krušnohoří Mining Region: Water systems and metallurgy

Mining in the Erzgebirge led to many new technologies being developed and perfected for the extraction, preparation and smelting of ore. In the 16th century, the Erzgebirge was considered the most important mining technology centre in the world. From here, new inventions found their way to many other ore fields in Europe and around the globe.

The art of pumping water: the invention of “Kunstgezeug”

Initially, the development of powerful drainage systems was groundbreaking for the mining industry. These technologies solved the problem of extracting ore from very deep layers. Pits could now be sunk to a depth of several hundred metres. The pumping systems were constructed from piston pumps and rods, and were called “Kunstgezeuge”. In 1540, one such system was put into operation for the first time at the tin mine in Ehrenfriedersdorf – hence its name, the “Ehrenfriedersdorfer Kunstgezeug”. The original wheel chamber and successor systems from the 19th century can still be seen today.

The physician, humanist and scholar Georgius Agricola documented these innovations in his book “De re metallica” (1556, German: “Vom Bergwerk”). It was the first scientific textbook and depicted all the mining technologies of the day. Agricola is therefore globally referred to as the “father of mining science”. The “Kunstgezeug” underwent further development in the Czech town of Jáchymov and remained the world’s foremost water pumping system for over 200 years. It is the forerunner of other, modern pump types.

The art of tunnelling: pits, adits and water ditches

In addition to pumps, tunnels and ditches were also used to transport water. In the 15th century, the “Markus-Semmler-Stolln” was built, a technological masterpiece used for draining mines. In the 20th century, it was expanded to a length of 220 km and is today the longest-serving adit in Germany to remain in constant use. It drains the Schneeberg mining district. The “Rothschönberger Stolln” adit is the pinnacle of engineering. It is still used to drain vast swathes of the Freiberg mining district. At over 50 km long, it was the longest underground construction in the world at the beginning of the 20th century. Tourists can explore these systems, for example on the “pit tour” with educational trail (starting in Reinsberg).

The art of ore processing: wet stamp mills, hammer mills and smelteries

Mine owner Sigismund von Maltitz was the first to hit upon the idea of operating a wet stamp mill in his pits at Dippoldiswalde (1507) to harness the power of water. The ore could now be crushed under a steady supply of water. This made it easier to divert unusable light rock waste away and reduce the amount of ore lost through dust. This process swept the globe and revolutionised ore extraction in Cornwall, UK, also a UNESCO world heritage site.

The museums in Altenberg and Schneeberg – through the “Wäsche IV” ore washing facility and the “Siebenschleher Pochwerk” stamp mill respectively – offer an interesting window into these techniques. Blacksmithing hammer mills also profited from these technical innovations in water use. Some even remain in working order today – for example the “Frohnauer Hammer” (17th century) near Annaberg-Buchholz, the oldest protected technical monument in Saxony, and the oldest blacksmithing museum in Germany (since 1907).

In smelting, the people of the Erzgebirge perfected a new method of silver production: “Saigern”, or liquation, which first emerged in the Nuremberg area. Visitors can gain an insight into this process at the “Saigerhütte Grünthal” (1537) at Olbernhau. This was a self-sufficient

early industrial smelting complex, which operated like a small town. At the time, liquation was the most innovative way of extracting silver from silver-containing copper ore. So, in addition to precious silver, the smelters were also able to obtain a purer, high-quality form of copper. You can still see Grünthal's top-quality roofing copper adorning famous buildings such as the Zwinger in Dresden, the Münster in Ulm and St. Stephen's Cathedral in Vienna. Today, the Saigerhütte has been restored and is a monument complex encompassing a museum, hotel and restaurant – and is unique in Europe in its completeness.