



Historical Metallurgy

Mercury mining museums

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Introduction

Mercury mining districts have recently been the site of intense cultural activities, for example: at Abbadia San Salvatore, where the Italian mercury mines of Monte Amiata are located, the first Congress on Preservation of Mining Heritage in Italy¹ was held on November 15, 1991; in Almadén, the First Scientific Session of the Spanish Society for the Protection of the Geological and Mining Heritage² took place on October 21-22, 1996; and the sixth International Symposium on Cultural Heritage in Geosciences, Mining and Metallurgy in Idria, Slovenia, was held on June 17-21, 2002. The main mercury mines in the western countries were transformed into museums. The most remarkable one is in Idria, Slovenia, which is a candidate for UNESCO's World Heritage List. Table 1 gives the world mercury production during the life of the mines.

New Almaden Mercury Mines in California, United States

Mining in New Almadén was first developed by the Mexican cavalry officer Andrés Castillero in 1845, who noticed that the Indian natives in Ohlone painted the walls of the Santa Clara mission with vermilion (cinnabar). Later on, the property was taken over by captain Henry Halleck. J. Marshall discovered gold in California, triggering the precious metal rush of 1848. Mercury was necessary for amalgamation and its mining experienced a great impulse. During the peak years, 1800 people (some from China) worked

in the mines. It was there that one of the oldest mining museums was founded in 1949. Douglas Perham organized the museum and opened it to the public in the old adobe house of George Carson, built in 1848. In 1973, the Department of Parks of the County of Santa Clara bought the terrain for preservation.

The old Halleck house — constructed in brick and known as the “Big House” (27 rooms) — was rented by the Department of Parks in 1983 and bought in 1987. This institution also bought Constance Perham's collection. In the Big House, the new Museum of the New Almaden Mercury Mines was inaugurated in July 1998. This museum contains maps of the enormous network of mining galleries, historical pictures, and devices of the mining and metallurgical exploitation, as well as tools used by the miners. A diorama reproduces the underground of the mine.

The Park of the New Almaden Quick-silver Council (which almost reaches Silicon Valley), is close to 4000 acres (1618 hectares) of forest pierced by numerous mines with sealed entrances.

Idria Mercury Mine, Slovenia

The Idria mine is the second largest mercury mine in the world. The deposit was discovered in 1490. During the first 20 years, only native mercury was recovered. In 1508, rich cinnabar ore was discovered in the Middle Triassic Skonca beds at a depth of 42 m (Dizdarevic, 2001). After the mercury crisis in 1970, the mine began closure in 1995 and will finish in 2005. At the Idria Tourist mine (*Antoniev Rov*), it is now possible to tour two levels, which will be increased to four in 2005, with another entrance at Franciska's shaft (Fig. 1). The rest of the levels below 150 metres will be flooded.

The Idria Town Museum was inaugurated some years ago in the *Gewerknegg* castle and covers the 500-year history of the mine and town. It was declared the best European museum of industrial and technical heritage in 1997. Another museum of technical progress is located in the Franciska shaft, where several restored mining machines and medical devices are exhibited. The 13.5 m diameter wood draw wheel, called *Kamst*, stands near the

Kazier shaft and was employed to drain the mine for 160 years.

Monte Amiata Mercury Mines in Abbadia San Salvatore, Grosseto Province, Italy

The Roman writer Pliny the Elder mentioned the collecting of cinnabar ore at Montes Tuniatius, known today as Monte Amiata. The first written document dates back to 1217. After the Middle Ages, the mines were probably abandoned, however, they were reactivated in the 19th century. After the mercury crisis in 1973, these mines were closed (Fig. 2).

The idea of creating a museum in this region was discussed in the October/December 1990 issue of the magazine *Dossier di urbanistica e cultura del territorio*. The paper contained architectural designs

Table 1. World mercury production — main districts

Locality	Total production in flasks (1 flask = 34.5 kg)
Almadén, Spain	7 500 000
Idria, Slovenia	3 000 000
Monte Amiata, Italy	2 000 000
Huancavelica, Peru	1 500 000
New Almadén, California, U.S.A	1 100 000

Fig 1. Franciska's shaft, view from the miners old district, Idrija. Picture by Luis Jordá, 2002.

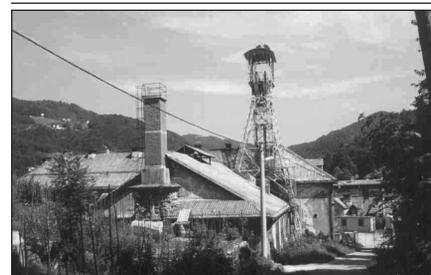
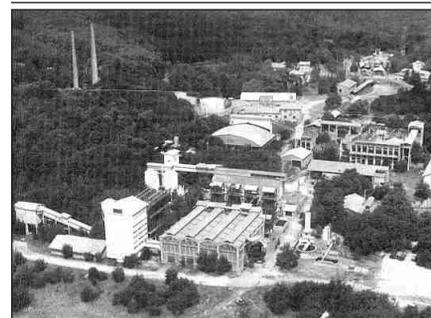


Fig 2. Monte Amiata mercury mine and factory (after Tognarini, 1991).



¹ Reabilitazione delle aree minerarie.

² Sesión Científica de la Sociedad Española para la Defensa del Patrimonio Geológico y Minero.

that cover the mining area of Abbadia San Salvatore. In 1991, the first Congress on Italian Mining Heritage was organized to reactivate the project on a museum park on mercury mining of Monte Amiata. The project was promoted by the municipalities of the region as well as the Environmental Department of Siena and Grosseto, the archives of the Toscana region and the University of Siena. The aim of the project was to recover buildings, archives, and devices, arrange several areas as a museum, and prepare recreation areas.

A 1991 law established a list of National Parks in Italy. In November 1993, new parks were added and among the proposals was the Museum Park of the mines of Monte Amiata in Toscana³. Today, the Mining Park integrates the natural and faunistic surroundings of Monte Amiata. A visit to the museum includes the underground gallery and a movie about mining in the area as well as diseases of the workers. The tour also includes the geological and natural sites, an excursion to the historical centre of Abbadia San Salvatore and the handicraft centre.

Huancavelica Mines, Peru

The Huancavelica mines were discovered in 1563. The production was mainly concentrated in the Viceroyalty of Peru, with important quantities applied into the metallurgical plants of Potosí. A small part was shipped to New Spain together with shipments from Almadén. In Huancavelica, the main heritage is the colonial architecture such as the cathedral on San Sebastian square. Few mining and metallurgical elements are preserved, except for the colonial smelters of Qoripaccha (Fig. 3).

Nikitovka Mines, Ukraine

The Nikitovka mines are located in the region of Gorlovka — *Donetsk* — in the Ukraine. There are references of work carried out under the Greeks and Romans. The main deposit was discovered in 1879 by A.V. Minekov, a mine geologist, however, work only began in 1885, when German engineers designed the underground methods (the railway was opened some years later). People began to settle in the area in 1886. In 1912, there were 338 homes for miners and 12 large huts, a hospital with 34 beds, a school, a bookstore and a church.

³ Parque-Museo delle Miniere del Monte Amiata.

The mine and the plant are located within the city boundaries. The mine was closed in 1994 leaving behind a few abandoned open pits and tailings. Currently, the ecological problems caused by one hundred years of mining have not yet been dealt with. The abandoned plant contains some important elements of industrial heritage which should be preserved. An international field study to raise the attention of the media and authorities of the need for an ecological recovery of this area was organized by the Environmental Union of the Gorlovka's Youth from July 15 to 29, 2001.

Almaden Mercury Mines in Spain

Pliny pointed out that the Almaden mercury deposit was already known and was in operation during the 4th century B.C. The region's first name was "Sisapo," which means "mine" in the Celtic language. Under the Romans, the exploitation of the mine was limited. The ore containers were sealed at the mine, transported to the Mediterranean coast of Cartagena and shipped to Italy where the cinnabar was processed.

The Roman period is well documented. During the period of the Visigothic monarchies, there is a lack of information that lasted until Arab domination. In the 8th century, the Arabs called this place *Hisn- Al- Maden*, which means Fort of the Mineral. More than one thousand people worked in the mine under the Arabs. The Almaden mine was recovered by Spanish Christian kings in 1212.

Fig 3. Colonial smelting of Qoripaccha, Huancavelica, Peru.



The amalgamation process for the new silver mines in South America needed an enormous amount of mercury. Mining highly increased during the 17th century and new deposits such as Almadenejos were discovered nearby. In 1755, at the old Castle mine, the worst fire ever broke out in Almaden. Due to bad mining conditions and huge amounts of wood for timbering, the fire easily spread throughout the mine. The fire burned for two years! The world's total cinnabar production decreased and the global trade was filled with ore from Idria.

To improve the formation and capabilities of the Almaden workers, the Almaden School of Mines was created in 1777 (precursor of the Madrid School of Mines). The famous Spanish mining engineer, Diego the Larrañaga, was nominated director of the mine in 1803. Under his direction, the method of wood timbering was changed to brick rubblework. This new method stopped fires and cave-ins, which increased the security in the mine.

The mining and smelting methods did not change much during one hundred years. Cermak Spirek continuous-working smelters were introduced in 1905, and the mining method changed to cut-and-fill in 1914. In 1954, modern smelters were installed, which still stand today. The mining method changed to VCR in 1981. The mine was mechanized to lower mercury prices and decrease injuries due to poisoning.

The mineral extraction ended in May 2002. The metallurgy in the Almaden Old mine will last — using the stocked mineral — until the year 2005. Today, the open pit in Almadenejos is undergoing a restoration process. All the shafts are abandoned; San Joaquin's shaft reached 675 m deep, San Teodoro, 500 m, and San Aquilino, 350 m.

The first mining conservation action in Almaden was the inauguration of the Historical Mining Museum Francisco Pablo Holgado on the day of Saint Barbara in 1989. The material recovery began in 1984. Some years later, the Mayasa Museum, located in a small building inside the metallurgy enclosure⁴ in Almadén, was opened. Another achievement was the declaration of the Bustamante kilns as sites of cultural interest (Fig. 4).

In October 1996, during the First Scientific Session of the Spanish Society of Geological and Mining Heritage⁵ in Almadén, the Manifesto for recovering the Almadén Historical and Mining Heritage

⁴ *Cerco de buitrones* in ancient Spanish.

Fig 4. Bustamante kilns, Almadén. Photo by O. Puche.



was divulged and the development of a mining park was requested. Within this park, the following buildings and mining plants must be considered: the Almadén Old mine and Nueva Concepción mine in Almadenejos; the Academy of Mines (18th century; Fig. 5); San Rafael Hospital for Miners (18th century); hexagonal arena (18th century); Fúcares House Palace (16th century); the old San Carlos shaft⁶ in Almadenejos (18th century; Fig. 6); aludeles or Bustamante kilns (17th to 20th centuries); Carlos IV Gate and the metallurgy enclosure of Almadén (18th century); metallurgy enclosure in Almadenejos (18th century); sentenced' gallery⁷ (18th century); Retamar Castle (Middle Ages); San Aguilino; San Teodoro; San Joaquín shafts and Diógenes mine; and the House of the Superintendent. The historical mining in Almadén and Puertollano (coal) is integrated in the Spanish possible candidates for the World Heritage List.

The Jiménez Villegas Foundation was created in 1999 by Minas de Almadén y Arrayanes, Mayasa and the Local Government of the Ciudad Real Province, with the aim of recovering the Historical Mining Heritage. The plan was to rehabilitate the sentenced' gallery, restore the Charles IV Gate, and to convert the ancient miners hospital into a mining museum and historical archives. As of yet, only the miners' hospital was restored, with a grant from the Cajamadrid Bank.

It is necessary to consider not only Almadén, but also the surrounding areas such as Almadenejos. There is a vast mining heritage dating back to the 18th century, such as, the Saint Charles old shaft in the Nueva Concepción mine (where the development of a museum is also needed), or the metallurgy enclosure with the remainder of Bustamante kilns. There is also an interesting Roman mine called

Fig. 5. Almadén School of Mines. Photo from archives at Escuela de Minas.



Quinto del Hierro, i.e., Fifth of Iron, with large developing narrow trenches.

Although many positive steps have been carried out in the past few years, some important heritage elements were destroyed, for example, the access Gate to the Pozo mine enclosure was demolished during the widening of the Cordoba road at the beginning of the 1990s. The last amount of ore was extracted in May 2002 (Fig. 7).

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Fig. 6. Ancient shaft driven by prisoners, Baritel San Carlos, Almadenejos. Photo by O. Puche.



Fig. 7. Main metallurgy enclosure in Almadén: Cerco San Teodoro. The last ore stock in front of the shaft. Photo by L. Jorda, 2002.



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⁵ *Sedpgym*: Sociedad Española para Defensa del Patrimonio Geológico y Minero.

⁶ *Baritel* in ancient Spanish.

⁷ *Galería de forzados*. Prisoners used to work inside the mine, moving small shafts and doing other hard work.