

## INDUSTRY

### COPPER SMELTING PLANT CONSTRUCTION PROJECT



Mining and metallurgy sectors have traditionally been the leading branches of the industry in Armenia. Copper is being produced in Armenia since 1777, when Alaverdi (Manes) copper smelter plant was founded.



In the 1980s, Alaverdi copper smelter plant has been functioning as a major metallurgical plant, the production capacity of which per year was at about 40-42 thousand tons of refined copper, 30-40 thousand tons of copperas and 200-220 thousand tons of sulfuric acid from the gases formed.

Before the collapse of the Soviet Union, Armenia was the third copper producing country among union republics leaving ahead only Russia and Kazakhstan.

Currently, Alaverdi metallurgical plant was reorganized as the "Armenian Copper Program" Company (Armenian copper program), which annually produces around 10 thousand tons of copper. The

company mainly uses the concentrates produced by "Base metals", "Teghut" and "Zangezur Copper and Molybdenum Combine".

Further development of the sector requires the use of new technologies addressed to the creation of higher added value through the expansion of product procession.

It is expected that mining, especially production of copper will have a significant role in the development of economy of Armenia.

The operation of metallurgical enterprise engaged in copper production will have a locomotive role in the development of the economy and will promote the development of other sectors by creating new workplaces, particularly expansion of copper processing up to electro-technical copper, and later the organization of wire production will promote the development of electrical complex of Republic of Armenia.

## CURRENT SITUATION AND POTENTIAL

The significant part of copper reserves are concentrated in copper-molybdenum mines (Kajaran, Agarak and Teghut), as well as in copper-pyrite mines (Kapan, Alaverdi, Shamlugh) and gold-polymetallic (Shahumyan, Armanis) mines.



There are six companies in Armenia engaged in copper mining and in the production of concentrate, the largest companies among them are "Teghut" and "Zangezur Copper and Molybdenum Combine" companies.

In 2014, the production of blister copper was about 10 thousand tons and the production of copper concentrate amounted to about 190 thousand tons.

"Teghut" mine was put into operation in 2015, which annually produces around 100 tons of copper concentrate.

During the period of January-October in 2015, the production of copper concentrate was more than 250 thousand tons.

Currently there are 38 mines of metal minerals with approved reserves registered in the state balance of mineral resources reserves, which include 8 copper-

molybdenum, 3 copper, 20 gold and gold-polymetallic and 2 multi-metal mines.

Explored and confirmed reserves of copper deposits are assessed at about 14 million tonnes, which enables mining companies to operate for 100-120 years.

### **The feasibility and investment assessment of constructing copper smelting plant**

The feasibility of building a copper smelting plant is conditioned by the following factors:

- The produced concentrate contains 22-27% copper, the actual quantity of produced concentrate in 2015 will enable to produce about 65 thousand tons of refined copper and in case of implementation of complete projects of exploiting mines these quantity will increase significantly, as a result it will allow to get 75-80 thousand tons of refined copper from the copper. In conditions of the above mentioned amounts the operation of a copper smelter becomes more expedient.
- Considering that the content of copper in the concentrate produced by mining complexes is an average of 25%, therefore in case of exporting the concentrate the companies have to pay for the shipment of the remaining 75% of the valueless goods. The possibility of making savings of these costs is another essential factor for the establishment of a new copper smelter in Armenia.

**According to preliminary assessments the necessary investment is estimated about 400-450 million USD.**

Taking into consideration that it is planned to build a plant with capacity of producing 80 thousand tons per year and based on the point that 1 ton copper costs 4500 USD conventionally, the company's financial performance will be as follows.

<b>Production volume, thousand tons</b>	<b>Unit price USD</b>	<b>Annual revenue, million USD</b>	<b>Profitability, %</b>	<b>Income, million USD</b>	<b>Payback period, year</b>
<b>80</b>	<b>4500</b>	<b>360</b>	<b>8</b>	<b>28.8</b>	<b>13.8</b>

The fact that concentrate also contain other metals (gold, silver, zinc, etc.) and that during the manufacturing process sulfuric acid is formed is not considered in the revenue calculations, while this will significantly increase the revenue. During the manufacturing of concentrates produced in Armenia the above-mentioned factors will increase the revenue for about 20-25%.

Meanwhile, the profitability level is considered taking into account the lowest parameter.

**The strengths of the project:**

- The availability of copper mines and the possibility of processing, enrichment and production of concentrate,
- Creation of higher value added,
- Reduction in transportation costs,
- Multiplicative impact on other sectors.

**The weaknesses of the projects:**

- The emergence of possible environmental risks,
- Sulfuric acid storage and distribution problems.

**The models and technologies for building the copper smelter.**

Two models are suggested for operating the copper smelter:

- Upgrading and expanding the existing capacity, in particular on the basis of Alaverdi copper smelter,
- Construction of a new plant.

**The following technological methods may be used for the construction of the copper smelter:**

- Pirometallurgical method
- Hydrometallurgical method.