

MINING: A challenging application for pumps



Eczacıbaşı Esan Lead & Zinc Facility is operating a very old mine (500 BC) around Marmara region in Turkey. Raw ore extracted from an underground lead and zinc mine is processed at crushing, milling, and flotation facilities.

Mining, from the very beginning of humankind, has been one of the main sectors affecting wealth, level of development, and quality of life of people and countries. In conjunction with its importance, prehistoric and antique ages were named after ore names (e.g. Stone Age, Bronze Age, Iron Age). Hamdi Nadir Tural, the Business Development Director at the Turkish-based Standart Pompa shares his expertise on the various factors to consider when using pumps in mining applications.

By Hamdi Nadir Tural, Business Development Director, Standart Pompa

Mining, along with farming applications, is one of the two main applications for supplying the raw material needs of society. Developed countries gain their economic powers by effectively utilizing their natural resources. At this stage, mining is crucial with its internal economic and employment volume and raw material supply for the manufacturing industry.

Recently, mining applications reached a financial volume of 1.5 trillion USD and production of more than 10 billion tons per year. The production mainly spreads over three sectors: 75% for raw energy materials, 10% for metallic raw materials, and the remaining for industrial raw materials.

Besides being one of the biggest business sectors, mining has the

most challenging applications within. From exploration to refining, every stage during production includes extremely difficult operating conditions and critical processes. The challenges include: deep underground mining (platinum mines in South Africa reached 3500m depths), explosive atmospheres in coal mines, exposure of heavily corrosive and toxic (e.g. H₂S) media during extraction of oil and some minerals, and transportation of minerals and ore through long distances for refining purposes. Particularly, corrosive and abrasive characteristics of ore and mineral, presence of dusty and explosive atmospheres, and heavy duty operating conditions (7days, 24 hours, 365 days of running), require equipment that is designed with high reliability, strength, and safety features.

In addition to reliability, efficiency of the equipment shall primarily be considered taking into account that the operating and energy costs have remarkable importance. In this respect, equipment providing continuous production, optimizing operating and maintenance costs (yet life cycle costs), and with high-tech designs are being used in such processes.



Every year, over 120 thousand tons of lead and zinc concentrate are processed in the facility in Marmara, Turkey.





Every day 76,000 tons of ore are brought to the surface in the Kiruna mine alone, part of the LKAB company, which is roughly equivalent to the volume of a 12-story building.

The main stages of mining can be listed as below:

- 1 Exploration
- 2 Resource estimation
- 3 Feasibility and preparation
- 4 Open-pit or underground extraction
- 5 Ore preparation and enrichment (crushing, milling, enrichment, extraction, vb.)
- 6 Smelting & refining
- 7 Closing and rehabilitation after closing

Pump Applications in Mining

Pumps are used from the very first stage of ore/mineral extraction to the final product of refining processes. Being a part of these processes, pumps are running under heavy operating conditions and pumping corrosive/abrasive liquids. Running under harsh environmental conditions (dusty and explosive) and pumping liquids with particles and corrosive chemicals, pumps

should be capable of providing strength and reliability for continuous operation of the system.

Some of the pump applications used in mining are:

Wastewater handling

Water used in mining applications is contaminated during chemical and physical processes. The contaminated waste water shall be removed and transferred to treatment plants. In fact, water used in the process has to be recycled by treatments that minimize environmental effects and utilize water efficiently and effectively. In this respect, pumps are used in both wastewater transfer and treatment stages.

Drainage and dewatering

Water is used in many stages, from the extraction of ore to the refining processes. Extraction processes are only possible after draining and dewatering applications in both open-pit and underground mining. At this stage, water has aggressive characteristics because of



LKAB is one of Sweden's oldest industrial companies. LKAB mines mostly magnetite ore in some of the world's richest iron ore deposits north of the Arctic Circle in Swedish Lapland. The company was founded in 1890 and has been an important cog in Swedish export industry and industrial development for more than a century.

corrosive dissolved minerals and abrasive particles inside. Exploration and extraction processes, in particular, are directly related with dewatering and drainage applications.

Dust suppression

Generation of dust is inevitable in mining processes. Unfortunately, this dust spreads everywhere and gets into equipment, covers every single gap, clogs pipes, makes machine components get stuck, and deteriorates lubrication systems. Consequently, maintenance periods shorten as the frequency of failures increases, resulting in many problems such as production losses and high maintenance costs. So, pumps used in spraying systems have a crucial importance in dust suppression applications.

Raw water supply and treatment

Huge amounts of water is used in the mining process. Raw water can be supplied from rivers, lakes, and rain water, and is processed at the treatment plants. Transfer of raw water and its treatment are done using high capacity pumps. Since raw water is generally non-aggressive, the main challenge is to use high efficiency and reliable pumps in order to decrease energy costs and increase the system's maintainability.



Standart Pompa was involved in excavating coal from mines belonging to TKI.

Ore/Mineral transfer

In many cases, geographical locations of the mines are not suitable to build enrichment and refining plants next to the exploration/extraction area. Therefore, mineral/ore has to be transferred through long distances by trucks in solid form, or by pipelines as dissolved into a liquid. In the case of transferring by pipeline, pumps are used and are exposed to abrasive and corrosive liquids, requiring heavy-duty designs and with low life cycle costs.

Leaching and floatation

Leaching and floatation processes are the most common applications where chemical substances are widely used for separation of valuable and invaluable minerals from each other. Floatation is the process of enrichment and

separation by sinking and floating of different minerals utilizing their physicochemical surface differences. Similarly, leaching is an enrichment process utilizing chemical agents (H₂SO₄, NaOH, NaCN, NaCl). These processes require transfer of aggressive liquids and chemicals where pumps have high-tech materials and sealing systems need to be used.



TKI, Turkish Coal Enterprises, is a Turkish Government-owned company which subsidiaries coal mines all around the country. In 2013, over 30 million tons of coal excavated in the mines belonging to TKI.

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Hamdi Nadir Tural is the Business Development Director at Standart Pompa, which is a Turkish pump and pump systems



manufacturer. Previously, Tural worked

in several different positions in the R&D Department within the same company for more than 10 years. He is currently responsible for promoting innovative and tailored solutions, consulting, and training on pump plant design and installation. He holds BSc and MSc degrees in Mechanical Engineering from Istanbul Technical University. He is a member of ASME, SIAM, and Technical Committees at the Turkish Standards Institute. His current research interests includes energy management, turbomachinery design-operation-maintenance, and project management.

