

Mining



Water Management in Mining

Effast and Mining

In mines, where mineral extraction processes rely heavily on water, effective water management is essential. Effast provides plastic pipe systems for a variety of pressurised applications, which provide solutions to a number of mining processes, including water delivery and distribution, de-watering and storage, processing, and water treatment.

Effast is the 35 year well established brand made by the company Polypipe Italia, a specialist manufacturer of technical solutions made in high performance plastics. We are 100% Made in Italy, and located in Genoa.

To meet the needs of any mining project, Effast is able to engage at an early stage to deliver technical support throughout the project, from concept development to installation, and customise its plastic pipe systems accordingly. Effast is therefore able to meet the most challenging supply demands and minimize downtime, ensuring quality systems are delivered on time to customer specifications.

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EFFAST Quality Certifications

Our technical experience in product innovation helps us have a range of products that are always kept up to date and in line with all the latest international standards. For this reason, the quality of the EFFAST product is the most prestigious in the international field and covers both technical standards and permits for use with drinking water and food fluids according to the regulations in force in various countries.



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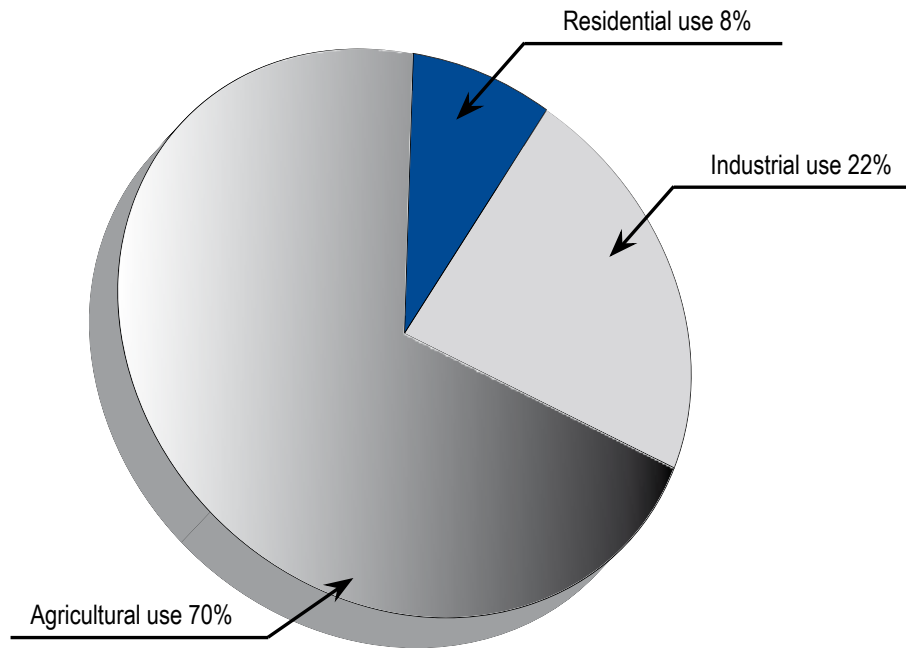


Water - a Precious Resource

Current global demand for water is at the level of 4,500 billion m³ a year and is expected to rise to 6,900 billion m³ by 2030.¹

70% of water use is agricultural, with industrial accounting for 22% and residential representing 8%.²

22%
of global water supply
is used by industry....



Water Use in Mining

- Mining uses between seven and nine billion cubic metres of water per year, which is about as much water as a country like Nigeria or Malaysia uses in total in a year.³

- Mining and burning coal account for half of all water withdrawals in the United States, which is the same amount of water that pours over Niagara Falls in five months.⁴

- An estimated 18.28 billion litres of water is withdrawn for mining a year in the United States.⁵

- Demand for water by the mining sector is likely to increase, with projections ranging from 810 billion litres of water used a year to 940 billion litres of water used a year by 2020 for Western Australia alone.⁶

The table below illustrates water use for processing and extraction by mineral/metal type⁷

Mineral/Metal type	Water use for processing and extraction
Coal	2 (Medium Low)
Copper	3 (Medium High)
Diamond	1 (Medium Low)
Gold	3 (Medium High)
Nickel	2 (Medium Low)
Iron Ore	2 (Medium Low)
Platinum	1 (Medium Low)

Key:
 High: 4 (High)
 Medium High: 3 (Medium High)
 Medium Low: 2 (Medium Low)

With different types of mines having different water requirements, platinum and diamond mines rely on water the least while, copper and gold mines are most water intensive.

Mining and mineral processing cannot take place without water

EFFAST plastic piping systems provide effective water management solutions for the following six applications, where water is used in mines:

•Water Delivery and Distribution

Delivery and distribution of water for mine operations from a number of sources from local boreholes to desalination plants.

•De-watering and Storage

Removal of waste water from mines and processing into tailings ponds as well as control of storm water.

•Processing

Once extracted, mineral ores are transported to the processing plant, where water is used to extract the metal or mineral from the host rock.

• Water Treatment

Removal of waste water to a processing or sewerage plant for treatment and possible re-use.

Sources:

- 1 National Intelligence Council's Global Trends 2030, 2012
- 2 Water facts and trends, World Business Council for Sustainable Development, 2006
- 3 Don't waste a drop, Mining Magazine, October 2011
- 4 Coal and Water, a Resource Mismatch, Circle of Blue, 2010
- 5 Estimated use of water in the United States in 2005, U.S. Geological Survey Circular, 2009
- 6 Water in Mining and Industry, CSIRO, 2011
- 7 Frost & Sullivan, 2011
- 8 Mott Macdonald Presentation to the British Water International Forum, MiningSub-Group, July 2013
- 9 Metals & Mining: a sector under water pressure. Analysis for institutional investors of critical issues facing the industry, CDP, July 2013

Water is a precious resource that needs to be protected and managed to enable the smooth running of any mining operation

Water – a resource to be protected

The use of water is essential for the effective operation of any mine. It is therefore of paramount importance to protect this valuable resource, to enable:

- The process of recovering valuable minerals from the host rock.
- The protection of local water courses and the wider environment.
- The delivery of clean water for the welfare infrastructure of the mine and surrounding communities.⁸

Water – a resource to be managed

The detrimental impacts of the mismanagement of water are:

- Cost increase.
- Production disruption.
- Transport disruption.

The top three water risks that pose a significant constraint to business operation, revenue, and expenditure are:

- Increased water stress.
- Flooding.
- Declining water quality.

Managed properly by introducing effective drainage, storage, treatment, and transportation, water can be repurposed and used as a valuable resource for mining operations.⁹

EFFAST provides innovative solutions for water management in mining or the following applications

Water Delivery and Distribution

Getting water to and from the mine is critical for it to operate effectively.

Water comes from numerous sources, including local bore holes through to desalination plants, which could be hundreds of miles away. It is then distributed to numerous areas around the mine.

Effast solutions for water supply pipework include, for example:

- Chemical and corrosion resistant pressure piping systems.
- High quality ball valves.

De-watering and Storage

Water is a business critical commodity, which needs to be carefully managed and controlled. This includes the removal of waste water to tailings ponds and the control of storm water.

Effast solutions for the control and management of water include, for example:

- Chemical and corrosion resistant pressure piping systems.
- Multi-Material system Butterfly Valves.
- Great opening angle wafer check valves.

Processing

Water is at the heart of the processing application. Once extracted, the mineral ores are transported to the processing plant, where water is used to extract the metal or mineral from the host rock.

Effast solutions for the extraction process include, for example:

- Chemical and corrosion resistant pressure piping systems.
- Ball Valves for chemical applications.
- Butterfly valves with high flow patented disc.

Water Treatment

The removal of waste water to a processing plant for treatment and possible re-use.

Effast solutions for water treatment include, for example:

- Chemical and corrosion resistant pressure piping systems.
- Water check valves, with ball or spring.
- Multi Material System Effast Valves.



EFFAST Valves for Leaching Process In Copper Industry

Proflow® Butterfly Valves by EFFAST have been selected as optimal solution to be used within leaching process for copper extraction



Multi-material solution:

**PVC-U body
PVDF disc**



Background

Copper is found in natural ore deposits in all continents. It can be found in the form of sulphides, oxides, carbonates, silicates or other minerals. About 80% of the world's known ores are chalcopyrite and bornite, which contain both copper and iron sulphides.

The ore is removed from the ground in either open pit or underground mines. 90% of ore is mined using the open pit method.

Conventional process: from ore to pure metal

The traditional process of copper extraction from its ore and conversion into pure metal is composed by several physical and chemical treatments: grinding, flotation and concentration, roasting, smelting with fluxes and conversion of matte, anode casting and electrolytic refining.

Leaching process

Leaching process represents an alternative to traditional copper mining. Firstly, the ore is treated with dilute sulphuric acid. This trickles slowly down through the ore, over a period of months, dissolving copper to form a weak solution of copper sulphate. The copper is then recovered by electrolysis. This process is known as SX-EW (solvent extraction / electrowinning).

Valves

Valves play an important role in the overall process by ensuring that various liquid flows are kept within the optimum range. Owing to the demanding requirements for some of the valve installations and the constant acidity, **selecting the optimal valves can have a positive impact on the plant's overall profitability.**

CASE STUDY

**Project
Copper Extraction, Perú**

**Application
Mining**

**Products
EFFAST Multi-Material
Proflow Butterfly Valves**

EFFAST

Technical Details

Copper oxide ores are processed using aqueous solutions to extract and purify copper in three steps:

- 1.** After mining, transporting and crushing to a consistent gravel-size, the ore is piled into a heap on top of an impenetrable layer on a slight slope. The leaching reagent (dilute sulfuric acid) is sprayed through sprinklers on top of the heap pile and allowed to trickle down through the heap, where it dissolves the copper from the ore. The resulting solution of sulfuric acid and copper sulfate is collected in a small pool, where copper concentration is around 65%.
- 2.** Next step is solvent extraction. The leach solution is mixed vigorously with a solvent. The copper migrates from the leach solution into the solvent. The two liquids are then allowed to separate based on solubility, with copper remaining in solution in the solvent, and impurities remaining in the leach solution. The leftover leach solution is then recycled by adding additional acid and sent back to the sprinklers in the heap leaching process.
- 3.** As last step, an electrical current passes through an inert anode (positive electrode) and through the copper solution from the previous step, which acts as an electrolyte. The positively-charged copper ions (cations) come out of solution and are plated onto a cathode (negative electrode) as 99.99% pure copper.

The choice of EFFAST valves

EFFAST Proflow® butterfly valves have been selected to be used for the set-up of leaching process in South America in 2020. Around 200 valves were part of this project, where a multi-material model with body in PVC-U and disc in PVDF perfectly responded to the technical requirements aiming to excellent performance with high acid resistance.

Outcomes

The leaching process can be applied to ore with as little as 0.1% copper: for this reason, leaching extraction is more and more growing in importance. Optimally selected valves simplify copper leaching, solvent extraction and electrowinning process control. The main outcomes that can be achieved in this case study regarding EFFAST butterfly valves application:

- Much less energy is used than in traditional mining.
- No waste gases are given off.
- Low capital investment.
- Ability to be operated economically on a small scale.

EFFAST PROFLOW MULTI-MATERIAL SOLUTION

The EFFAST ProFlow P Series Valves can be supplied with the multi-material system consisting of a PVC-u body and discs in different materials based on the application.

PVDF Disc: Material with exceptional resistance to acids, salts, and hydrocarbons. With the FKM gasket and PTFE seals, it can be used in the temperature range between -40 °C and +140 °C

