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Weak sulphuric acid treatment plant

Codelco

Div. Salvador

Chile

At the CODELCO, Div. Salvador copper smelter in Potrerillos, Chile, sulphur dioxide-containing process gases form during the smelting operation which are used to produce a ~98% sulphuric acid.

Prior to the production the process gases are cleaned in a gas cleaning and cooling plant (GCCP).

The so-called weak acid that forms when cleaning the process gases mainly contains sulphuric acid, heavy metals and arsenic. From this weak acid, all harmful substances have to be removed so that the effluents meet the requirements for discharge into a receiving water.

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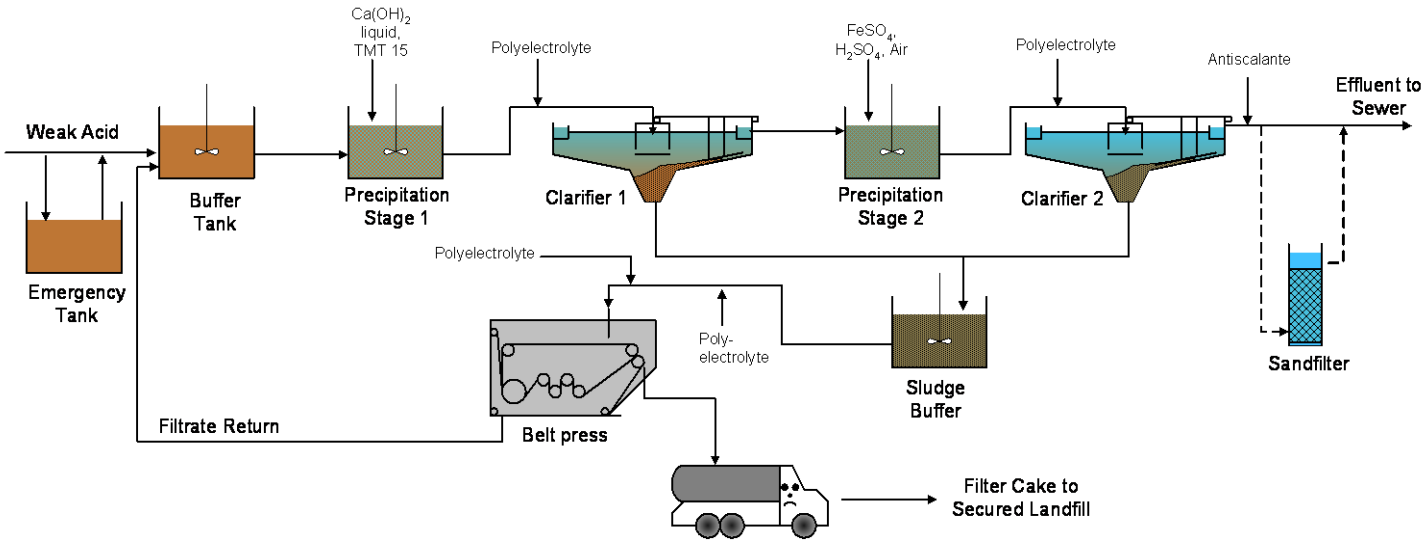
Bamag
6. El Terra St. Hadayek El Ahram - Giza, Egypt
Tel . +2 (02) 3377 2082 Fax. +2 (02) 3376 2465
www.bamagllc.com



The solid reaction products are dewatered and disposed as compact products in an adequate landfill.

1. Objective

Weak acid treatment

- Design data

Throughput	32 m³/h
Temperature	55 °C
pH	< 1
H_2SO_4	26.7 g/l
SO_2	3.2 g/l
As	11.3 g/l
Cl^-	1.5 g/l
F^-	0.1 g/l
Heavy metals	0.1 g/l

- Treatment criteria

pH	6 - 9
As	≤ 1 mg/l
SO_2	≤ 50 mg/l
H_2SO_4	≤ 50 mg/l
Filter cake	compact

2. Plant concept

- Process steps

  Buffering, pre-treatment (neutralisation), clarification, secondary treatment (precipitation), clarification, filtration, sludge buffering, sludge dewatering

- Brief description

  In the pre-treatment stage, the weak acid is neutralised by adding milk of lime. Simultaneously, most of the heavy metals and arsenic contained in the acid is precipitated.

  After settling of the solids that form in the process, arsenic is separated by chemical precipitation in the downstream secondary treatment stage to reach the required residual concentration.

  After leaving the secondary treatment stage, the treated water is subjected to final filtration thus ensuring that the required limit values are safely met. Then, the water can be discharged into the receiving water body.

  The sludge from the two treatment stages is collected and dewatered by means of a belt filter press until compact. The resulting filter cake is disposed in an adequate landfill.

  The filtrate streams that form in the plant are returned to the weak acid buffer tank.

3. Characteristic plant data

Some of the selected tank sizes are untypical for this type of plant and have been designed to accommodate the particular needs of the plant location.

- 1 emergency tank volume 5,000 m³
- 2 pre-treatment tanks volume 70 m³
- 1 clarifier Ø 18 m
- 2 secondary treatment tanks Volume 90 m³
- 1 clarifier Ø 10 m
- 1 sand filter Filter surface 4.5 m²
- Sludge dewatering 1 belt filter press
- Chemicals dosing stations

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