

Weak Acid Treatment

Atlantic Copper Huelva / Spain

Weak Acid Treatment to Produce Market-worthy Gypsum

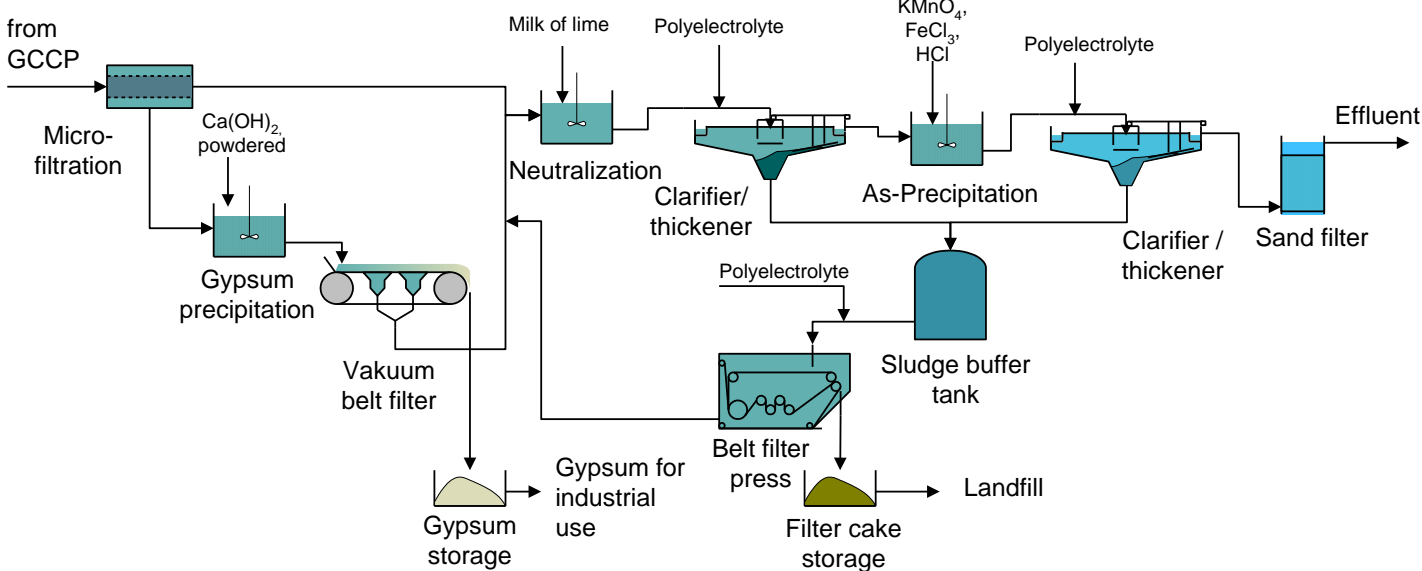


The copper smelter of Atlantic Copper in Huelva, Spain produces an sulphur dioxide containing process gas used as a basis for the production of 98 % sulphuric acid. Cleaning of this process gas in a GCCP yields a weak sulphuric acid containing heavy metals, high amounts of arsenic and solid particles.

The arsenic concentration has to be reduced to a minimum prior to discharge. The sulphates are precipitated as market-worthy gypsum. The concentration of heavy metals and arsenic is reduced to values below the statutory limits thus allowing the cleaned solution to be discharged into the receiving water.

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Only a small portion of the gypsum containing the precipitated heavy metals, arsenic and other substances has to be landfilled. In 1999, Lurgi Bamag was awarded the contract for the basic engineering of the plant, followed by the contract for the execution in 2000. In this segment of industry Lurgi Bamag has built the first plants in 1959.

1. Objective

Weak acid treatment to produce market-worthy gypsum

- Design data

Throughput	10 m ³ /h
Temperature	30 - 50 °C
pH	0
H ₂ SO ₄	ca. 30 %
HCl	6 g/l
HF	3 g/l
As	≤ 10 g/l
Zn	≤ 5 g/l

- Treatment criteria

pH	6.5 - 9
As	≤ 0.1 mg/l
Zn	≤ 1.0 mg/l

- Gypsum parameters

Solids content	ca. 65 %
Heavy metal concentration	< 0.1 %

2. Plant concept

- Process steps

Pre-filtration, gypsum precipitation, vacuum belt filter, heavy metal precipitation, clarification, arsenic precipitation, clarification, filtration, sludge buffering, sludge dewatering.

- Brief description

The plant is designed for a weak acid volume of 10 m³/h and a gypsum production of ca. 7 t/h.

In the first part of the plant the gypsum is precipitated such that the heavy metals and arsenic remain dissolved. The heavy metals are removed in the second part in a two-stage unit.

After pre-cleaning the clear weak acid is partially neutralised with solid Ca(OH)₂ with precipitation of gypsum. This gypsum is dewatered, washed and discharged into the bulk material storage for market-worthy gypsum.

In the next step the pretreated weak acid is fully neutralised with Ca(OH)₂ thus precipitating the heavy metals as well as most of the arsenic.

In the third treating step the arsenic is precipitated and flocculated together with the iron hydroxide. The sludge is separated from the water through sedimentation and the water is then subjected to final filtration.

Final filtration ensures that the limit values are safely met. Then, the water can be discharged into the receiving water.

The sludge from the first and second treating stages is dewatered by means of a belt filter press until compact.

- Special features of the system

The weak acid is neutralised with dry Ca(OH)₂ powder. The heat that forms during neutralisation must be dissipated by cooling.

Tests were performed on site using the available hydrate of lime and the original weak acid to determine the parameters that are important for the process.

3. Characteristic plant data

- pre-filtration stage	
- 3 reactors	55 m ³ each
- 1 vacuum belt filter capacity	7 t SS/h
- 1 graphite cooler	
- 2 reactors	40 m ³ each
- 1 clarifier diameter	11 m
- 2 reactors	15 m ³ each
- 1 clarifier diameter	5 m
- 1 sand filter filtration area	3 m ²
- 1 sludge buffer tank volume	30 m ³
- 1 belt filter press capacity	ca. 500 kg SS/h
- lime dosing station	
2 silos	380 m ³
- chemical dosing stations	