Case Study

GEOSENSE

PROJECT: HALILAĞA COPPER MINE, TURKEY

SECTOR: MINES

I&M SPECIALIST: TRUVA BAKIR WITH ASSISTANCE FROM ARTI GEOTEKNIK

OVERVIEW

The Halilağa Copper Mine is located in the Bayramiç district of Çanakkale in northwest Turkey.

It is an open-pit operation with an annual ore production of 6 million tons and an expected lifespan of 19 years.

The copper ore is processed in flotation cells, where ground ore is mixed with water to form a slurry and chemicals are added to render specific minerals hydrophobic.

Agitation introduces air, creating bubbles that hydrophobic particles attach to and rise with. The mineral-rich froth is skimmed off into a launder, while the remaining material (tailings) is removed for further processing if required.

Two new reservoirs are being built to meet process-water demands and provide irrigation to agricultural land, increasing capacity from 1 million to 3 million cubic metres.

Three tailings dams are also under construction to store and manage waste material, requiring extensive geotechnical and structural monitoring.

MONITORING

Truva Bakır, with assistance from Arti Geoteknik, specified a comprehensive range of Geosense monitoring sensors to ensure safety and stability during the construction of the tailings dams.

A range of instruments were deployed in boreholes to measure displacement and settlement profiles around the dams. These included wire-rope In-Place Inclinometers (IPIs), with the wire allowing targeted deformation profiles at depth beneath the dam structures.

The combined In-Place Inclinometer-Extensometers (IPI-X) instrument was also used, offering both displacement and settlement measurements from each borehole.

6 MILLION TONS ORE PRODUCED ANNUALLY

3 TAILINGS DAMS REQUIRING MONITORING

Additional settlement measurements were obtained using borehole rod extensometers, with anchor points at 15 m and 30 m connected to a surface reference head.

Pore water pressure monitoring is critical for tailings dams due to extensive site water usage. In locations where the water surface was exposed to air, vented piezometers were installed to compensate for barometric pressure changes.

Heavy-duty Piezometers were also used, directly buried within the dam embankment.

Vibrating Wire Total Pressure Cells were installed to measure effective stress (total stress minus pore-water pressure) during roadway construction.

Other instruments deployed on site include Crack Meters, a Hanging Pendulum system, a Weir Monitor, Soil Extensometers, Strain Gauges, and Thermistors.

RESULTS

A comprehensive monitoring programme has been implemented, giving project engineers clear visibility into the structural and hydraulic conditions of the tailings dams.

This will allow Engineers to optimise site stability and safety throughout the project's lifespan.

PRODUCTS USED

- In-place Inclinometer (IPI)
- In-place Inclino/Extensometer (IPI-X)
- Quick Joint Inclinometer Casing
- Borehole Rod Extensometer
- VWP-3000 range of Piezometers
- Total Earth Pressure Cells
- 3D Crack Meter
- VWCM-4000 Crack Meter
- Hanging Pendulum System
- Weir Monitor
- Soil Extensometers
- Surface Mount Strain Gauges
- Thermistors

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