Wide-area monitoring of tailings dams in Brazil

Country
Brazil

Project type:
Tailings dam monitoring

Sector:
Mining

Main product:
Monitoring Solution

Challenge

A Brazilian mine has a complex tailings dam monitoring system that covers 22 dams. The mine consultant in charge of dam monitoring, Worldsensing partner Tetra Tech, needed to gather real-time data from various sensors, including piezometers, water level sensors and inclinometers, installed across different tailings dams. The challenge was to find a cost-effective way to send the data to a database server and workstation, taking into account the fact that one site included seven dams with a 7 km radio range

Advantages

- Savings of up to 30% on the acquisition of materials and infrastructure
- Cost reductions of up to 40% on installation
- Minimized risk as a result of improved data
- Full compliance with safety regulations

Solution

Tetra Tech opted to use a wireless monitoring system from Worldsensing and installed a network of 467 Loadsensing vibrating wire, analog and digital data loggers to send real-time data to 10 gateways connected to the mine's private network.
Two gateways at one of the sites receive data from 158 Loadsensing data loggers, including vibrating wire 1-channel data loggers connected to piezometers, analog data loggers connected to ultrasonic water level meters and digital loggers connected to chains of in-place inclinometers.
For connectivity, Loadsensing uses LoRa, a long-range, low-power wireless technology used by IoT networks worldwide. Features of the system include:

- A star network topology that can cover a range of up to nine miles/15 km without any repeaters.
- A radio sensitivity of up to -137 dBm, which makes the signal up to 32 times stronger than other wireless monitoring systems.
- Data logger casings that are IP-67 rated and have been tested in temperatures ranging from -40°C to +80°C
- Certification by ANATEL, the telecommunications regulation agency in Brazil, making it apt for deployment across the country.

" We haven't had to change the batteries yet. The Worldsensing devices in this project draw very little power and vibrating wire piezometers also require little power compared to other instruments. We expect the solution to easily have a 10-year battery life."

Vincent Le Borgne
R&D Manager
GKM Consultants

Benefits

The wireless configuration of the data acquisition system eliminates the need for expensive cabling and manual monitoring. Laying cables in a tailings dam requires trenches and cable protection against issues such as embankment settlements. New sensors have to be added as the site grows, again requiring expensive cable installation. A wireless system provides data from sensors in near-real time, versus manually collected readings with a more sporadic periodicity and vulnerability to human error.

Loadsensing leads to savings of up to 30% on the acquisition of materials and infrastructure and up to 40% on installation. Reliable data on the behavior of the dam helps minimize risks and improve the safety not only of mine employees but also of local communities. Loadsensing contributes to the sustainable growth of the mining industry by ensuring compliance with safety regulations and standards.

1 - A Loadsensing vibrating wire 1-channel logger connected to a vibrating wire piezometer.
2 - The red circles represent the radio ranges of different wireless solutions in optimal conditions. The outermost circle represents Loadsensing's radio range in a site with 16 tailings dams.