

CASE STUDY



THE CUSTOMER

El Teniente, a division of Codelco Chile, located at 80 Kilometers south of Santiago and 2,500 meters above sea level, is the largest underground copper mine in the world. El Teniente has been in operation since 1904 and has a total of 2,400 kilometers of underground tunnels.

El Teniente produces 403,616 metric tons of fine copper per year, in the form of ingots refined at fire (RAF) and copper cathodes. As a result of the mining process, it produces around 5,617 metric tons of molybdenum as well.

El Teniente uses multiple mining processes, from extraction to casting and copper cathode molding. In support of these processes, its internal electrical distribution system is divided into multiple electrical substations, located throughout the mine.

THE PROJECT

Codelco Corporation has implemented a cost savings plan aimed at energy savings and power demand reduction while maintaining current productivity levels. The first step in the plan was to install measurement devices in any unmonitored zones. Secondly, existing metering systems with older technology and devices that did not fulfill the accuracy and/or communication standards of the corporation's norm committee would be replaced with a new measurement system and advanced measuring devices.

The first phase of the project required 500 metering devices, which were used mainly to update the supervisory systems of the mine (PI system and SCADA system). This first phase also required that each metering device was accessible over a communications network, for downloading of all metering information (trends, profiles, events, alarms, status and I/O events) to a central database for storage and analysis.

From many options, Codelco selected EIG measurement devices because of their quality, accuracy, field-upgradeability, accessibility, easy-to-use software interface, and open protocols.

Codelco decided on the following devices:

- Shark® 100 meter. V4 (450 units)
- Shark® 200 meter. V6 (30 units)
- Nexus® 1500 meter. V2 (6 units)

The Shark® 100 and Shark® 200 units connect to the PI monitoring system (OSIsoft), through Modbus RTU (RS485) and Ethernet. The application enables the users to access all electrical measurements both locally, by means of the display, and remotely through communication, providing real time monitoring to the control room, as well as data downloads that enable users to create reports, draw trending graphs, and perform event and alarm monitoring for any available measurement (energy, power and demand, V, I, Freq, PF, etc.).

Shark® 200 V6 analyzers were installed in remote and isolated areas with the highest electrical fault occurrence ratio and where communications are difficult or nonexistent. The Shark® 200 meters allow high speed PQ and event recording, and offer extensive logging capability.

For advanced and high speed PQ analysis, event recording and transient detection, Nexus® 1500 meters were installed at main distribution lines and underground critical points. The Nexus® 1500 meters connect to the PI system and the DCS system of the plant via RS485 through DNP 3.0 Level 2 protocol. An Ethernet connection is also available for users to remotely access the meters using Communicator Ext software, for downloading, recording, real-time trending, analysis and configuration of the meters.

