**Customer need**

The extensive mining activities in the Andes require robust electrical power supply. The harsh conditions with high altitudes and the constant risk of earthquakes for example, place very tough demands on both high voltage equipment and people.

**Effects on high voltage equipment**

Since the air pressure is lower at high altitudes, the dielectric strength of components will also be lower. For this reason, larger components are needed. Additionally, the equipment must be able to withstand the highest seismic spectra, such as described in the IEEE 693 and ETG 1.020 standards (0.5 g).

**Effects on people**

At altitudes higher than 2,400 MASL (meters above sea level), low air pressure and less oxygen often lead to “altitude sickness” (severe headaches, fatigue, weakness, nausea, etc.). Due to this, most of our customers with substations at this altitude require the most reliable solutions possible since maintenance or overhaul under these conditions is very demanding. Additionally, UV radiations dramatically increases at high altitudes with subsequent increased risks for skin diseases.

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**ABB solution**

To achieve highly reliable operations and fulfill all the technical challenges of this type of application, ABB designed a custom solution for conventional high voltage equipment. It includes among other things, reinforced porcelain and support structures with special dampers according to various seismic standards. To reduce the impact of altitude on the isolation levels of the electrical equipment, ABB also utilized more robust/longer isolators, and these were pre-tested prior to installation.

Circuit breaker operating mechanisms were specially designed with non-simultaneously operated spring charging motors, to reduce stress, cross-sections and costs of supply cables.

For some substations at 5,000 MASL we supplied DCB (Disconnecting Circuit Breaker) solutions to reduce the need of difficult maintenance at these locations. DCBs incorporate a disconnecting function in the open gap of the circuit breaker contacts, which enables smarter, safer, greener and smaller substations.

Our instrument transformers and surge arresters have also been extensively used in the region, even at 5,000 MASL. The IMB bottom-tank current transformer is especially well suited to areas with high seismic activity due to their low center of gravity.

By using ABB’s surge arresters, our insulation coordination study has reduced the need for extensive protective levels for other equipment, thus significantly reducing overall substation costs.
Customer benefits

- Increased safety for personnel and equipment
- Excellent seismic performance
- Superior insulation performance
- Flashover resistant
- Excellent performance and reliability can be assured for the lifetime of the equipment
- Less maintenance
- Reduced total cost

A complete program with full support

ABB provides complete resources in electrical high voltage technology, and stands for innovative new approaches with the focus on efficient and environmentally friendly power transmission.

Our comprehensive product line, which besides disconnecting circuit breakers also includes conventional circuit breakers, surge arresters, instrument transformers and power capacitors, makes us a comprehensive supplier of both individual high voltage equipment and complete turnkey installations.

The withstand capability of external insulation is affected by the atmospheric pressure, temperature and humidity. To fulfill the requirements for higher altitudes, the circuit breaker will need an insulation level belonging to a higher system voltage.

For more information please contact:

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