

Ergon Energy Optimizes its Asset Utilization with Online Transformer Monitoring



Australian utility Ergon Energy supplies electricity to around 700,000 customers in the state of Queensland. Its vast operating area covers over one million km² and includes expanding coastal and rural population centers, as well as remote communities. To secure efficient energy supply, Ergon Energy is increasing the use of online monitoring of their assets. Vaisala's MMT338 transmitters monitor online moisture of transformer oil helping in maintenance planning and daily grid operations.

"We find our partnership with Vaisala to be very valuable. Vaisala provides practical solutions to operational and transformer life management issues," says Greg Caldwell from Ergon Energy.

Online monitoring is used for daily network operations and for defining asset health in order to support optimal maintenance activity planning and asset replacement. When it comes to daily grid operations, the focus is on improving the asset utilization rate.

"We may need to operate the transformer either right up to or beyond its specified capacity. This can be either temporary or long term emergency cyclic (LTEC)," says Greg Caldwell, Senior Advanced Analysis Engineer Rating, Ergon Energy. LTEC is an operating condition in which a transformer is operated at higher limits to meet an abnormal system condition, which can result in accelerated aging. A transformer can be operated under LTEC conditions for months if required, until the system returns to its normal condition.

Ergon Energy is responsible for providing safe, reliable, efficient, and sustainable energy solutions to support its individual customers and the Queensland economy in general. It employs approximately 5,000 people and has an AUD 10.6 billion asset base. The electricity network consists of approximately 150,000 km of power lines along with associated infrastructure, including major substations and over 700 power transformers with capacities ranging from 5 MVA to 80 MVA.

Vast and Aging Grid Benefits from Online Monitoring

The size of the geographical area and the number of assets make grid operation and asset maintenance challenging. Furthermore, the recent development of embedded power generation and the increasing use of renewable energy sources present new challenges for the aging grid and its assets. To meet these challenges and to protect the reliability of the energy supply, Ergon Energy is increasing the use of online monitoring in its transformers and other assets.

Transformer Moisture Trend for Accurate Loading Guidance

Moisture in a transformer affects its loading capacity and may lead to a rating restriction that is lower than the specified rating. “The moisture level in a transformer affects its dielectric strength, and it is particularly important to manage this at higher loading levels,” says Caldwell. “A transformer with high moisture levels may not be permitted a cyclic overload until dry-out has occurred. This is presented as the operational limit and may differ from the nominal limit, which assumes serviceable dry oil. The operational limit is based on oil moisture levels and the temperature at the paper/oil boundary, which is driven by the loading conditions.”

Ergon Energy is well aware that online oil moisture monitoring provides the most accurate results.

“Determining the true value of water concentration in the paper insulation is difficult with traditional sampling due to the hysteresis effect of the moisture migration between paper and oil. The moisture ppm results can vary significantly depending on where in the loading cycle the sample is taken. Because online measurement allows us to see the moisture migration trend over a long period it provides a much more accurate result than traditional methods,” Caldwell explains. For example, Ergon Energy will use moisture data when providing loading guidance to its network operations engineers.



The probes of the Vaisala MMT338 Moisture and Temperature Transmitters for Oil are installed along the oil cooling circulation. The sensor at the top provides real-time data on temperature and moisture level, while the bottom sensor shows by how much the oil cools down in the radiator and how much higher the relative moisture saturation of oil is as it flows back into the transformer tank.

A Value-Adding Partnership

Ergon Energy became familiar with Vaisala moisture-in-oil transmitters when the company began collaborating with Monash University in Melbourne, which was using Vaisala sensors on its test transformer. In 2011, Ergon Energy began discussing the implementation of online moisture monitoring in its network power transformers.

Today, Ergon Energy is participating in a joint-venture research program at The University of Queensland called ‘Development of smart power transformers with intelligent monitoring, diagnostic and life management’. As part of the program’s field study, Ergon Energy’s 30/60 MVA distribution transformer was equipped with two Vaisala MMT338 Moisture and Temperature Transmitters for Oil in April 2013.

The probes are installed along the oil cooling circulation. One probe

is located at the top before the radiator and one at the bottom after the radiator. The sensor at the top provides real-time data on top oil condition, temperature and moisture level, while the bottom sensor shows by how much the oil cools down in the radiator and how much higher the relative moisture saturation of oil is as it flows back into the transformer tank. The gathered data has been analyzed and discussed together with the researchers at Queensland University and Vaisala’s oil moisture monitoring experts.

“We find working with Vaisala a valuable partnership. Vaisala provides practical solutions to operational and transformer life management issues. Temperature and moisture monitoring has great benefits for Ergon Energy,” Caldwell concludes.

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