

Application

Ensuring a reliable power supply

Generator testing avoids the costly consequences of failure

Gaal Umwelttechnik provides industrial organizations with testing services to ensure reliable generator operation. For many years, industrial companies with medium-voltage (MV) generators are the principle customers of Gaal Umwelttechnik. These companies include airports, data centers, paper mills as well as chemical plants and waste treatment plants. They all use MV generators on site to ensure a continuous, reliable power supply that is so crucial for their operations. With the experiences of more than 30 years working with generators in the area of industrial power generation, Zsolt Gaal and his team have established testing procedures for reliable condition assessment of these generators.

Using diagnostics to prevent failure

All types of generators have insulation, which is subject to operational stress and aging processes. Weak spots and deterioration in stator winding insulation in particular can eventually result in a complete failure of the machine. "The consequential costs in the event of a machine failure are immense," says Zsolt. "That is why diagnostic testing of the insulation is so important over the entire service life of generators."

Gaal Umwelttechnik uses various diagnostic measurements for reliable condition assessment of insulation; measurement

of dissipation factor and capacitance, dielectric response and partial discharge measurements. These off-line measurements are conducted by Gaal engineers on site during commissioning as well as during periodic maintenance checks throughout a generator's service life.

"We own a CPC 100, CP TD1 and CP CR500, a DIRANA and a MPD 600 from OMICRON. Together these diverse solutions cover everything that we need for primary testing on generators," Zsolt says. "You can get excellent performance out of these testing products." ▶

GAAL Umwelttechnik

Founded in 1991 and based in Hannover, Germany, GAAL Umwelttechnik is a service company that specializes in secondary testing of generator protection devices and energy distribution systems as well as primary testing for condition assessment of generator insulation systems. Its customers include industrial companies throughout continental Europe.

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Zsolt Gaal
Managing Director at Gaal Umwelttechnik
and a member of CIGRE



Data centers are one of many types of industrial companies that are dependent on reliable generator operation.

► Verifying condition with various tests

Gaal Umwelttechnik performs a number of tests on the insulation of its customers' rotating machines. This way, Gaal engineers are able to obtain a lot of information, which can be compared to verify results. "The various test measurements help us to confirm or negate any suspicions we may have," Zsolt explains. "We start with a typical voltage withstand (DC) test of the insulation to make sure that it can handle the high-voltage testing that is about to be performed. Then we conduct a power / dissipation factor and capacitance measurement over a wide frequency range with DIRANA, continued by a power / dissipation factor measurement tip-up test using the CPC 100 combined with CP TD1 and CP CR500."

With the measurement of capacitance and power / dissipation factor, also known as tan-delta, changes in the insulation can be diagnosed using the CPC 100 and CP TD1. Aging processes, changes in the insulation structure or moisture all result in measurably increased power / dissipation factor levels. Measuring power / dissipation factor over a wide frequency range using DIRANA helps to determine the dielectric response in order to differentiate between several polarization losses and power losses.

"After the dissipation factor measurement we make a partial discharge measurement with the MPD 600," says Zsolt. Partial discharge (PD) occurs in the stator insulation system of rotating machines, where local electric field stress exceeds the local electrical

strength. Compared with other dielectric tests, PD measurements allow localized weak points of the insulation to be identified.

"We achieve the best results with the MPD's synchronous, multi-channel PD measurement, which separates internal PD sources from each other and from outer noise signals common in industrial environments," Zsolt continues. "Finally we conclude with an insulation resistance measurement to make sure that the insulation was not damaged in any way by testing and that it can be returned to normal operation".

Establishing a baseline trend

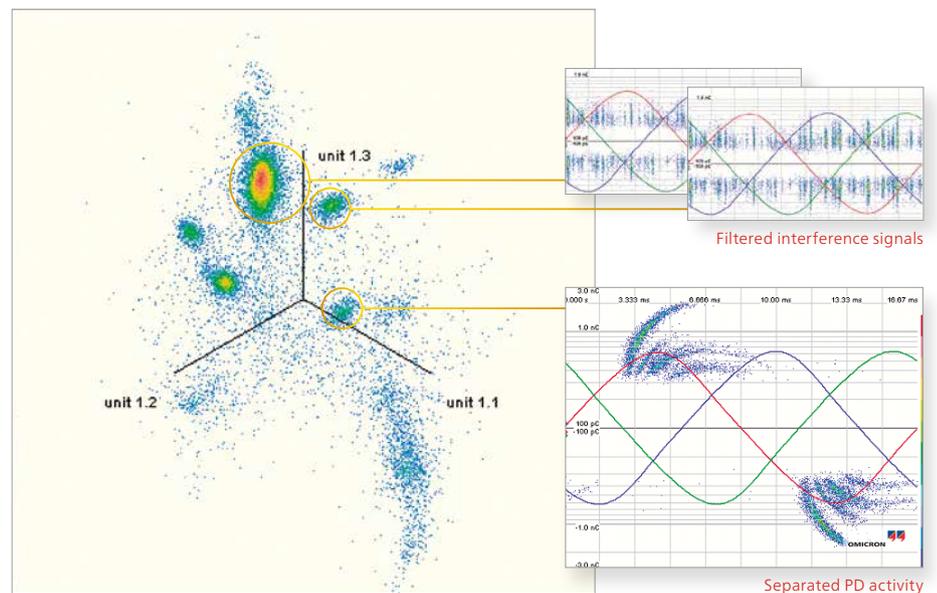
Gaal Umwelttechnik compares current measurements with previous data to come up with a reliable conclusion. "One has to



Customers of Gaal Umwelttechnik use medium-voltage generators on site to ensure a continuous, reliable power supply.

build up a trend to understand changes in condition," Zsolt says. "That is why it makes a lot of sense to start testing if you have the chance at the beginning during commissioning. This provides you with a basis that you can build on with successive measurements for a real comparison over time".

"As long as there are no unusual values, then everything is OK," says Zsolt. "However when anomalies are found during these tests, then it is important to keep an eye on them during subsequent tests. If the measurement values become progressively worse, then I recommend to the customer to take the necessary maintenance or repair measures," he says. "In this case we conduct further testing to make sure that repairs were performed successfully."



Separation through 3PARD (3-phase amplitude relation diagram)

Advanced measurement techniques allow the MPD 600 to separate internal PD sources from outer noise signals for optimal results.