

CHECKING THE CONDITION OF WIND TURBINES

On-line partial discharge (PD) diagnostics plays an increasingly important role in the commissioning and maintenance of wind power plants

Robert Gramlinger and his team at EWS Consulting in Austria perform on-line PD testing during the commissioning and later maintenance of wind turbines in various wind parks throughout the country. These periodic PD measurements allow the early detection of insulation-related faults in the system and the cables, thus preventing unplanned shutdowns of the entire medium-voltage network.

Ensuring proper operating conditions

"We have been involved with the planning and construction of about 60 percent of the wind turbines which are currently rotating in Austria," says Robert Gramlinger, who directs the office for electrical technology at EWS Consulting. "Our clients are either the manufacturers or the operators of wind turbines."

"Often a PD measurement must be carried out during commissioning of the wind turbines to make sure that the cables installed are working properly and to secure safety approval from government agencies. These are brand new cables, which were tested by the factory and are supposed to be free of PD when installed, but the plug-in terminations fitted on site

have to be checked," he adds. "We confirm this with our initial PD measurements and we repeat this check again five years later to make sure the insulation condition is still good."

OMS 605 as an on-line diagnostic tool

"To make these PD measurements, we use an OMS 605 on-line PD monitoring and diagnostic system from OMICRON, which we have already been using for three years," says Robert Gramlinger. "It is a portable case with everything you need, including three measurement channels so that you can measure PD on all three phases synchronously at the same time."

"We use the OMS 605 to measure PD activity in the 20 kV and 30 kV medium-voltage cables which connect the wind turbines with one another. We hang the high-frequency current transformers on each of the connections coming out of the cable terminations in the switchgear of each wind turbine."

"We start by shutting down the operating voltage. Then we install the HFCT sensors and set up the OMS 605 system, calibrating all measurement frequen-



cies. Then we switch the power back on and carry out all of our on-line measurements," describes Robert Gramlinger. "The PD measurements take between 10 to 15 minutes for each wind turbine. Then we turn off the power, dismantle the equipment, switch the power back on and go to the next turbine," he adds.

Multiple measurement frequencies

"Because we do an on-line measurement with operating voltage, we can always switch off cable sections on either side of our OMS 605 PD measuring system in order to investigate a fault if we happen to find one," says Robert Gramlinger. "With the OMS 605 system's adjustable frequency bandwidths, EWS Consulting is able to measure at multiple frequencies to observe different influences. Our experience has shown us that we get the best results by measuring at three, five, seven and ten megahertz," he adds. "This enables us to look at events very close up and further away."

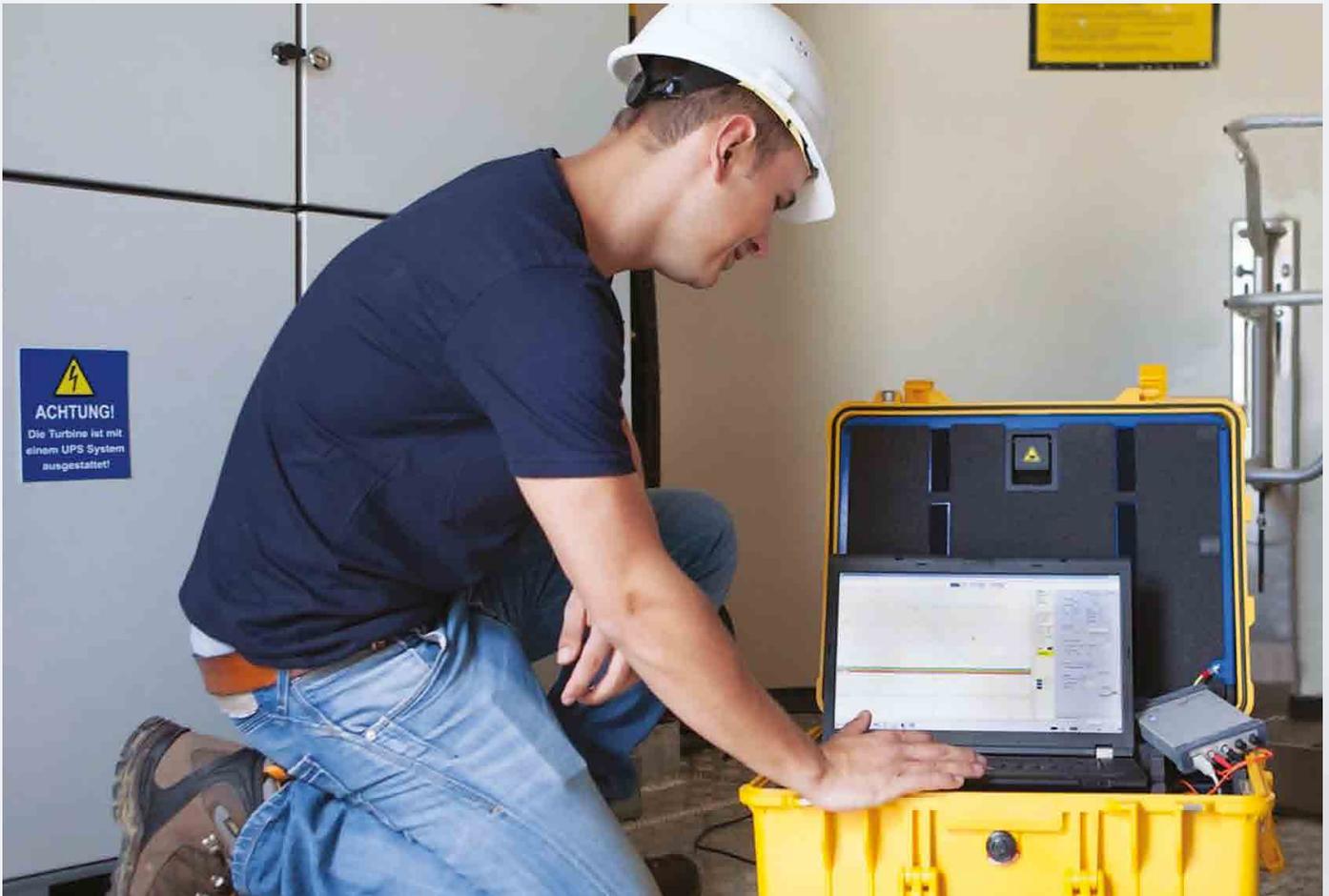
Views real-time data on a laptop

"We can easily connect our laptop computer to the OMS 605 system. Thus, we can adjust the settings and quickly look at the data after each measurement, to see whether there are any abnormalities or possible ▶

«The 3PAR diagram generated by the OMS 605 software is very useful for separating noise from actual PD.»



Robert Gramlinger
Engineering Director Electrical
Technology,
EWS Consulting GmbH



The portable OMS 605 PD monitoring and diagnostics system can be easily connected to a laptop to adjust settings and view real-time data.

disturbances from the network. Sometimes we do the measurements twice or even three times so that we get a clean measurement and to rule out that interference in the network is compromising the measurement. The 3PARD diagram (3-Phase Amplitude Relation Diagram) generated by the OMS 605 software is very useful for separating noise from actual PD. If the data looks out of the ordinary, then we repeat the measurement again to confirm."

Detailed information when needed

"Our clients receive a condition status report and they in turn give it to the local authorities for approval of their wind turbine installations," Robert Gramlinger explains. "The reports we generate for them are short and to the point – simply confirming whether everything is free of PD or not, as well as any recommended

actions. If clients want to know the details of the on-line measurements we made, we send them the recorded real-time data streams and the 3PARD pictures from the OMS 605 system."

"Detecting and finding errors is relatively simple," clarifies Robert Gramlinger. "However, since most of the measurements we have made so far are at new plants with no real instances of PD activity, we are still gathering experience with the diagnosis of faults, should they appear," he adds.

"Whenever we have any doubts regarding the data, we can call the OMICRON service team. We are able to upload the real-time data streams for review and together we interpret the data. This cooperation between EWS and OMICRON is very good." ❖