

# Ensure trouble-free electricity supply with dewpoint control

Fortum Power and Heat relies on Vaisala for accurate measurement



One of the critical jobs in power plant service and maintenance is to monitor the moisture level of circuit-breakers that are filled with SF<sub>6</sub> (sulfur hexafluoride). This is because the dewpoint of SF<sub>6</sub> reflects the circuit-breakers' ability to withstand fault situations.

During electrical power distribution, power switching or load current interruptions can lead to arc formation, which in turn may cause serious and costly cut-off of power to the distribution network. Sulfur hexafluoride gas is widely used for insulating and quenching purposes in high voltage circuit-breakers because of its high resistance to arcing. This is especially true in the case of large-scale circuit-breakers and switchgear, where no equally effective alternative to SF<sub>6</sub> has been found – even though other insulators have been sought to replace this environmentally problematic greenhouse gas.

Excess moisture in SF<sub>6</sub> downgrades its electrical insulation capabilities and can lead to the formation of unwanted by-products. To prevent critical consequences in the power distribution system, it is important to maintain low humidity in the SF<sub>6</sub> gas.

## Experts in switchgear maintenance

Fortum Power and Heat is one of the leading providers of maintenance and operation services within the industry and energy sectors in Finland. The company provides service and maintenance for a number of power utilities. Vantaa Energy, one of Finland's biggest

*Circuit-breaker maintenance includes verification of critical parameters as well as functional tests.*

*With the Vaisala meter, we end up with a reliable dewpoint reading with much less uncertainty than before.*



*The Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 with the probe DMP74C is especially designed for measuring moisture in SF6 gas.*

municipal energy companies, outsources some special service and maintenance work at its nine substations. Each substation has, on average, six 110kV circuit-breakers containing SF6 gas.

Jussi Penttinen works as a foreman in the switchgear maintenance group in Fortum Power and Heat. With 35 years of experience in the company, he has a solid background in circuit-breaker maintenance.

According to Jussi Penttinen, the servicing of a circuit-breaker is a thorough process that involves verification of the critical parameters with the appropriate measurement instruments, as well as functional tests. Typically, the circuit-breaker fields are serviced at an interval of 8-10 years, as specified by the circuit-breaker manufacturer. The place of installation and volume of operations is also taken into account when deciding the maintenance interval of each piece of equipment. When it comes to measuring the moisture content of equipment containing SF6, the maintenance team relies on the Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70.

### **Dewpoint compared with reference values**

During maintenance of a circuit-breaker, Fortum's team measures the dewpoint of the SF6, the SF6 percentage concentration and the operating pressure of the circuit-breaker. The acceptable dewpoint values in a circuit-breaker vary between -22...-45 °C (-8...-49 °F) in atmospheric pressure. The operating pressure is typically 4-5 bars, and the measurement is commonly done at system pressure. The Td/f atm calculation available in the Vaisala DRYCAP® Hand-Held Dewpoint

Meter DM70 can be used to conveniently make the conversion to atmospheric dewpoint. In addition, the humidity of the SF6 may be expressed in terms of ppm volume or weight concentration. Both of these parameters can be selected on the display as well.

If the SF6 is not dry enough to pass the inspection, it will be replaced by new gas or processed in a drying unit. In large switchgear, where hundreds of kilograms of SF6 are used, drying is the usual procedure. In circuit-breakers out in the field, the old SF6 is typically collected for appropriate waste treatment, and new gas is fed into the system.

### **Dry without a doubt**

Fortum has been using the Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 in circuit-breaker maintenance for two years, with good results: "We like the instrument because it gives exact readings. The technology we had before was not easy to use. The result always depended on who took the measurement. With the Vaisala meter, we just follow the dewpoint until it stabilizes, watch this on the graphical display, and end up with a reliable dewpoint reading with much less uncertainty than before. We also appreciate the unit's light weight and easy handling," says Jussi Penttinen.

The company has two meters that are posted from place to place as required. Jussi Penttinen has been impressed by their robustness: "We are somewhat apprehensive every time we ship them, since cargo handling can be pretty rough. But the instrument has always survived the transit without any problems, thanks to its firm carrying case."



*Jussi Penttinen from Fortum Power and Heat makes sure the dewpoint of the SF6 is up to standard at Vantaa Energy's power plant.*



*The lightweight instrument is appreciated by the service team.*