

Outages Happen 24/7 - So Should Monitoring

/ SAFEGUARD YOUR HIGH VOLTAGE ASSETS
WITH VAISALA ONLINE MONITORING



VAISALA

A Small Investment to Generate Measurable Benefits



Sometimes, solving challenges is surprisingly easy and cost effective. In the power industry, you can achieve it simply by adding knowledge.

Vaisala offers a comprehensive range of premium measurement technologies and solutions for the power industry. Our transmitters provide real-time online information about the condition of critical high-voltage assets while enabling operators to safely increase equipment performance.

Knowledge is power – literally. Accurate and stable measurements translate to savings through correct, timely decisions for optimized operational efficiency and cost-efficient maintenance.

Information for the industry's critical needs

Vaisala gives equipment manufacturers, network operators, utilities, integrators and service companies the power to solve both

daily and long-term challenges. Extending the lifetime of critical high-voltage assets, maximizing performance and yield, and minimizing risks cannot be based on guesswork. The only answer is accurate measuring - whether real-time, online or periodic spot-checking. Luckily, it also means that your work becomes easier and less stressful.

Tried and tested applications

Vaisala measurement transmitters represent decades of advanced technology development. Packaged into easy-to-use, tailored plug-in solutions for different applications, they provide you with online, real-time values of hydrogen in oil, moisture in oil, SF6 density, dew point, pressure, and temperature.

Some parameters you can monitor:

- Hydrogen in oil
- Moisture in oil
- Relative humidity
- Dew point
- SF6 density
- Pressure
- Normalized pressure
- Barometric pressure

Condition Monitoring for Power Transformers

Hydrogen in Oil, Moisture in Oil, and Temperature



Capital safety - extended lifetime

Transformers are among the most expensive assets in a power network, representing close to 60% of substation capital costs on average. Maintenance breaks are also expensive. Servicing a single transformer can take weeks and cost hundreds of thousands of dollars. Age, increased load levels, and network failures all take their toll on transformers, increasing the risk of unpredicted faults and outages.

The first step in extending the life of a transformer and reducing the total cost of ownership is implementing predictive maintenance practices, such as monitoring hydrogen and moisture levels with an in-situ probe. Hydrogen levels and their rate of change indicate the severity of fault incidents. Moisture levels reveal the

transformer's cellulose condition and the oil's ability to insulate. Increased moisture levels reduce transformer lifetime.

Condition-based maintenance can extend the operational life of a transformer by years. Accurate real-time moisture data is essential. Moisture in a transformer deteriorates the cellulose insulation, reduces the performance of the oil, and accelerates ageing. Traditional periodic checks can be insufficient for assessing the performance and safe load conditions, as temperature variations and other factors can rapidly change moisture levels with potentially serious consequences. A permanent online measurement system protects transformers by enabling timely and cost-efficient maintenance.

Facts & figures

- The moisture in oil technology developed by Vaisala has proven itself - it has been used for over 15 years by leading power industry customers in over 30 countries worldwide
- You can get both relative saturation of oil as water activity value and calculated ppm values
- Measurement is immune to oil contaminants
- Hydrogen is a general signal gas that is quickly generated in various transformer failures
- Direct H₂ measurement from oil with non-consumable sensor guarantees long-term field operation
- Easy and fast measuring - installation in minutes, via ball valve. Transformer does not need to be off-loaded
- Longest recommended calibration interval on the market for fixed moisture transmitters - 3 years

Reliable and robust hydrogen monitoring

The MHT410 Vaisala Moisture, Hydrogen and Temperature Transmitter is a reliable solution for monitoring insulating oil in power transformers online. Unlike conventional solutions, the MHT410's sensors directly measure representative transformer oil to provide non-stop, accurate trend data.

The transmitter can be easily installed and mounted onto an operational transformer in minutes by one person, with no necessary field adjustments. The MHT410 is also robust. With its non-membrane technology, the MHT410 can handle both under-pressure and over-pressure conditions. It doesn't have

pumps, hoses, batteries, valves, membranes, or other sensitive wearing parts that could fail or lead to outages. It also withstands wide-ranging temperature changes, vibration, and harsh outdoor conditions.

Continuous online moisture measurement - MMT330

The Vaisala HUMICAP® Moisture and Temperature Transmitter Series for Oil MMT330 measures transformer oil moisture online, providing an accurate real-time picture of the transformer's condition.

The MMT330 transmitter monitors moisture levels in all ambient and operating conditions and is compatible with any insulating oil.

Installation is easy and the device can be directly connected to the substation data collection system. The MMT330 has proven itself even in the most demanding conditions and has the longest recommended calibration interval on the market - 3 years.

Hand-held for spot-checks - MM70

The lightweight Vaisala HUMICAP® MM70 is a specialized hand-held moisture meter for spot-checks and short-term checks, to identify transformers with moisture issues. The probe can be inserted directly into the process through a ball valve so there's no need to drain the oil or shut the transformer down.



MHT410



MM70



MMT330

Product for online hydrogen in oil monitoring

- Reliable Moisture, Hydrogen and Temperature Transmitter: MHT410

Products for online moisture-in-oil monitoring

- Configurable transmitter for fixed installations: MMT330
- Compact transmitter with remote probe for fixed installations: MMT310
- Small transmitter ideal for OEM applications: MMT162
- Hand-held meter: MM70

Ensure Dry Insulation with Dew Point Measurement

Complete drying

When building a new transformer or overhauling an installed one, the cellulose insulation needs to be dried completely by applying heat and vacuum. After drying, the tank is purged with dry nitrogen or air. Dew point measurement is crucial in ensuring a thorough drying process by confirming the final dryness after

the nitrogen/air purge. But how do you know when dry is really dry?

Fast verification

Vaisala's fixed and portable dew point instruments offer fast response time, enabling quick and reliable verification of specified moisture levels.

Products for dew point monitoring:

- Configurable transmitter for fixed installations: DMT340
- Compact transmitter for very low dew points: DMT152
- Hand-held meter: DM70



DMT340



DMT152



DM70

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Safe Operations for SF6 Gas Insulated Equipment

Density, Moisture, Pressure, Dew Point, and Temperature



DPT145

Ensure safe operations

Sulphur hexafluoride (SF6) is used as an insulating gas in transmission and distribution equipment such as switchgears and circuit breakers. It effectively prevents arcing during switch-offs and protects equipment from failures.

In order to maintain SF6 insulation properties and to reduce the formation of unwanted secondary decomposition products, the amount of water vapor in the gas insulated system (GIS) should be kept to a minimum. Also, the SF6 system needs to be pressure tight for best insulation performance and safe operation of the equipment.

Industry first - seven parameters with one meter

The new Vaisala Multiparameter Transmitter DPT145 for SF6 Gas is a unique innovation that measures dew point, pressure and temperature with one meter, and calculates four others online, including density. The dew point measurement combined with the pressure measurement provides an excellent assessment of the condition of the SF6 and its performance. The direct normalized pressure value offers fast leakage detection. Online measurement makes it easy for you, by minimizing the time needed for field operations.

Smart savings

You need only one transmitter to get up to seven parameters. This saves money and time across the board from investment to installation, operation and service. It also means faster, risk free and more accurate and environmentally friendly measuring.

Online monitoring helps minimize on-site visits by detecting sudden and minor leaks. It also removes the need for sampling and ensures that no SF6 gas is released into the atmosphere. The instrument's long calibration interval means practically service-free operation.

Spot-Check Convenience with the DM70 Hand-Held

When SF6 dew point spot-checks are required, the Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 is the optimal lightweight, battery-powered instrument for the job. It helps optimize the field technician's work with a fast response time and internal datalogging capability. The unique auto-calibration technology invented by Vaisala ensures accurate dew point measurements and long-term stability.

Vaisala sample cells allow for dew point measurements both at gas pressure and at atmospheric pressure. The cell meets environmental regulations requiring a minimal sample size and enabling SF6 collection and recycling.

Multiparameter Online Transmitter DPT145

- Only one transmitter to be installed to provide seven parameters online
 - Measured parameters: Dew point, pressure and temperature
 - Calculated parameters: Density, normalized pressure, dew point in atmospheric pressure and ppm
- Saves time and money across the board, from investment and installation to operation and servicing
- Online measurement reduces need for on-site visits
- Fully digitalized measurement technology offers all seven parameters with less cables and need for space
- Less mechanical connections, reduced risk for leaks
- On-site verification of dew point measurement is convenient with the hand-held DM70

Achieving Best Yield for Hydrogen Cooled Generators

Monitor Humidity / Temperature for best yield

Hydrogen control

Dry hydrogen cools electric generators thanks to its high thermal conductivity and low viscosity, but it requires constant monitoring to avoid major risks. An increase in the hydrogen moisture level may lead to reduced cooling efficiency and insulation capability as well as an increase in corrosion. The worst outcome: total generator breakdown.

Built for safety

The Vaisala HUMICAP® Humidity and Temperature Transmitter series HMT360 is built to be intrinsically safe and thus ideal for monitoring hydrogen dryer performance. The sensor can be installed directly into a pressurized pipeline to provide accurate moisture measurements of the hydrogen being fed to the generator.



HMT360

Optimized Performance for Gas Turbines

Optimized Humidity and Temperature – Optimized Performance

Measure inlet air to increase output

Accurate measurement of inlet air humidity is essential for better turbine control and improved performance. Optimally cooling inlet air increases turbine efficiency, as only a 1 °C change in temperature

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Vaisala facts

- A global leader in environmental and industrial measurement, over 75 years of experience
- Customers in over 120 countries, nearly 30 offices worldwide, global distributor network
- Four service centers in China, Japan, the US and Finland
- Experience with humidity measurements in demanding industrial applications for over 40 years
- Developed oil moisture measurement technology, used for over 15 years by leading power industry customers in more than 30 countries worldwide
- Over 10 years of SF6 moisture measurements; proven track record with thousands of dew point measurement installations

can result in a 0.5% difference in electricity production. On the other hand, too cold and humid air can lead to condensation or icing, which may damage turbine blades.

Safe performance

Vaisala's humidity monitoring helps the utility operator optimize the temperature and compression of the inlet air, maximizing output without risking condensation.

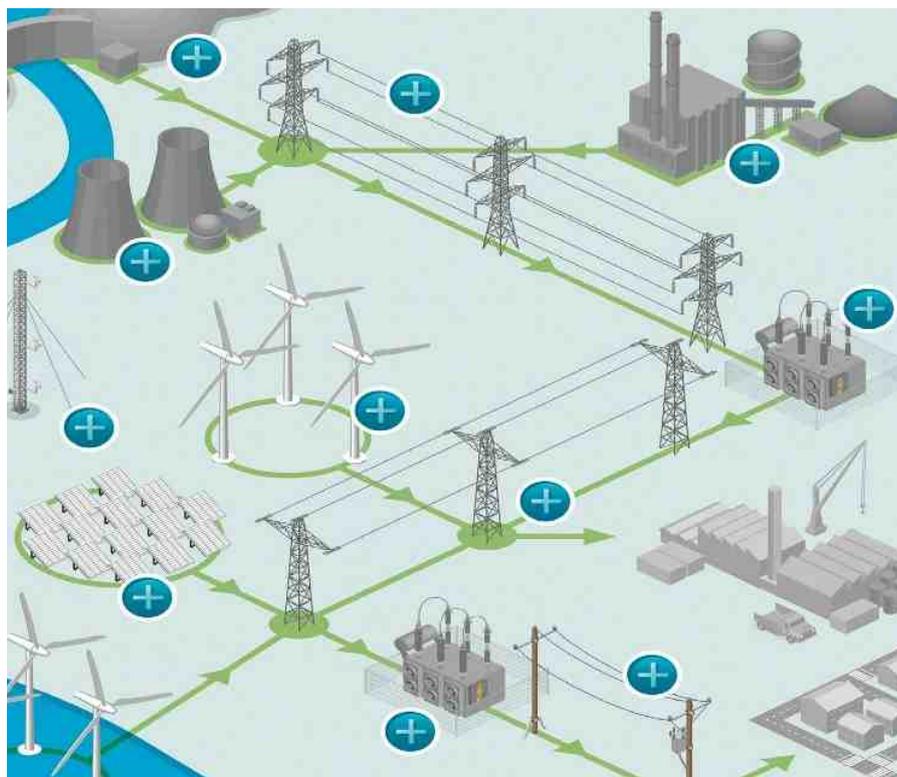
The HMT330 belongs to the Vaisala HUMICAP® Humidity and Temperature Transmitter Series and incorporates Vaisala's 40 years of experience in industrial humidity

measurement. The HMT330 uses a Vaisala patented warmed probe, which ensures sensor stability in even the most extreme and condensing conditions.

Information – any way you need it

For power industry operators the HMT330 offers reliable, stable and accurate measurements. The versatile HMT330 series gives you many options tailored to different needs: Numerical and graphical displays, multilingual menu, alarms, trends, battery secured data logging, Modbus protocol and WLAN/LAN.

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