

Temperature Monitoring Solution for Quick Detection of Fires in Fume Ducts

Distributed Temperature Sensor

The DTSX is a unique and innovative temperature monitoring system that uses a high-bandwidth optical fiber cable as a temperature sensor.



Customer Concerns

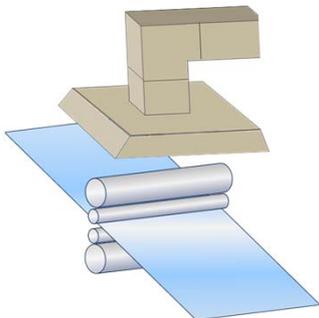
Risk of fire in rolling mills due to accumulation of oil residue inside fume ducts

In rolling mills, rolling oil is sprayed on the rollers to reduce friction and stabilize product quality. Most of the rolling oil is circulated and reused, but a small portion evaporates. The oil vapor, together with dust and other materials, is sucked up into a fume duct mounted directly above the rollers, and is then treated with a dust collector.

Over time, oil residue builds up on the inside surface of the fume duct and is dried by exposure to high temperature gasses, making it highly flammable even at relatively low temperatures. Any contact with an ignition source such as an electrostatic spark can cause this residue to catch fire, and in the worst case such a fire originating in the duct can spread throughout the structure.

Most fume ducts are cleaned periodically, but some locations high up inside the ducts can be difficult to access and clean well, making it difficult to entirely eliminate the risk of fire. It is also nearly impossible to manually monitor conditions inside these ducts.

Fume ducts play an essential role in rolling mills, and the breaking out of a fire inside such an installation can have an adverse impact on a company's bottom line by causing an unplanned plant shutdown.



The Solutions and the Benefits

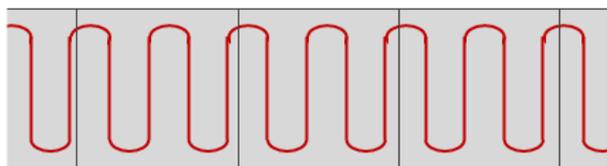
24/7/365 temperature monitoring in difficult to access locations

When its optical fiber sensor cable is installed on surface of a fume duct, the Yokogawa DTSX distributed temperature monitoring sensor is able to quickly detect any abnormal rise in temperature inside the duct. Around the clock and year-round, the DTSX is able to monitor temperature even in those locations that are too narrow or too high up for human operators to access.

Minimizing fire damage through early detection of abnormal overheating

The amount of damage caused by a fire will depend in part on how long it takes to detect it and determine its exact location. As many rolling mills are unmanned operations, the fire response at such facilities tends to be delayed. The DTSX is an ideal solution for such problems: with a resolution of just one meter, it is able to pinpoint the location of a heat buildup in as little as 10 seconds.

Together with this solution, Yokogawa provides its customers monitoring screens and reporting functions that are customized based on their specific requirements.



Cable laying example on fume duct surface (Top view)

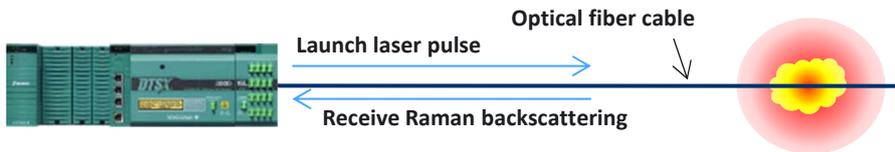
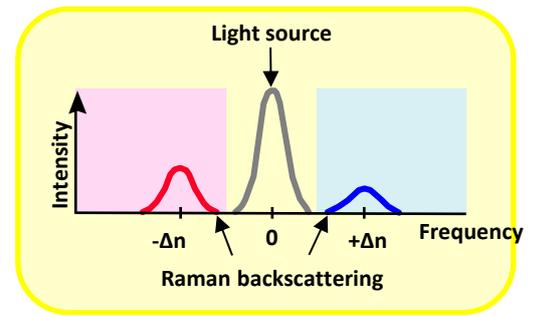
How DTSX Works

Measuring the intensity of Raman scattered light

Using pulses of laser light beamed through an optical fiber cable, the DTSX is able to detect temperature-dependent variations in signal frequency that are the result of a phenomenon known as Raman scattering that occurs along the entire length of the optical fiber cable, and it also can determine the locations of those temperature readings using light that is bounced back (backscattering) to the source.

Example: Along a 6,000 meter optical fiber cable, nearly 6,000 measurement points

By measuring how long it takes light to make a round trip back to the source (backscattering), the DTSX is able to calculate the location for each temperature reading. Abnormalities can be located with a spatial resolution of just one meter.



Advantages of the DTSX

Long distance, wide area coverage

Temperature can be monitored anywhere along a single optical fiber sensor cable that is kilometers in length. No longer is it necessary to install numerous temperature sensors for a specific application. A single DTSX can monitor variations in surface temperature at any point on the outer wall of a large reactor vessel or furnace.

Temperature monitoring in difficult to access locations

The DTSX can monitor the temperature in locations (underground, etc.) that cannot be easily accessed by maintenance personnel. Abnormal temperatures can be detected quickly and automatically.

Flexible installation

The DTSX only needs to be wrapped around objects or affixed to surfaces to measure temperature in specific locations. As such, the DTSX can flexibly accommodate the needs of all kinds of facilities, both greenfield and brownfield.

Integration with host control systems

Fully compatible with DCS, SCADA, and process automation and control (PAC) systems, the DTSX is well suited for use in integrated temperature monitoring systems.

Related Applications

In a wide range of applications, the DTSX is able to quickly detect temperature changes that are the result of equipment failures and other abnormal situations.

✓ LNG tank leak detection

Leaking natural gas can catch fire or explode. If cold (-162 degrees Celsius) liquefied natural gas (LNG) starts to leak from a tank, the temperature in the area immediately surrounding the leak will fall. A DTSX optical fiber sensor cable placed around the tank will detect that temperature change so that emergency corrective measures can be immediately taken.

✓ Detection of abnormal overheating inside bus ducts

Unlike conventional electric sensors, which do not perform well in bus ducts due to the intense electric field, the DTSX's optical fiber sensor is able to accurately monitor temperature in such locations.

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