

RH

Relative Humidity Sensor

Product Description

Caledonia Instrumentation Systems Ltd has a relative humidity (RH) sensor that can detect water in the presence of hydrocarbons. The sensor is connected into a system through a pipe manifold or by threading it into a sump or container. The instrument will measure up to 100 percent saturation Relative Humidity level. The sensor also gives out an oil temperature value which can be used to determine the condition of the system-lubricant.

When a machine runs from initial start up position, the amount of moisture within the oil will change with the changing machine runtime oil temperature. The sensor in measuring both the oil temperature and moisture content of the machine oil can use the parameters to determine any deviation or difference from a known *RH v temperature* profile. It will then give as an output in real time, instrument data that would be used to assess the change in condition due to the ingress of water into the system. The sensor will communicate using an RS232 and RS485 digital serial communication protocols. It also has the option of an analogue voltage level for Relative Humidity of 0-5 Volts DC.



Figure 1 The Relative Humidity Sensor

Product Application

The Moisture Sensor shown in figure 1 above can be used in a wide variety of applications where water intrusion into a lubrication system can cause damage to machine components and decrease the useful life of the machine and lubricant.

Applications include wind turbines, industrial gearboxes, pulp and paper mills with bearing systems and many other industrial applications. Caledonia Instrumentation Systems Ltd can, if required, facilitate the task of adapting their technology to equipment lubrication systems and assist in the integration into client control systems. This will then make the data directly available in real time when transferred to a SCADA or DCS system.



Data Analysis and Trending

The sensor determines the amount of water in the oil as the oil crosses the sensor head and outputs the value as a 'percentage RH'. This calibrated output value is referenced to the oil temperature and continually assessed over a period of time. The output data relates 'X%' RH to 'Y' degrees oil temperature etc.

The sensor will process the data within the internal microprocessor and accurately give out the RH value to the end users acquisition system and a longer term trend can be obtained. The trend line in the example shown in figure 2 shows a reasonable or normal drop in humidity as the machine went from start up to runtime temperature (at point A) for the oil. After a period the sensor picked up the intrusion of moisture into the system lubricant. This can be seen as point 'B'. The amount of water gradually increased till the sensor saturation.

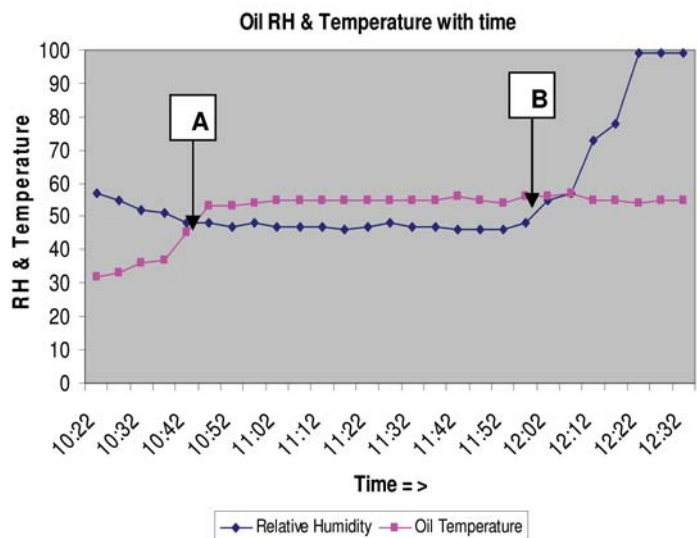


Figure 2 The Relative Humidity Sensor output trend

Longer term trending of instrument data could include the average RH value per day at the runtime temperature or the percentage rate of change for the RH when compared to the temperature of the oil at that time. The trend in showing the high levels of moisture from point 'B' would indicate that the bearing in this system would prematurely corrode and this in turn could lead to the degradation in bearing performance due to the water contamination level and the machine degradation may even continue till component and/or system failure.

Monitoring the system lubricant for moisture will maximise the useful life of the oil and allow scheduled machine maintenance rather than the expense of component failure and cost of the machine downtime due to the failure.



Product Specifications

Body Material	Stainless Steel 304 grade
Union & Manifold Materials	316 Non-Magnetic Stainless Steel
Seals	Non-Magnetic Bonded
Fluid Interface	Hermetic Glass/Metal Seal
Working Pressure	100 Bar max.
Sensor Mounting	Oil Resistant PCB with Lacquered Contacts
Working Fluid	Mineral & Synthetic Oil
Temperature Range	5° to 85° C
%RH Accuracy	±1% when calibrated
Temperature Accuracy	±2° C when calibrated
Power Supply	6-30 V DC
Current Consumption	<10mA
Data Processing	8 bit PIC Microcontroller
Data Interface	RS232 & RS485/422
Serial Protocol	MODBUS Serial Protocol
Serial Data	9600bps, 8 data bits, 1 stop bits no parity
Analogue Input	0 to 5V for 0% to 100% respectively

Product Dimensions

