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Dewpoint and dryers

Warm air coming out of a compressor will contain condensed water when it cools. Drain traps can remove the liquid but the wet air that is left will cause corrosion and freeze in the winter. The air should be dried if maintenance costs are to be minimised - and a dewpoint meter placed on the dryer outlet will give early warning of any problems plus being a useful diagnostic tool.

Recent advances in dewpoint sensors have changed moisture measurement from an art into science and advances in micro-processors have made life easier and costs lower.

The new model LPDT from Xentaur, is a compact, fully functional, loop powered instrument, smaller than some manufacturer's sensors. The 4-20 mA output is configurable for both range and units, and a 3.5 digit LCD provides a display of moisture in dewpoint °C, °F, PPM, lbs/MMSCF or g/m^3. An RS232 output allows instruments to be daisy-chained

But no matter how simple dewpoint meters become the same questions arise:

- Measure at line or atmospheric pressure?
- Install the dewpoint meter at the dryer outlet or point of use?

The most important consideration is accessibility to the sensor and an isolating valve should always be installed. A small flow chamber with integral valve is available for the LPDT allowing the user to decide whether to monitor dewpoint at line *or* atmospheric pressure. With the sensor at line pressure the instrument indicates the dewpoint at line pressure. However, if the line pressure fluctuates the dewpoint will also fluctuate as a function of pressure. With the sensor at atmospheric pressure the signal is specific to moisture content. In addition, the sensor is protected from possible damage due to saturation conditions because of the lower dewpoint.

A dewpoint meter should be fitted to all types of compressed air dryer or at the tank when nitrogen, argon or other gas is supplied as a liquid in bulk. On a large distribution system, what is fed into the system is not necessarily what is received at point of use. Long pipework can hold large amounts of water vapour and filters and small leaks also contribute to the contamination. For processes sensitive to moisture the cost of measurement has now fallen to the point where it is now feasible to fit a small transmitter like the LPDT in the same way as a pressure or temperature transmitter.

Dryer reliability, as with other equipment, has greatly improved in recent years. Even so, a relatively minor fault in a dryer can cause considerable losses in down time or damage to equipment or product. Dryer problems include:

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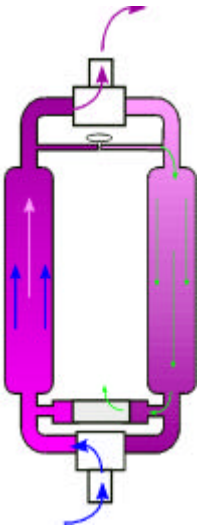
After-coolers

A small hole in the compressor after-cooler will probably not lead to gross water contamination of the system, as the air pressure is usually higher than the water pressure. Water ingress is not normally noticed until the small hole turns into a large one. But if water flow becomes insufficient in the heat exchanger or the after cooler is under-sized, hot air entering the dryer will cause major problems. Refrigeration dryers are unable to maintain a reasonable temperature and desiccant dryers become much less efficient at higher temperatures. In addition the hotter air holds far more water vapour and puts a much higher load on the dryer.

Refrigerant Dryers

The line pressure dewpoint produced by a refrigerant dryer (assuming 100% efficiency) will be about +3°C. Most fridge dryers are fitted with an air temperature sensor that is labelled " Dewpoint". However, the only way to properly measure moisture is to put a dewpoint meter on the dryer outlet. Drain valves can fail and drain points can become blocked leading to water not being removed and therefore contaminating the air.

Desiccant Dryers



Desiccant dryers normally have two beds of desiccant, one on line and the other regenerating. Fig 2 shows a heatless (or pressure-swing) dryer. Air passes through the desiccant and is dried, and a percentage of this air is used to regenerate the other tower. With heatless dryers change over of the desiccant beds occurs every few minutes. Heated dryers are similar except that the desiccant is heated during regeneration, a smaller amount of air is used to regenerate, and change over occurs every few hours.

Both types of dryer have solenoid valves and other moving parts that need to be maintained. One of the main problems is insufficient purge air when regenerating: This can be caused by desiccant dust partially blocking the vent. Desiccant dust can also get onto valve seats and cause leakage across the valves.

Older dryers are operated with cam timers that can wear after a few years and cause changeover malfunctions.

Water vapour comes from many sources and is all around us. The only way to ensure dry gas is to measure it.

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