Compressed air drying in hazardous areas

Controlling moisture levels to protect equipment and ensure safety

Background

Compressed air is often used in hazardous areas to operate tools and machinery for the simple reason that pneumatic tools are safer in potentially explosive atmospheres. As with any other instrument air application, the compressed air to be used in the hazardous area needs to be dry to avoid excess moisture building up as this could lead to corrosion or malfunction of the equipment. In hazardous areas, either a desiccant dryer or a membrane dryer is the best option as there are no moving parts to produce the risk of sparks.

Air at atmospheric pressure contains a certain amount of water vapor. When pressurized and at cooler temperatures, the amount of water the air can hold is reduced and some of the vapor returns to liquid phase water, either as visible droplets or in aerosol form (tiny liquid water droplets that are suspended in the air). Whichever form the moisture takes, it can be damaging for the equipment and the compressed air needs to be dried. (The compressed air will also contain other contaminants such as oil and dust particles which need to be filtered out, however this is beyond the scope of this application note.)

Desiccant dryers, which are also known as regenerative dryers, consist of a pressure vessel with two towers which are filled with a desiccant such as alumina, silica gel or a molecular sieve. One of the towers is active whilst the other is being regenerated. The compressed air is passed through the active tower and the desiccant adsorbs the moisture, until it becomes saturated. At this point the flow of compressed air switches to the second tower and the first is regenerated.

In membrane dryers, the compressed air is passed through a central core of hollow fibers of the membrane bundle, which removes the moisture. A portion of the dried compressed air is passed over the outside surface of the fibers to remove water vapor that has permeated the membrane, and this is vented to the atmosphere. Membrane dryers are designed to operate continuously and there is no need to switch for regeneration.

Accurate moisture or dew-point measurements ensure the efficiency of the dryers. While some desiccant dryers rely on a timer to determine when to switch from active to regeneration, many others rely on dew-point dependent switching. A dew-point transmitter is used to monitor the dew point of the compressed air leaving the dryer. As soon as this starts to rise above a certain level, the active tower is switched to regeneration. This ensures not only that the compressed air is dried to the correct level, but also that the towers are switched at the optimum point to save energy.

While membrane dryers do not need switching, accurate dew point measurements are important to ensure that the system is working correctly and to alert operators to any problems early on.

Moisture measurement options:

Michell Instruments offer a range of moisture measurement options for hazardous area use, including online and portable instruments.

Easidew PRO XP Explosion-Proof Moisture Transmitter
The Easidew PRO XP is a robust and reliable transmitter for explosion and flameproof applications. It allows installation without the need to fund, site and install an I.S. barrier system.

Easidew PRO I.S. Intrinsically Safe Moisture Transmitter
The Easidew PRO I.S. is an intrinsically safe two-wire dew-point transmitter, certified for use in hazardous areas around the world. With ±1°C accuracy, it reliably monitors moisture content to -100°C dew point.

Easidew I.S. Dew-Point Transmitter
The Easidew I.S. (intrinsically safe transmitter is a dew-point transmitter designed and certified for use in hazardous area applications globally, with certification from IECEx, CSA, FM and ATEX. With ±2°C accuracy, it monitors moisture content from -100°C to +20°C dew point.

MDM300 I.S. Advanced Dew-Point Hygrometer
This high-speed portable dew-point hygrometer provides rapid spot-check measurements of moisture in hazardous areas. Certified by ATEX, IECEx, FM, CSA, GOST and INMETRO the MDM300 I.S. is suitable for use hazardous areas around the world.

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