AN10

Temperature measurements in compressed air

1. Introduction

Gas temperature measurement is more complex than most people think. Why? Because gas (compressed air) molecules have a very low thermal conductivity compared to, for example, water. Also, the heat capacity (the amount of heat that can be stored in a gas) is much lower. Have you ever seen a central heating system use gas instead of water as transport medium for the heat?
It is important to realize this when measuring compressed air. When something heats up on the outside, there might be an extreme heat source on the inside. And when you try to measure something on the inside, the outside world will have a significant effect on your measurement.

2. Why temperature measurement

We integrate temperature sensors in all our products because of two reasons: 1) We need the temperature to compensate for the thermal mass flow sensor. And 2): The additional temperature signal provides crucial information on the performance of your compressed air system, especially on the supply side. Here are some examples:

2.1. Heat regenerated desiccant driers

With the VPFlowScope, you can measure the outlet temperature of the drier combined with flow and pressure measurement. In the drier, heat from the compressor is used to regenerate the desiccant. When the temperature gets too high, the desiccant powder has less absorbing capacity, so it is important to keep within specified limits (consult your drier's user manual).

2.2. Intercooler issues

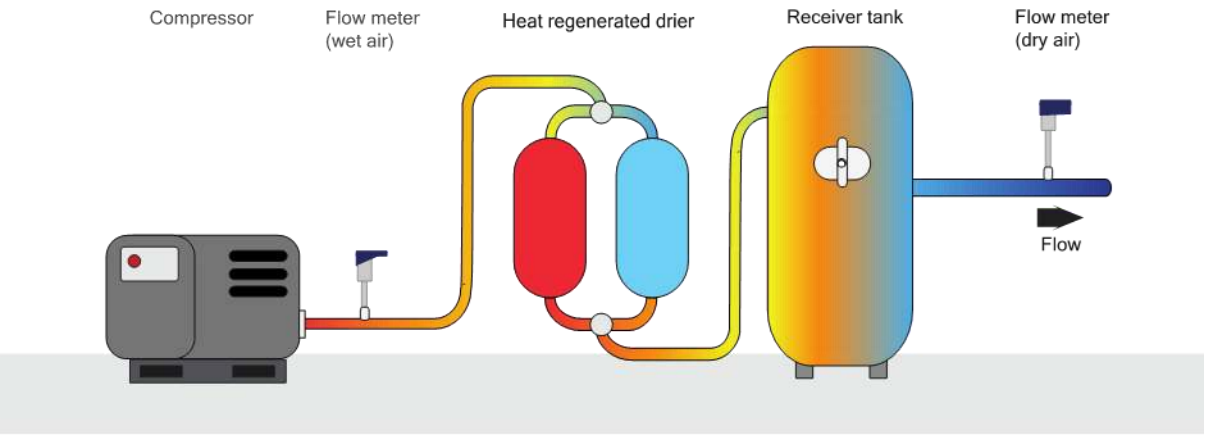
If the compressor's discharge temperature increases there might be serious issues with the air end of the intercoolers between stages. The VPFlowScope DP, when used in the discharge of the compressor, will be able to reveal these issues.
During normal operation, you can expect a temperature just above ambient if the drier is properly sized. If the drier is accidentally off, you will see a temperature increase after the drier. But you can see something else: if the air demand exceeds the drier capacity, you will see a temperature increase. So even without a dew point sensor in the system, the VPFlowScope can already indicate if there are dew point issues due to undersized driers.

2.3. Overheating of the flow sensor

You might run into situations where the flow meter is used beyond its specified max temperature. If you log the temperature every 5 minutes, you can use this signal to detect these problems instead second guessing. During overheating, the flow signal will drop to zero. It will recover once the temperature comes within the specified temperature range of the VPFlowScope.

3. Things to avoid

The VPFlowScope temperature measurement needs time to respond to changes. If you have a fast changing temperature in your compressed air system, the temperature compensation may lag behind, which will cause temporarily misreadings. So we recommend to avoid fast temperature swings. Extreme overheating is also not a very good idea. The construction of the flow sensor will age faster when exposed to temperatures above 140°C (which is already more than twice the specified 60°C). So keep it cool and keep temperature swings slow.



The figure above: in a compressed air system, temperature measurement can reveal issues with compressor discharge temperature (cooling water capacity issues), heat regenerated driers (issues with the regeneration cycle post-cooling) and refrigerant driers (too high inlet temperature).