Pipeline Drying

Background

Sasol Refinery, South Africa

Process pipelines (and chemical vessels) which operate at elevated pressures need to be tested for the integrity of their construction and sealing at the time they are assembled. Periodic retesting is also required during usage. There are a number of methods of conducting this pressure test with the most common method being to seal the pipeline or vessel and pressurize with liquid water. Gas can be used to pressure test a vessel, but it is less commonly used because of its high compressibility which would be very dangerous if a leak or fracture developed in the pipeline.

The problem with using water is that it leaves the pipeline wet after the test: This has two effects, first that the corrosion of the pipe or vessel will be accelerated and second, that the process itself may well require the pipe or vessel to be dry. So it is common practice for the pipeline to be dried after the pressure test before it is put into operation.

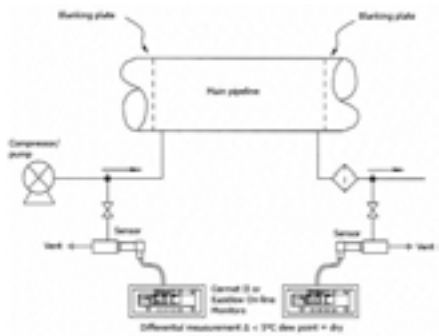
Drying Methods

Three methods of drying the pipeline are commonly used, each of which can make use of a Kahn Ceramic Hygrometer.

1. Hot Air Drying

The pipeline is fed at one end with a supply of heated air from an air compressor. Heat energy is absorbed by the water in the pipeline which speeds evaporation. The water vapor is transported by the flowing air out of an exit port located at the opposite end of the pipe to the hot air entry.

A capacitive instrument such as a Cermet II Hygrometer or Easidew Transmitter located at the air outlet will indicate completion of the drying process when the outlet air dewpoint reduces significantly from its starting value. During the process the air will be close to saturation at the prevalent ambient temperature. When the pipeline is dry, the dewpoint will reduce towards that of the feed air from the compressor.

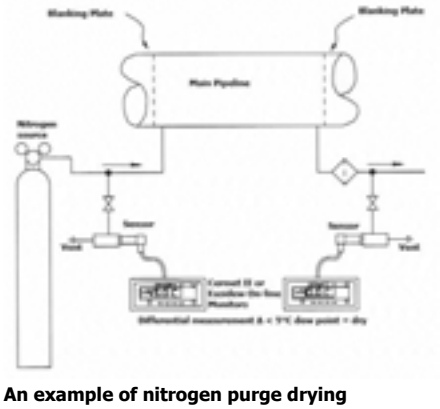


An example of hot air drying

2. Nitrogen Purge Drying

Instead of using hot air, an inert purge gas such as nitrogen may be used. Two advantages of using nitrogen are that it will be very dry and therefore have a high capacity for water adsorption and also that it is inert and can be used to prepare pipelines or process vessels that will later contain explosive or flammable gases.

The same procedure is used as in hot air drying above, often with comparison of feed minus outlet gas dewpoint being the measurement which determines the dryness of the pipeline. It is common for a differential of 10ºF dewpoint to be used as the signal for the end of the drying process.

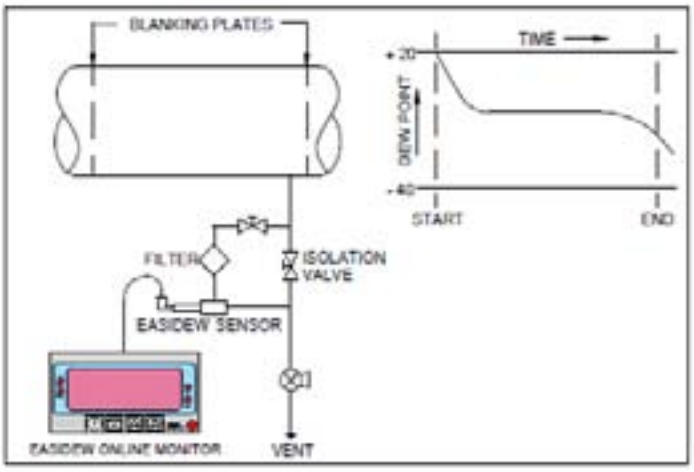


An example of nitrogen purge drying

3. Vacuum Drying

In this method the pipeline is completely sealed and then a single port is connected to high power vacuum system, which extracts air from the pipeline. Over a period of time, the humidity level in the outlet will reduce rapidly as a stable vacuum level is formed.

There will be a period where the dewpoint level stabilizes as residual liquid water is evaporated and extracted. When all the water has been removed, the dewpoint will drop again and this signals the end of the vacuum purge process. A single Easidew or Cermet II Sensor mounted in the vacuum inlet will give rapid determination of the end point. In any of the above applications, the Cermax or HygroPort Portable Hygrometer may be used if the operator needs to make spot measurements or compare drying performance at various locations.



An example of vacuum drying

WARNING: Pipeline drying applications can easily damage any moisture sensors. Filtration is strongly recommended as is only exposing the sensors to gas towards the end of the drying process.

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