Measuring interface in the LPG dehydration unit

At its liquefied petroleum gas (LPG) plant, a hydro company in Norway uses advanced capacitance technology to measure the interface in its dehydration unit.

The dehydration unit is specially constructed to remove water from LPG feed-stock, beginning with first-stage separation in a coalescer. Then a series of adsorber columns remove water, resulting in “dry” LPG that is siphoned off the top. The columns are regenerated with a counterflow of a heated drying liquid (hydro-carbon) that removes water. After cooling, the water/hydro-carbon mixture flows to a phase separator that separates the water from the hydrocarbon fluid. Water drains from the tank, and the drying fluid is recirculated into the process.

The challenge

In both the coalescer and phase separator, process efficiency depends on reliable, accurate monitoring and control of water levels to ensure the end product meets a high quality standard of less than three parts per million of water. If the adsorber receives too much water, it needs more frequent regeneration. This exhausts the adsorber pellets, uses more hydrocarbon drying liquid, and raises operating costs. Measurement instruments must be reliable in normal process conditions of 20 bar (290 psi) and 40 °C (104 °F) and during shutdown.
when reduced pressure turns the LPG to gas and the water to ice.

The solution

As a rule, the company engineers prefer a compact, maintenance-free design. Although they had considered differential pressure transmitters, they are expensive, need recalibration after shutdown, and their configuration with tubing, manifolds and terminal boxes works against the company's compact design.

Because they had successfully worked with the SITRANS LC300 on other projects (in particular, their glycol regenerators), they recommended the device for the interface measurement in this installation.

In the coalescer, the SITRANS LC300 measures the interface between water and LPG. It tells the control system to open a valve and drain water as needed. In the phase separator, the unit measures the interface of water and drying liquid. There are two SITRANS LC300 instruments in each vessel, one for measurement and a redundant unit connected to the back-up safety system. A stillpipe prevents any interference between the two instruments.

From the variety of SITRANS LC300 probe options available, they selected a PFA-coated stainless steel rod with a flanged process connection. SITRANS LC300’s patented Active Shield is electrically isolated from the probe’s active measuring section and is fully covered by an insulating sleeve, so that measurement is unaffected by vapor or condensation. Unlike traditional capacitance instruments that measure voltage drop or current flow, SITRANS LC300 measures frequency change. This provides better resolution in short spans or in low dielectric materials.

The benefits

SITRANS LC300's reliable measurement helps ensure product quality and an efficient process. It easily handles changing pressure and temperature conditions. The capacitance device was less expensive than the alternative differential pressure transmitters. Installation was simple and compact because SITRANS LC300 needs only one nozzle and needs no transmitter chemical seals, manifolds, or terminal boxes. This saved space, helping with the compact plant design. The single entry point minimizes the potential for leaks for enhanced safety, an important consideration in a process with volatile chemicals.