



VEGAFLEX 86 delivers precise measured values in crude oil processing

The separation of water from crude oil is a continuous process. There are several reasons why it is important to know where the interface between water and oil is located in the desalinator. For one thing, the high-voltage grid must be positioned in the oil phase, as this method only works with non-conductive media.

However, too much water must not be drawn off downwards. If that would happen, the treatment process for the water then contaminated with oil would be much more complex. Another reason is that the tank should be optimally utilised, which allows the separation process to run effectively.

The desalinator contains high-voltage grids that accelerate the separation process of the phases. In the process, the saline water settles to the bottom, is drawn off downwards and fed to the appropriate treatment facilities. This is done at elevated temperatures of about 130 °C to reduce the viscosity of the crude oil. The desalinated crude oil is then pumped in the direction of the distillation facilities.

Coping with fluctuating densities

From the point of view of interface measurement, there are a number of challenges here: The composition, and thus also the DK value and density, of the crude oil-water mixture changes depending on where the oil comes from. For example, the density can vary between 820 and 940 kg/m³. This means that the running time of the previously used measuring methods also varied.

Until recently, a level gauging method that works according to the displacement principle was used at this measuring point. Besides the fluctuating density, other factors also affected measurement accuracy: vibration and turbulence. Nevertheless, this measuring system had been in use at the site for many years because there was simply no alternative. A classic interface measuring method just did not deliver the required accuracy. At one point the company tried using a TDR reference sensor from another manufacturer, but it did not work satisfactorily because its compensation range was not large enough.



A respected partner at two locations

VEGA has been present with numerous pressure and level sensors at the Bayernoil locations in Vohburg and Neustadt since 2013.

A number of VEGA sensors are now in use at the Vohburg site, including many **pressure sensors** of the VEGABAR and VEGADIF series. VEGASWING 66, the universally applicable vibrating level switch, is also one of the VEGA instruments deployed there and has been particularly convincing in its performance. It is valued above all because of its very wide process temperature and process pressure range in the demanding refinery processes.

Bayernoil and VEGA worked together to develop a new solution for the problem of measurement in the desalinator. Two years ago, a measuring instrument based on guided radar, a **VEGAFLEX 86** with a reference section, was installed parallel to the existing displacement solution. The purpose was to measure the interface between oil and water as accurately as possible, especially when the DK values of the crude oil fluctuate, making it possible to operate the system even closer to its limits.

Defying vibrations and shocks

During the development of the VEGAFLEX Series 80 sensors at that time, the focus was not only on simple instrument selection and guided setup, but also on reliability and measurement certainty. The greatest advantage of the sensor: It delivers exact values regardless of media properties such as density or dielectric constant.

In **interface measurement with guided radar**, the radar pulses are guided along a cable or rod probe and reflected by the product surface. The measuring probe of the TDR sensor ensures that the signal travels down to the product undisturbed. The series consists of four different instrument types, each of which is tailored to a particular application. VEGAFLEX 86 is often used for high temperatures and high pressure applications, e.g. in distillation columns or in crude oil processing. It has a ceramic insulation and graphite seal in the coupling that can withstand the penetration of steam at a maximum pressure of 400 bar and temperatures up to 450 °C. The spacers in the coaxial probe are also made of ceramic and mechanically stable enough to withstand the vibrations and shocks.

A good solution to the problem of fluctuating dielectric constants has also been developed for this sensor. This probe was originally designed to compensate for the signal propagation time in the steam atmosphere of steam boilers. A test should now provide answers as to whether this also works in the crude oil in a desalinator. Ultimately, the innovative steam compensation ensures higher measuring accuracy. The **VEGAFLEX 86** used in Vohburg uses a reference section of 750 mm and has a probe length of 3,950 mm. Incidentally, the reference section for compensating for deviations is the longest one available on the market. The longer this distance, the more accurate the measurement.



Simple setup and commissioning

In order to improve the sensitivity of the sensor, a special signal processing algorithm was implemented in the development phase. It is based on false signal suppression during setup and commissioning. The sensor subtracts this false signal suppression from the visible echo curve. The result is a straight echo line. The responsible technicians were eagerly awaiting the results of the practical test. As expected, the test ran smoothly. Commissioning was simple – the application was configured as a “normal” level measurement. Thus, no special settings were required to ensure a reliable measurement with sufficient measurement certainty.

Test run with a positive outcome

It quickly became apparent that the advantages of the self-compensating VEGAFLEX sensor had a positive effect on measurement accuracy, even with constantly changing crude oil quality. To be on the safe side, the displacement measurement was left in place so that the measured values could be compared with one another. The test run was consistently positive for 1.5 years, with no malfunctions during the entire period. After this successful test run, another desalinator with a **VEGAFLEX 86** with reference section was put into operation last year.

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