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80 GHz radar secures cosmetic material supply

Pharmaceutical and cosmetics plants are often hesitant to replace existing sensors with different measurement devices because the effort and expense of new approvals are frequently much greater than the costs of the sensors themselves. This example from a manufacturer of special chemical substances shows that there are other ways.

Although beauty is in the eye of the beholder, it does no harm to give people a little help for their personal well-being. With this goal in mind, the multinational company Croda Ibérica SA has been supporting renowned companies in the beauty and personal care industries through the development of its products. On one hand, the products must be made from high-quality raw materials that meet the high-quality demands of the end users in this sector and, on the other, they must be sustainable. This includes, for example, the use of renewable energy sources as well as careful handling of natural resources, and the use of certified, sustainable palm oil.

Over the past decade, numerous new skin, sun and hair care technologies have been developed from natural plant-based materials. Apart from their effectiveness, the products must comply with quality assurance regulations and market analyses, and regulatory requirements must also be considered. Every cosmetic product must undergo several tests before it comes onto the market and hardly anything in an approved process may be

changed. This also applies to by-products that are manufactured in large quantities at the site in *Fogars de la Selva*, a Catalan district of Barcelona, under the name *Croda Ibérica*, which is responsible for the Spanish and Portuguese markets.

Croda Ibérica is therefore grateful for every process and measuring point that has worked reliably over many years. The company has been working with VEGA Spain for more than 10 years and relies completely on the local VEGA subsidiary, which is supported with fill-level measurement technology by its specialist parent in Schiltach, Germany.

The whole factory houses about 200 sensors



On tanks for storing raw materials, the VEGAPULS 64 allows non-contact filling level measurement down to the bottom of the tank despite internal installations such as heating coils.

of different product families, including pressure transducers, guided radar sensors, different limit detectors for liquids and solids, as well as differential pressure transducers. A special feature of the measuring points is that all of the VEGA measuring instruments and sensors used are ATEX-certified. The only fill level measuring point at which a VEGA sensor is not installed is a reactor in which temperatures of more than 300 °C are typical. Here, a weighing system is used instead.

Radar sensor with high transmitter frequency offers advantages

The VEGAPULS 64 radar fill-level measuring instrument, launched onto the market in 2016, is also in use at the site and demonstrates its advantages in the measurement of a mixture of special detergent recipes and alcohols. Here, the sensors measure the raw material levels in three tanks with heights of two, three and five metres. The result of the measurement is decisive for the further processes because the end product of this raw material accounts for about a quarter of the entire factory production.

Since very reliably measured values are crucial for the company, the expenses at this measuring point were always high. At first, differential pressure transducers were used but these led to accumulation of deposits that clogged up the pipe system. The company then switched to guided radar as a measuring principle but the structure of the tank with



built-in pipes led to heavy deposits on the inserted rod probe.

The medium, with its tendency to settle on the tank wall and installations, also led to inaccuracies in the previous measurements, while the heating coils and pipework in the reactor influenced the measuring signals. The problems at these measuring points were only solved with the installation of the VEGAPULS 64, which operates with a high frequency of 80 GHz – compared to 26 GHz with previous generations.

Because the VEGAPULS 64 measures without contact using radar technology, there are automatically fewer problems with product deposits. The radar measuring technology is also ideal from a hygienic perspective, as the front-flush encapsulated antenna, for example, can be cleaned optimally and is insensitive to the extreme conditions of the sterilise- and clean-in-place (SIP and CIP) processes.

The VEGAPULS 64 is also insensitive to deposits or formation of condensation, despite its shorter wavelength. This is achieved, principally, by adapting the sensitivity in the near range of the sensor. The distance-dependent dynamic adaptation reduces the influences of interferences directly in front of the antenna system and, at the same time, enables very high signal sensitivity at a greater distance. Reliable filling level measurement is therefore also possible during cleaning cycles.

Reduction of interference signals

The structure of the tank with its complex installations no longer has any influence on the measurement. This was achieved through better focusing of the radar measuring instrument, which depends on transmitter frequency and the effective antenna surface area. The three-fold higher transmitter frequency, however, enables smaller antenna sizes, which achieve similar signal focusing to lower frequency sensors. This enables much smaller process connections with an antenna size of just 3/4-inch, no bigger than a one-Euro coin.

The new antenna version helped to reduce the interference signals in the near range considerably. Since the antenna system is integrated into the process connection, no antenna protrudes into the tank, so it is possible to measure reliably right up to the process connection. The tank volume can therefore be better utilised to create more flexibility.



The narrow radar beam of the VEGAPULS 64 sensor allows it to be installed where metal elements exist.

Measurement down to the bottom of the tank

Another positive aspect which turned out to be extremely important in practice has emerged. With the VEGAPULS 64, it is possible to measure right down to the bottom of the tank even with quite different media. This is decisive in view of the fact that the tank must be completely emptied every two weeks.

Operators need to know that, with media of low relative permittivity, some of the signals penetrate the medium and are reflected by the bottom of the tank. Therefore two signals are returned: the actual filling level and the bottom of the tank. The signals from the bottom are greater if the relative permittivity of the medium is lower, so increasing reflection from the bottom of the tank (e.g. flat metal bottom). Due to the much shorter wavelength of the 80 GHz signals of the VEGAPULS 64, these differences are damped in the medium much more strongly than with 26 GHz sensors. The reflection from the bottom of the tank is therefore lower. This has the result that a media level measurement near to the bottom of the tank is much easier than with previous sensors.

Fast commissioning

Although the structure of the tank was complex, the conversion and installation of the VEGAPULS 64 was fast. Since the existing process connection could be used, the new sensor was simply installed on the available connection.

The procedure has already proven effective in other applications in the phar-

maceutical and cosmetics industry. Plants and apparatus have usually gone through acceptance testing, and subsequent constructional modifications are only possible at great expense. The VEGAPULS 64 thread sizes can be adapted with appropriate adapters, such as on clamp connections. Other process connections are available for use in aseptic sections in which only PTFE is used as a medium-wetted material. These process connections meet the requirements in accordance with 3-A and EHEDG.

Operation was familiar because the VEGAPULS 64 is also equipped with the proven plics® concept. The PLICSCOM display and operating module still serves for commissioning and operation of the sensors and indicates the measured values on site. No PC or special software is required. The display and operating module can be inserted into and removed from the sensor at any time without interrupting the power supply.

Wireless bluetooth communication was also introduced last year. This is particularly interesting for places with difficult access, rugged industrial environments and Ex areas. The module is downward-compatible and can be used for the entire installed base of the plics® sensors – in pressure and filling level applications with 70 different instrument types – without a software update and using the same proven operating structure. In this way, the user can configure and parametrise his or her plics sensors from a safe distance with a smart phone or tablet, regardless of whether Apple or Android. Display and diagnostic functions are also available. □