

SITRANS LR560 and SITRANS RD500

## An ideal narrow beam radar level transmitter for textile additives

### *Project at Beaulieu Technical Textiles*

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The cities of Comines-Warneton and Kruishoutem host two companies that are part of the Technical Textiles division of the Beaulieu International Group. Both companies use storage silos containing several types of polypropylene particles.

Until recently, the level in each silo was monitored using a manual float-type detection device. To increase measurement efficiency and monitor level variations automatically, the system was replaced by a radar level measurement device, working with a frequency of 78 GHz, specifically designed to measure powders, pellets, or grains.

*Industrie Technique & Management* discussed the details of this application with Bart De Bleeckere, Production & Operations Manager and Jean-Luc Dejaeghere, Project Manager from Beaulieu Technical Textiles in Comines-Warneton, as well as Gert Davidson, Application Engineer Process Instrumentation & Analytics, from Siemens.

### **Manufacturing technical fabrics**

The Beaulieu International Group (BIG), European market leader and international front-line player in the design, manufacturing and marketing sales of both rigid and soft floor coverings, furnishing fabrics, and



Beaulieu Technical Textiles purchases bulk quantities of polypropylene pellets. These pellets are stored in six silos throughout the plant.

technical fabrics, is a Belgian industrial group created in 2005 by merging five independent branches of the Beaulieu group. BIG is an integrated vertical company, specializing in the production of raw materials, semi-finished products, and finished goods. With thirty sales and production plants in eight countries and 3,500 employees throughout the world, the company generated a turnover of approximately 1.4 billion euros in 2012. The Comines-Warneton and Kruishoutem plants form the Beaulieu Technical Textiles division.

Beaulieu Technical Textiles produces technical fabrics for various applications, such as textile for tufted carpets, geotextiles such as those used to strengthen linings, or covers; canvas used in horticulture, films for lower roofs, and packing materials. The production process starts with polypropylene (roughly 90%) and polyethylene (roughly 10%), with additives such as chalk, dyes, or colourings and other materials (such as UV stabilizers).

Polypropylene particles are delivered by truck as loose bulk products. They are purchased based on type (quality, fusion) and supplier (as batches). There are a total of six silos. One of the main suppliers of raw material is Polychim, based in Dunkerque, which is also part of the Group. The other raw materials are delivered in bags and bigbags, depending on quantities required.

Raw materials are mixed to obtain a preliminary product, required to prepare other products. The mixture is transferred to an extruder, which transforms it into film. This film is cut into strips, just a few millimeters wide, that are wound on a coil. Coils are then placed side by side and hundreds of threads are wound around them to form shafts. These shafts serve as basis for the warp



SITRANS LR560 radar transmitter for solids level measurement and SITRANS RD500 remote data manager.

threads used for the canvas (longitudinal threads). Once the weaving process is complete, a special coating is applied to these cloths, depending on the application. Packing films, for instance, are treated with a moisture-proof coating.

#### **New level measurement improves inventory control**

Purchasing policies vary depending on market price fluctuations. However, there always has to be some material left in stock to avoid production stops. For this reason, silo levels have to be constantly monitored.

These silos were previously equipped with a manually activated plumb-bob device. This required daily on-site interventions to carry out the required measurements: pressing a button to unroll the cable, making sure the sensor reached the material level, recording measured levels and rolling the cable up again. Any electromechanical device dysfunction required human intervention to repair faulty components. Silos used to store polypropylene pellets were installed 25 years ago, so even normal wear and tear resulted in more and more frequent breakdowns.

The company hoped for a valid alternative using devices available on the market. During last year's Siemens Road Show, Beaulieu management discovered the new SITRANS LR560, the first radar level measurement system for solids particles with 78 GHz frequency. The SITRANS LR560 is a 2-wire non-contacting FMCW (Frequency Modulated Continuous Wave) radar instrument, measuring up to 100 meters (328 feet). Anyone can program the instrument on site using integrated programming keys. Thanks to the graphical



The SITRANS LR560 is currently the only instrument available on the market operating at a frequency of 78 GHz.

Quick Start Wizard, the instrument is up and running in just a few minutes.

#### **Increased measurement accuracy thanks to higher frequency range**

Measuring level using radar technology involves the emission of short microwave pulses that are reflected by the surface of the liquid or bulk solid. The level is calculated based on silo dimensions. Normally, the frequency used in radar level measurement is 6 GHz or 26 GHz. This frequency is suitable for measuring liquids or coarse-grained bulk solids. Fine grain solids can, however, send incorrect signals and lead to measurement errors. This phenomenon is due to pulse dispersion (multi-path reflections). As a result of this dispersion, the number of radar pulses reflected back to the instrument is insufficient, making measurements difficult.

Using a radar device to measure products stored in a tank can be even more complicated due to the presence of diagonal cones (slanted towards the top when the tank is full, and towards the bottom when it is emptied). Consequently, the radar pulse is not reflected back in the direction of the sensor. As well, polypropylene is a material with a low dielectric constant. In an attempt to obtain reliable results, the radar transmitter was tilted so that the beam hit the cone area on a perpendicular angle. This, however, is not sufficient to correct measurement errors on 6-26 GHz radar.

#### **Short wavelength**

Siemens Milltronics in Canada began developing the SITRANS LR560 some years ago. The idea was to design

another instrument for level measurement of dry materials, to provide an alternative to the oriented radar, which involves a complex setup in the silo and has cables that are subject to wear.

The laws of physics brought the solution: the higher the radar frequency, the shorter the wavelength. Consequently, particles produce fewer reflections, leading to the reflection of a larger number of pulses back to the sensor, and increased measurement accuracy. Today, the Siemens SITRANS LR560 is the only high frequency device that uses 78 GHz. The short wavelength guarantees reliable level measurements of granular solids, even those leading to wider spillage cones.

The SITRANS LR560 measurement radar also has a narrow beam signal (just 4°). A conventional radar instrument would require a parabolic or dish antenna to provide similar results, leading to a fragile construction. The reduced beam increases measurement accuracy and reduces the risk of interference caused by silo walls and other obstacles. The radar pulse can easily be directed towards the lowest point of the silo cone, so that measurements are carried out from the real zero setpoint, hence eliminating any applicable blanking. Thanks to this short wavelength, the instrument has a lens antenna, designed specifically by Siemens. Consequently, the instrument is very compact and highly resistant (the antenna is integrated in the enclosure). The device can be fitted with an optional air purge for measurement applications with very sticky solids.

#### **Radar level measurements in Kruishoutem**

Following two months of testing with the new device, the customer purchased six measurement units. Every



Level transmitters are connected to the SITRANS RD500 remote data manager.



With this system from Siemens, Beaulieu Technical Textiles can now perform inventory monitoring in the silos without any human intervention.

instrument was equipped with a built-in air purge cleaning system that turned out not to be necessary for the application.

The SITRANS LR560 is compatible with HART, Profibus PA, or Foundation Fieldbus protocols. For the latter, however, level measurements are transmitted via the 4 to 20 mA signal to a very user-friendly SITRANS RD500 remote data manager. This device includes a data logger, ensuring regular back-ups of level measurements in the six silos via flash memory. It also includes an adjustable alarm handling module, accessible via any web browser.

The device is connected to the company's internet network, giving authorized personnel real-time access to volumes (and hence consumption) with any browser. The data recording device is also equipped with a GSM modem, making it possible to send SMS warnings or pre-warnings to managers when the recorded level is too low. Inventory levels are monitored without human intervention.

Measurements were carried out without any problems for 12 months in Comines. As a result, since early 2012, four devices have been installed on the silos at the Kruishouten plant. The installation was completed in three days. The most time-consuming part of the setup involved routing power wiring and Ethernet cables over the silos.

Siemens AG  
Industry Sector  
Sensors and Communications  
76181 KARLSRUHE  
GERMANY

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