# Focused on the Essentials!

## A new high frequency bulk solids radar level sensor from VEGA reaches yet further into the most challenging process application areas.

**Radar level sensors are a proven a success story for bulk solids level, in some industries they have superseded measuring devices like electromechanical and ultrasonic in many sectors. Their immunity to pressure, temperature, in-flight dust, good focusing and no loss of echo - even during pneumatic filling, have seen the areas of application extended. Although users are increasingly adopting this microwave technology, it is still recognised that a level sensor which truly covers all applications has not yet been realised. Now, with a higher frequency and performance capability, the new VEGAPULS 69 radar designed for bulk solids comes a big step closer to this ideal.**

This new level device operates with a frequency of 79 GHz, enabling a much tighter focusing of the transmission signal, this means it easily avoids interference from internal structures inside vessels. With latest generation microwave components, even the tiniest reflection signals can be measured. This means previously difficult to measure products with very poor reflective properties, such as high purity plastic powders or wood chips, can now be measured with confidence. VEGAPULS 69 also offers versatility over a much wider application range. With measuring capability from one or two metres...right up to 120 m, and an accuracy of ±5 mm, it still has enough performance reserves for unusual assignments, such as deep mine shafts or for fast response distance measurement on conveyor car systems.

### Focused on measurement reliability

The ‘beam angle’ of the radiated radar energy and therefore the focusing, depends on two factors: the transmission frequency and the active antenna area. This means at a higher frequency, much better focusing is achieved with a smaller antenna size. The VEGAPULS 69 operates with a transmission frequency of approximately 79 GHz and a 75 mm antenna, which achieves a beam angle of only 4° (compared to 26 GHz at 75mm – which has a beam angle of 10°) Why is this so important? The narrower 79 GHz beam misses internal installations and vessel wall build up, which makes the measurement more accurate and reliable. This ability makes commissioning much easier and faster, with fewer ‘tweaks’ like ‘false signal suppression’, ‘masking’ or ‘mapping’ (depending on manufacturer terminology). This focusing also means less signal is scattered and more signal returned, so any applications which previously returned very small reflections, like plastic pellets with very low dielectric figures, greatly benefit from this focusing.

Plastic powders or pellets are usually stored in high, very narrow silos. Circumferential welds, even if they are only a few millimetres wide, can cause repeat interference reflections in silos over tens of metres. In the worst case, there can be one of these welds every half metre, which can interfere with the useful signal. It is always difficult, especially with plastic powders with very low reflective properties, to filter out the right signal. In some cases large parabolic antennas had to be used to achieve the focusing needed to reduce the interference signals. But these large antennas are no always practical.

Another application which benefits particularly from this narrow beam angle is measurement in segmented hoppers or mixing silos in the cement and building materials industry. These multi-compartment silos often have corrugated reinforced plates as the partitions. In comparison with the signal reflected from the product level, these plates can cause very heavy interference, which can be ignored with complex evaluation algorithms, but not always successfully. Another option is using guided wave radars or capacitive based systems, but the problems of roof loading, cable wear from the stones, changing materials and cable fixing at the bottom, is far from ideal.

Food based bulk solid products vary greatly and range from abrasive grains, very fine adhesive powders to dusty by-products, these are measurements you need to rely on. A non contact measurement is preferred (i.e. with no cables for cross contamination, wear, roof loading or breakage), and a radar level is the perfect answer for intelligent foodstuff management. In large facilities the products are usually stored in high, slim silo blocks to concentrate a high volume and store the widest variety possible into a compact area. Increasingly these higher silos are being used, which brings many measuring principles up to their physical limits. In smaller sites, the whole plant can be dependent on a supply from only one or two silos. A reliable level measurement in all these different applications is essential for production and logistics planning, as well as optimising replenishment by the appropriate route planning. One device, VEGAPULS 69, works reliably on all these applications from a few meters up to 120m. The right measurement data avoids unnecessary costs and deliveries.

**Dynamic performance**

The user also benefits from the dynamic echo tracking with the VEGAPULS 69. This dynamic range i.e. the difference between the largest and the smallest signal, in radar sensors makes a statement about the real capability of a sensor and the applications it can be used in. The greater these dynamics, the wider the range of application of the sensors.

Because of the very large 120 dB dynamic range of the new VEGAPULS 69, even the smallest reflections can be measured. This achieves excellent certainty and reliability for media with good reflection properties such as coal, ore and rocks, but even media with poorer reflection properties such as plastic powders, fly ash or dry sawdust can be measured confidently by the new technology. With the possibility of measuring ever smaller reflection signals, even

polystyrene pellets or extremely light fumed silica applications are possible. This universal application capability offers great advantages especially in applications in which very different media are stored. For example, in the grain processing industry, the silos often fill with different products from wheat, corn or bran, as required. Because of the high dynamics of VEGAPULS 69 the sensor now covers a very wide area of application.

**Versatility in performance**

The measuring range is also a sign of the performance capability. Thanks to the good focusing and the high dynamic range, the VEGAPULS 69 can reliably measure poorly reflecting bulk solids, even at a distance of 120 m. Longer ranges are common in quarrying and mining, where the higher focusing also plays a role because the rock walls have a rough surface and there are fewer interference signals. The system is designed so that the sensor also operates with the same performance over the smaller measuring ranges. This comes as a benefit to users of conveyor belts, for example, in which distance measurements need to be made under very harsh conditions. A fast measurement is also necessary because the level on the belts changes very quickly. The cycle time of the new VEGAPULS 69 is less than one second with an accuracy of ±5 mm. So even applications in crushers, where very fast moving stone levels need to be monitored, sometimes from far above to avoid damage, are ideal for VEGAPULS 69.

**Equipment features**

The new VEGAPULS 69 is available in two versions, a simple version with a light plastic antenna of PP and an integrated lens antenna. (The encapsulated antennas are insensitive to deposits and ensure trouble-free operation even under harsh conditions) The flanged version has an integrated swivel holder made of high quality stainless steel, which can be used to align the sensor in a range of ±10°. On this version an purge air connection, which ensures efficient cleaning across the antenna face in extreme applications, is provided as standard. This is ideal, for example, in the measurement of very dusty wood based products or some foodstuffs.

Inspired by the spirit level Apps on smartphones, VEGA engineers came up with something special. They have developed an App to set the inclination for the measuring instrument. If it is possible to get the camera to look through the mounting nozzle down into the silo (using the light/flash if needed) pointed at the outlet, it will automatically calculate the angle you need from the picture, or you can calculate the angles from input of dimensions. Then, after installing the sensor, align it precisely by placing the smartphone on the top and the app will tell you when it is in the perfect position!

**Proven already!**

All though new to the market, the radar level measuring instruments have been installed in various test applications over the last year. These so-called ‘zero series’ have been in use worldwide in many different ‘real life’ applications with many successful outcomes. Most

importantly in this period, parameters and echo curves were monitored, to optimise the sensor algorithms and perfect their performance. This means VEGAPULS 69 is launched with an already proven track record in the field. More detail about some of these tests will be published soon. Download the VEGA App from your smartphone App store. If you would like to make a test of your own or further details contact VEGA Controls: info.uk@vega.com

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**Interview:**
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***Until now you have kept a fairly low profile as far as the demand for higher frequencies for radar measuring instruments is concerned. Why have you now decided to offer a radar measuring instrument with a frequency of 79 GHz after all?***
***Skowaisa:*** With well over 100,000 radar sensors in the bulk solids sector alone, VEGA is very experienced in this field. In addition to the interesting, better focusing at a higher frequency, the limited dynamic range of the components was a reason why we have waited. In recent years, the 79 GHz radar technology has developed rapidly in the automotive industry. New components which can measure even the smallest signals and still have a very low energy requirement came onto the market. The time was ripe for launching a new radar sensor onto the market that meets our requirements.

***Does the bulk solids world really need a new radar measuring instrument?***
***Skowaisa:*** Although we can cover a large part of the bulk solids sector, there are still applications in which better focusing or a greater dynamic range would be an advantage. If the technical possibilities exist, it is logical to exploit them to offer our customers a further possibility to solve their respective complex level applications. With the VEGAPULS 69 we are adding a further piece to the radar technology application area.

***Does the VEGAPULS 69 now come close to the aim of a universal sensor in the bulk solids industry?***

***Skowaisa:*** That is certainly the case. The sensor is not only suitable for media with low reflection properties and larger measuring ranges but also covers all standard tasks. Therefore we have also created two different antenna systems for the different measuring tasks. Practice will show whether the sensors with the higher frequency will bring a better solution for all previous measuring tasks. More than 10 years of experience with the previous 26 GHz technology cannot be replaced with a new system overnight. Our focus for the development of the new sensor was on extending the range of application. The practical tests have been very positive so far – the tendency towards a universal sensor is certainly there with the new instrument.

However, there is certainly still no sensor that can cover all applications but the new VEGAPULS 69 is used in many different applications – from small bulk solids containers to large warehouses. To meet the different requirements, different versions have been used up till now. The new sensor now has enough power reserves for smaller measuring ranges and can also be used at heights up to 120 m for level and distance measurements.

***The VEGAPULS 69 was launched late in 2014. How were the pre launch tests?***

***Skowaisa:*** We distributed a large number of sensors worldwide to get extensive feedback. Of course, many of our colleagues have the ambition to use the instruments where we have reached our limits with the previous technology, i.e. in especially difficult applications. We get detailed reports of every measurement and are often surprised what is possible with the new instruments. In addition to the good focusing, the great dynamic range, i.e. the possibility of detecting even extremely small reflection signals, is the great advantage of the new instrument.