

The image shows a close-up of a person's hand holding a small amount of blue, spherical fertilizer granules. The hand is positioned over a patch of dark, rich soil. To the left of the hand, a small, vibrant green seedling with several leaves is growing out of the soil. The background is a soft, out-of-focus green, suggesting an outdoor agricultural setting.

Phosphorus – crucial mineral for food and feed production

Russia's largest phosphate mine turns to Siemens for accurate measuring

Apatit, part of the PhosAgro group, is the world's largest producer of high-grade phosphate ore and Russia's only producer of nepheline concentrate.

If you asked the general person on the street about phosphorus, you might get a puzzled look. He or she probably wouldn't know that this little-known element is fundamental to all living organisms. Phosphorus is essential for the creation of DNA, cell membranes, and for bone and teeth formation in humans. Phosphorus is one of three nutrients, along with nitrogen and potassium, used in commercial fertilizer, giving it a vital role for food production. Unlike many modern innovations, it is impossible to manufacture phosphorus synthetically. This places greater importance on phosphorus mining.

Although the lion's share of the phosphoric acid mined globally (approximately 82%) is used in production of fertilizers, the other uses for the mineral are wide-ranging. The remaining 18% is used in the production of feed phosphates, medicines, and food products. In addition, phosphorous is used during the treatment of metals, in medicine and dental solutions. Demand for phosphoric acid for the production of feed, food-grade and industrial phosphates reached 6 million tons in 2015. With projections that the world population will reach 9 billion by 2050 and require 70 percent more food than we produce today, phosphorus is crucial to global food security.

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Siemens Milltronics MMI's compact design and drop-in installation offer a significant cost savings at heavy duty industrial sites.



The Milltronics MWL weight lifter's modular construction, easily adapts to different conveyor widths including the large size 1400 and 1600 mm belts at Apatit.

World's largest producer of phosphate ore

Only a few countries contain the necessary raw material base for the production of phosphate-based fertilizers, and Russia is among the best positioned. Founded in 1929, Apatit Mining in Russia is the world's largest producer of high-grade phosphate ore and Russia's only producer of nepheline concentrate.

Recently, Apatit Mining, part of the holding company PhosAgro, began a search for a belt scale supplier. Given the nature of phosphate mining, the company had high requirements in terms of reliability and accuracy for heavy-duty applications. As with any mining process, high accuracy is important, as the ore is weighed to determine mine production rates. In particular, Apatit sought to reduce maintenance time, requirements for spare parts, and modernize their production processes.

Challenge

Conveyor belt scales are designed to continuously calculate bulk material flowrate by measuring belt load and speed. They can be installed in many locations throughout a mine or mineral processing operation for rate control, production, and inventory monitoring. Proper selection is important because with increased accuracy comes greater cost.

In addition to high accuracy and reliability, Apatit had two specific requirements for the modernization and expansion of production. First, calibration of the belt scale must take place without stopping the process. Proper calibration is like picking up the right tool for the right job. Without proper calibration, accuracy is at risk. Second, safety of staff was paramount. Employees must be fully protected and not required to touch any moving parts of the conveyor.

Apatit invited Siemens to test their Milltronics belt scale systems at two mines on the vacuum filters and load mills. Tests were conducted over several months using a variety of calibration methods. Apatit needed to ensure accuracy and reliability even with uneven, heavy or light loading.

Siemens solution

Belt scales work by responding to vertical forces, both desired and undesired. Many issues are a result of problems with the conveyor or improper commissioning. Careful evaluation of the application, proper installation, calibration, and routine maintenance will yield many years of continuous and reliable service. A typical belt scale system is made up of a weighbridge structure supported on load cells, electronic integrator, and a belt speed sensor.

Siemens offered the Milltronics MSI belt scale and the Milltronics MMI belt scale (a combination of two or more MSI belt scales working in tandem). The compact design of the single idler model allowed for quick and easy installation, as well as reduced the amount of total weighing space required. This allowed for a more suitable area in the conveyor to be selected. A Sitrans WS300 speed sensor mounted on a self-cleaning bend pulley or a Milltronics RBSS return belt speed sensor, a calibration test chain, and a Milltronics BW500 integrator completed the belt scale system solution from Siemens. Installation, initial configuration and commissioning of the belt scale system were carried out by JSC ROITECH – the authorised Siemens service partner.

After testing a variety of systems from different suppliers, Apatit chose the Siemens Milltronics MSI and MMI belt scale package. The Milltronics belt scales fully meets Apatit's



The rugged design of the Milltronics RBSS speed sensor is ideal for heavy duty applications. The RBSS offers easy, low cost installation while providing accurate belt speed detection

requirements for accuracy, easy maintenance, long-term stability, and simple and fast methods of calibration.

Improved performance without sacrificing safety

Milltronics MSI is a heavy-duty, high accuracy full-frame single-idler belt scale used for process and load-out control. Milltronics MSI provides continuous in-line weighing on a variety of products in primary and secondary industries. It is proven in a wide range of tough applications from extraction (in mines, quarries and pits), to power generation, iron and steel, food processing and chemicals. The MSI's patented use of parallelogram-style load cells results in fast reaction to vertical forces, ensuring instant response to product loading. This enables it to provide outstanding accuracy and repeatability even with uneven loading and fast belt speeds – a key concern for Apatit.

Like the MSI, the Milltronics MMI is a heavy-duty, high accuracy scale with multiple idlers. It is ideally suited for the harsh conditions of Apatit's nepheline mining.

The total belt scale system provides indication of flow rate, total weight, belt load and belt speed of bulk solids materials on a belt conveyor. The MSI or MMI is installed in a simple drop-in operation and may be secured with just eight bolts and existing idler sets, secured to the dynamic beam. With no moving parts, maintenance is kept to a minimum, with just periodic calibration checks required.

An added benefit of the Siemens system is the Milltronics MWL. Milltronics MWL Weight Lifter is a mechanical calibration weight lifter for Siemens belt scales. The MWL mechanically raises and lowers the static weights and then stores the weights securely above the belt scale calibration arms, and allows the operator to lower and apply them safely without having to lean into the conveyor. Safe and easy application of



Milltronics BW500 is a full feature integrator for use with both belt scales and weighfeeders. Belt load and speed signals are processed for accurate flow rate and totalized weight of bulk solids.

belt scale reference weights with the MWL ensures the operators remain external to the conveyor.

The two belt scale systems were installed on belts carrying nepheline ore before and after the secondary crusher. The first belt width is 1600 mm with a heavy-duty feed rate of 3200 t/hr. The second belt width is 1400 mm and the feed rate is 500 t/hr.

Following installation of the Siemens belt scales at the material dosing portion of the mill, Apatit noticed improved performance and higher quality of material components in the finished product. Apatit knew they had made the right choice for their modernization and expansion project.

With the belt scales installed, Apatit's inventories are now measured in real-time, preventing costly inventory adjustments. Apatit was able to improve capacities and production infrastructure, while increasing output. All of this while keeping safety at the forefront.

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