



Figure 1: In-motion belt scale systems are used for providing accurate weighing measurements of materials from the moment they come off the truck and are crushed and screened, to the moment the final product is loaded back into the vehicle to leave the plant.

Improving the aggregate production process

This article highlights the importance of accurate aggregate measurement and monitoring, what systems were used previously and how new technology can help significantly improve the aggregate production process as well as the bottom line.

Paula Frisk, Thermo Fisher Scientific, Rugby, UK

Today's aggregate production plant managers face ever-increasing pressures and challenges. Customers demand more complex blends, better-performing products, and higher-than-ever levels of quality, while senior management calls for lower costs and increased productivity. With these persistent demands, plant managers are frequently caught in the middle. Operating without the benefit of accurate aggregate measuring and monitoring equipment can be labour-intensive and costly.

Stuck in the Dark Ages

In the past, aggregate manufacturers had no option but to use crude and often unreliable methods of measurement to determine how much aggregate was being produced – whether it was guessing at the amount of material moving across the conveyor belts,

'eyeballing' the material streams for tramp metal, or dropping tape measures down their bins and silos to find out how much material they held. As a result, quality was often compromised with the wrong blends of aggregate being supplied to customers.

Today, a variety of products and technologies are available that can be used to provide accurate information on inventory control, weighing, monitoring and blending. The decision to automate some or all of these processes can liberate the aggregate producer from the inaccuracies and high costs of the 'pot luck' approach.

Considering the options

Accurate measurement and monitoring requires the right equipment for the process. These include, for example, sampling systems, belt scales, tramp metal detectors, weigh belt

feeders, level detection, conveyor safety devices and plant management software.

However, before changing existing methods, it is advisable to talk to an aggregate measurement and monitoring expert who will be able to offer invaluable advice when it comes to choosing the right systems for the plant.

Choose a supplier with a proven track record who fully understands all aspects of the aggregate monitoring and measurement process. It is also essential that they offer the widest possible range of systems and technologies. Combining these with in-house expertise will provide the right solution.

Sampling systems

Sampling systems provide information regarding the quality and composition of the materials going through each specific process.



Figure 2: Oretronic III Tramp metal detector.

It is an economical and simple way of procuring a representative sampling from a material stream, providing details on the quality and content of the material. Sampling systems are subjected to rigorous in-the-field testing and meet ASTM and ISO specifications. Robust, compactly designed and easy to install, a sampler can be used as a stand-alone device or a primary in a multi-stage mechanical sampling process.

Belt scale systems

In-motion belt scale systems are used for providing accurate weighing measurements of materials from the moment they come off the truck and are crushed and screened, to the moment the final product is loaded back into the vehicle to leave the plant. A wide variety of belt scale systems are available to provide vital information for the effective management and efficient operation of a business.

Most belt scale systems comprise three major elements: the weighbridge with load cell(s), the belt speed sensor and an electronic integrator. The weighbridge attaches to a conveyor's stringers and supports the weigh idler, while the load cell(s) measure the weight of material on the belt. The speed sensor is mechanically connected to the conveyor's tail pulley and generates a stream of pulses. Each pulse represents a unit of travel. The frequency of the pulse stream is proportional to belt speed. The electronics integrate the output signals from the load cell(s) and speed sensor to arrive at a rate of material flow and total material passed over the scale.

The model chosen very much depends on the application. Some belt scales provide basic rate information and totalisation functions in processes involving non-critical or lower-value materials with an accuracy of $\pm 1\%$. These are specifically designed for applications where economy and ease of installation are important considerations. Other systems are developed for high accuracy or basis-of-payment applications requiring certification by government and regula-

tory agencies. These are extremely accurate, to within 0.125%.

Tramp metal detectors

A tramp metal detector provides an economical and reliable method of protecting expensive crushers, conveyors and other equipment from potentially costly damage by tramp metal, which helps reduce downtime and ensures the production process stays operational. As a result, aggregate producers should consider tramp metal detectors to be an essential part of their operation.

Able to identify all types of metallic scrap including bucket teeth, manganese steel mantles, bore crowns, bar scrap chains, and tools, the tramp metal detector can even detect tramp metal buried in wet conductive materials. Tramp metal detectors are insensitive to materials with high magnetic permeability and electrical conductivity so they can be used in applications where conventional metal detectors produce an unacceptable false alarm rate.

Weigh belt feeders

A weigh belt feeder along with a digital feeder controller provides accurate measurement down to $\pm 0.5\%$ and control of materials allowing for optimum blending ratios and maximum material consistency. The type of weigh belt feeder you choose is dependent on whether your plant handles heavy industrial or light aggregates with high, moderate or low feed rates.

Level detection

Microprocessor-based continuous level measurement indicators provide the critical material feed and inventory levels required to keep the aggregate production process running – ensuring there is always product available for the crushing and screening process. Offering accuracy to within $\pm 2\%$, these indicators are simple to operate and calibrate, plus they are not affected by uneven material discharge, or build-up on



Figure 3: A weigh belt feeder along with a digital feeder controller provides accurate measurement and control of materials down to $\pm 0.5\%$.

sidewalls or bridging.

Tilt switches, another form of level detection, are actuated when aggregate rises to tilt the probe 15° or more from its vertical position. These rugged, abrasion-resistant switches are easy to install, and precisely positioned so that, regardless of the direction of tilt, their normally closed contacts will open.

Conveyor safety

Safety conveyor pull switches and belt run-off switches are essential for the safe operation of any conveyor system. Both switches can be mounted on the side of the conveyor's stringers and offer two methods of protection. Whether detecting belt run-off or providing a cable for emergency shut-off, the first 10° displacement of the actuating arm activates an alarm signal, the second 10° displacement, for a total of 20° , shuts down the process, keeping personnel safe, equipment from being damaged, and profits from becoming losses.

Plant management software

Most of the products used in today's aggregate production plants are equipped to send process information to a PLC equipped with a software-based management programme, giving the plant manager the ability to conveniently monitor and control the entire manufacturing process from his desktop.

Conclusion

Aggregate producers in 2007 have access to a wide range of weighing, measurement and monitoring products, purpose-designed to significantly enhance the efficiency of your manufacturing process, maximise final product output and improve the bottom line. As Thermo Fisher Scientific moves forward, working closely with its customers, researching and developing new technologies, this equipment will play an even bigger role in the future success and profitability of the aggregates industry. ■