Case Study

Ampacet Texas

Plastics Manufacturer Reduces Labor Costs and Improves Production Runs By Using New Ultrasonic Level Technology

Ampacet installed new ultrasonic level sensors from Kistler-Morse (KM), and now the plastics manufacturer can accurately see what's in their resin tank. By eliminating false "empty" misreads of the resin tank, Ampacet has reduced labor costs by 20 hours per month, and smoothed-out snags and slowdowns that previously occurred during their production runs.

Problem

Ampacet of Latexo, Texas previously depended on outdated technology that indicated to plant personnel that an important resin feed tank was completely empty -- even though it wasn't.

Application

Ampacet is headquartered in Tarrytown, NY. Ampacet's Latexo plant makes compounds and concentrates for the plastics industry. Their customers make a variety of finished plastic products, such as plastic trash bags and plastic bottles that hold bleach or other household chemicals.

Altogether the Ampacet site has 30 bulk material silos, but the resin feed tank on line #2 is one of the most important bulk storage vessels at the site. Ampacet purchases resin from suppliers and this is delivered in railcars that run on a track next to the building where the resin feed tank is located. One completely full railcar holds three times as much material as the resin tank can hold. Production workers use a 100-horsepower blower to generate a strong vacuum that pulls raw resin pellets from the railcar via 6-inch aluminum pipe that spans about 100 feet to the resin feed tank's top. Made of structural steel, the resin feed tank is 30-feet tall with a 10-foot diameter. It stands 32-feet above ground level and can hold 50,000 pounds of resin when completely full. In practice, though, the resin tank typically holds anywhere from 5,000 to 10,000 pounds of material during production runs. It usually takes 15 minutes to fill the empty resin tank with 6,000 pounds of material. Seven feet from the bottom of the resin feed tank, the side walls begin to taper gradually into a cone-shape, so that the very bottom of the tank has an exit hole that is 8-inches in diameter. A production technician controls a pneumatic slide gate that opens and closes the exit hole, which is located three feet above a conveyor belt. A weigh belt controls the speed of the conveyor as the resin is brought to a mixer where it will be combined with other ingredients. During the mixing process, the material becomes a heated polymer melt and then undergoes other production steps to convert back to pellet form. Since resin is the most common ingredient in terms of volume, management must know the status of the resin feed tank at all times.

Solution

Ampacet agreed to serve as a beta test site for KM's new ultra-*cell* ultrasonic level transducer. This level sensing technology was specifically designed with the plastics industry in mind.

KM's ultra-*cell* is located atop the resin feed tank, just off-center from the fill point. In the last decade, the use of ultrasonic technology for level sensing of bulk plastic pellets has become an increasingly popular option in the plastics industry. This technology determines material level in a vessel by sending an acoustic signal down to the surface of the material. The signal then bounces off the material -- in this case, the plastic pellets -- and back to the unit's transducer at the top of the tank. The level sensing unit then determines how much time elapsed during the signal's roundtrip and uses that data to calculate the depth of material within the vessel.

However, applications involving plastics pellets can be particularly demanding because of specific quirks and idiosyncrasies associated with plastics applications.

When the resin tank is being filled, pellets are moving at a high rate of speed. As the pellets rub against each other, this generates friction and friction generates heat. Whoever installs the ultrasonic device must keep this in mind because varying temperatures in the tank will change the speed of sound in the tank, thereby affecting the speed of the acoustic signal. Other factors that must be taken into consideration are:

· air currents from moving material in the tank can attenuate the return signal.
· noise from loading equipment, as well as material moving in and out of the bin, can compete with the return signal of the sensor.
· narrowness and structural idiosyncrasies of the holding vessel can trick or mislead the ultrasonic level sensors by hiding the true signal from the filled material.
· density of the plastic pellets can affect the strength of the return signal.
· angularity (sharp-cornered or smooth) as well as the length of the plastic pellets determines the reflectivity of the material, which in turn affects the strength of the return signal.

Before they began working with KM, Ampacet was tripped-up by two of these factors. For many years, another ultrasonic sensor sold to them by a different manufacturer had worked sporadically at best.

"Our main problem was seeing an accurate level when the tank was almost empty," says Leonard Boffa, Process Engineer at the Ampacet plant. "It would tell us that the tank was empty, and it wasn't. There'd still be a couple feet of material left in there. We would have extra material left over". This extra material was typically sent through a divert pipe and workers would then go through the time-consuming process of putting the extra material into containers, where it would eventually be fed back into the system. On other occasions, "we might run out of material in the tank when we still needed more, right in the middle of a production run," Boffa says. In other words, the older ultrasonic technology falsely indicated there was material in the tank, when in fact it had emptied. "That was a problem, too, because we would have to stop and start our entire production run". Boffa conservatively estimates that misreadings from the older technology created an extra labor cost of 20 hours per month -- mostly from having to handle the extra material left over in tanks that were supposed to be empty.

What were the two technical factors that led to the false readings?

1. The signal beam from the ultrasonic transducer atop the tank wasn't narrow enough to squeeze down into the tapered conical portion at the bottom of the tank. KM's product solves this problem because it has an extremely narrow beam angle of 5 degrees. This allows the device to narrowly target the exit hole and see the resin pellets all the way to the bottom of the tank. The competitor's product used a beam angle that was too wide -- in excess of 10 degrees.
2. The competitor's product wasn't using an acoustic signal frequency that was suitable for plastic pellets. The signal emitted by the KM ultra-*cell* is at a frequency of 24 KHz, which means the acoustic wavelength is better for signal reflectivity off the very small plastic pellets.

"Our trial of the KM equipment was successfully concluded," Boffa says. "It tells us precisely and accurately what's in the tank". Later, the plant experienced an electrical power spike that failed a circuit board in the KM system's readout transmitter. KM shipped him a replacement board, along with a power filter to protect the unit from future power spikes. Boffa replaced the boards himself, calibrated the controller, and had the system up and running within an hour.

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