Flowing Smoothly

Oded Rose, Flow Industries Ltd, USA, explains how a solution to a bulk materials flow problem at Nesher Cement's Ramle plant was provided.

Draft

Nesher Cement is Israel's main supplier of cement. Its Ramle plant is one of the largest integrated cement plants in the world, with a 5 million tpa cement production capacity (850 tph). Like many other cement plants, Nesher faced problems with some of their bulk materials storage and flow processes, in particular with its gypsum feeder bins. Despite the modern design of the plant, the installed air cannons (several per bin) and 24 hour emergency team, the gypsum bins would clog 2 – 5 times per shift on average. Any gypsum flow stoppage of more than a couple of minutes led to disruption of the cement production process.

Engineer Yair Yitzhak, the plant's Director of Operations, is a Nesher veteran and a big believer in technological innovation. Yair is behind many of the plant's technical advances and new technology implementations. He was frustrated with the continuous gypsum flow problems and unpredictability of the cement production process. When he heard of a new technology that assured continuous and stable material flow he went to visit a chemical plant where it was installed. After seeing it in action, he agreed to a 30 day test trial of the product at the Ramle plant.

The Silo-Flow™ patented technology was developed and marketed by California based Flow Industries Ltd. It was designed to solve the toughest bulk material storage and process flow problems. The system may be installed at all types of feeders, hoppers, bins and silos. A souped-up version of this technology, known as Turbo-Flow™, adds water bursts to the high pressure air pulses and is used for cleaning high temperature facilities such as kiln preheaters and calciners.

The Silo-Flow™ device (SFD) is made of high-grade stainless steel and designed for very high pressure. Unlike the standard air cannons provided by the plant air pressure line, which use up to 100 psi (7 bar), the SFD uses compressed air at up to 3000 psi (200 bar), supplied by a dedicated high pressure compressor through a couple of buffer air cylinders. The device creates a powerful shock wave followed by a high velocity air stream. The shock wave and air stream are generated inside the vessel and dislodge any build-ups inside. The sheer force of the device combined with its quick repeat action leaves no material stuck to the vessel walls and, as a result, the SFD maintains a continuous material flow.

Figure 1. The Silo-Flow™ device installed on a feeder bin (next to a pipe of a dismounted air cannon).

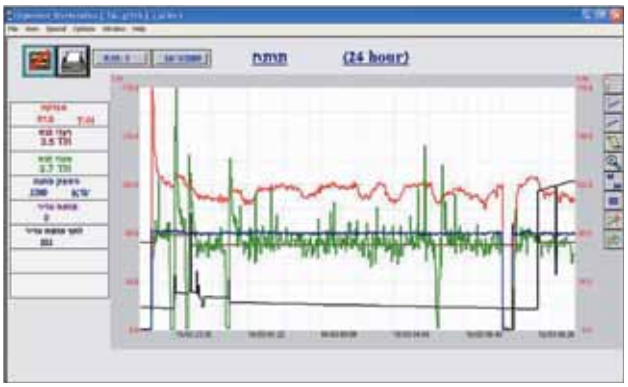

Figure 2. Nesher control panel showing a typical shift before the Silo-Flow™ installation. The green line shows the gypsum feed and the red line shows cement production. Note the five gypsum stoppages, with the fifth leading to a cement production stoppage.

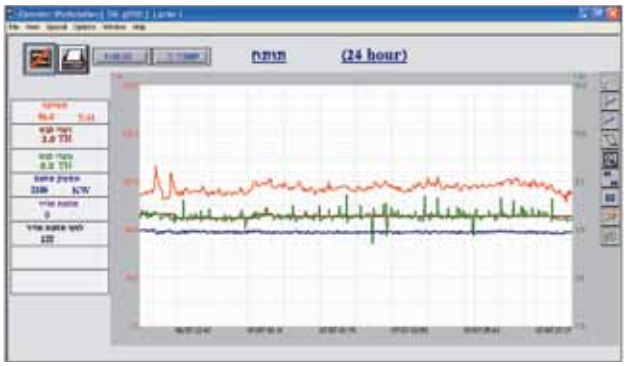

Figure 3. Nesher control panel showing a typical shift after the Silo-Flow™ installation. The green line shows the continuous gypsum feed, closely following the required quantity (brown line) of 3 tph. The red line is the cement production, with an output of around 96 tph.

The device can be activated from the control room or by a stand alone timer. The SFD is then programmed to 'fire' at predetermined intervals depending on the application. Typical air cannons fire once every few minutes depending on their tank's filling time. The SFD fires every few seconds as long as the air supply is kept 'on'. In addition, the air pressure can be fully controlled from as low as 300 psi (20 bar) to 3000 psi (200 bar).

Before employing the SFD, Nesher was using a mixture of 20% synthetic and 80% of the more expensive natural gypsum to reduce the aggressive stickiness properties of synthetic gypsum. Nesher had the device fire for 25 sec (5 'shots') every 20 min at about half its maximum power (1500 psi). After seeing that the low synthetic gypsum mixture did not clog any more, they tried a 50% – 50% synthetic-natural gypsum mix. After a few more days of clog-free operation they moved to 100% synthetic gypsum. The SFD maintained continuous material flow of 100% synthetic gypsum at all times. "My main objective was to increase the production process predictability," says Engineer Yitzhak, "we got this all right, but as a big bonus we got huge savings with the move to 100% synthetic gypsum. We paid back the investment in no time."

The results of the Silo-Flow™ application in Nesher can be seen in Figures 2 – 3, which show the gypsum flow before and after implementation of the device.

"We got more than we bargained for," added Yitzhak, "we realised the system's advantages right away. After a week we stopped the trial and decided to purchase this unit and order several more for other feeder bins. I am always on alert in case the cement production stops. Silo-Flow™ actually helps me sleep better."

Several cement manufacturers have installed, or are planning to install, the Turbo-Flow™ on their preheater towers. The Turbo-Flow™ system uses the SFD and adds bursts of water to the high pressure air stream. This patent-pending technology creates a high pressure spray that spreads over the entire preheater wall and wipes out any build-up. A dedicated shock absorbing system protects the wall's internal refractory lining.

Today, dozens to hundreds of air-cannons are installed on preheater towers or coolers. Often they become a maintenance nightmare. Moreover, air-cannons have a limited range and do not solve the build-up problems. Most operators have to rely on frequent manual cleaning by the water-jets. However, one Turbo-Flow™ unit can cover a 3 x 3 m preheater wall and keep it clean.

Both systems have been installed around the globe with leading cement manufacturers, such as Lafarge, Italcementi, Cemex, HeidlebergCement and Holcim.