

A Reliable Approach to Ball Mill Optimization: MillScan DSP2000

WHAT IS MILLSCAN DSP2000?

MillScan DSP2000 precisely determines and optimizes the fill level of a ball mill by employing a combination of proven DSP and predictive neural network technology, a sensitive proprietary vibration measurement probe and a radio frequency link, to produce a linear output with respect to fill level. MillScan DSP2000 represents an important paradigm shift in instrumentation, not only in terms of sheer sophistication, but also in terms of measurement accuracy and directness.

Plants around the world are seeing immediate advantages of this new technology:

- MillScan DSP2000's unprecedented real-time accuracy often produces significant increases in mill throughput and decreases.
- MillScan DSP2000 is completely immune to crosstalk. Its vibration sensors mount directly to the mill hardware, eliminating the influence of noise from nearby mills and other equipment.
- MillScan DSP2000 maintains a high degree of accuracy at all fill levels, from empty to full, and its predictive neural network enables it to provide a linear 4-20mA output, reliable enough to be used for dynamic fill level control.
- MillScan DSP2000's solid-state digital electronics are fully immune to analog drift.



MillScan remote unit mounted on mill shell



MillScan base unit

RECENT INSTALLATIONS

Holcim - Artesia, Mississippi

The Holcim plant in Artesia, Mississippi uses a fuzzy logic High Level Control (HLC) system, but its weak point was reliance on sonic ears. In 2003, various problems with ears, including calibration drift and incorrect calibration, limited HLC run time to 58%. Since the installation of the MillScan DSP2000, the HLC run time has increased to 99.2% with an average production increase of 1.5%.

As a direct result of installing the MillScan DSP2000, the Blaine standard deviation has significantly stabilized, decreasing to 14.6% of its previous value. Plant Automation Engineer Rick May believes the standard Blaine target can still be lowered in the near future, if the standard deviation continues along this path.



MillScan remote unit mounted on a fixed point

The average separator set point has been lowered by 5% and moved much less than ever before, leading directly to more stable Blaines, because moving the separator less equates to more throughput and a more stable mill grinding circuit.

Rick May says, "Instead of the dog wagging the tail or the dog chasing the tail, there is now a much more clear and defined signal, which reacts far more quickly than the sonic ears."

Recent Installations, continued

Mountain Cement – Laramie, Wyoming

Mountain Cement in Laramie, Wyoming was looking for a way to control the feed to two of their ball mills. The previous attempt at automatic control, using discharge elevator amps and single line PID loop controllers, was eventually scrapped because of configuration problems with the controller, among other problems. Sonic ears were never considered for the application, because of the widely known problems with crosstalk and microphones becoming buried in material. Other feeder controls were considered but rejected for a combination of environmental and lag-time issues.

In 2003, frustrated by discovering ball mills grinding empty for hours at a time --sometimes, entire shifts -- the plant installed MillScan DSP2000 on both mills.



Peltier power supply mounted on mill shell

Brett Bott, Automation and Process Engineer says, "I could not justify the ears with the problems of cross-talking and frequent adjustments, but MillScan, along with some automatic and cascade control loops has helped to control the mill. We no longer run the mill empty, losing precious grind time."

Cemex - Charlevoix, Michigan

Cemex in Charlevoix, Michigan had a problem with plugging on a 4000 HP finish mill in a multiple mill building. The mills were close enough together that crosstalk would have made sonic ears impractical.

In December of 2002, the problem was solved with the installation of MillScan DSP2000. The signal is now used in the feed rate control loop for the mill, and Matt Gower considers the installation a success because, "The mill plugging problem has been virtually eliminated, and the operators quickly built confidence in the unit."

Based on the performance of the initial installation, the Charlevoix plant has since purchased two more units.

Cemex - Mexico (3 plants)

For years, Cemex- México used microphone-based sonic ear units to monitor ball mill loading, but the low sensitivity, difficulty in calibration and crosstalk between adjacent mills made plants reluctant to trust these instruments. Cemex kept the instruments meticulously clean and tried every possible positioning, but the problems persisted, even in their most efficient and well-maintained plant.

In 2000, Cemex solved problems on one mill with their first installation of MillScan DSP2000. They were sufficiently satisfied with its performance that they now use MillScan DSP2000 on the inlet compartments of mills rated up to 8000hp, producing between 70 and 140 tons per hour in three different plants, and plans are in place to add more units.

Jaime Ramirez, Cemex Central SA DE CV, says, "MillScan sounded promising, and it turned out to be a good choice. By using the signal in closed loop control, we have increased our production by an estimated 1%. We are using MillScan DSP2000 for all instrumentation retrofits and new installations. It's the only technology that solved our issues."



MillScan remote unit mounted on mill shell

‡ MillScan DSP2000 is a trademark of

