MOISTURE MEASUREMENT IN FOUNDRY MOLDING SAND

The Requirement: A major automotive castings producer requires continuous monitoring and control of moisture in molding sand, following installation of an automatic sand molding machine. Sand molds formed by this high-speed machine must hold their. shape without support from a traditional mold box or frame. It was soon learned that low moisture contributed to deformed castings. High moisture, on the other hand, caused the sand to aggregate, and produced combustible hydrogen when molten iron entered the sand mold. Quality control staff judged that molding sand moisture should be maintained at 3.2 % by weight, +/- 0.2, to allow the new automatic sand molder to do its job.

Molding sand is prepared in a continuous vertical mixer, capable of accepting water before and during the mix. Incoming sand composition is typically 80% recycled sand and 20% new sand, with clay and approximately 2% black carbon also present. Water content of sand produced by the mixer ranged typically 2.5% to 4% by weight. Prior to adding the automatic sand molding machine, sand moisture was monitored by operator "feel" of the mixed sand, a practice no longer adequate with the newer molding technology.

The Solution: Plant management purchased and installed a Berthold LB 354 Micro-Moist on-line moisture analyzer (**Now LB 456 MicroMoist**), to provide (first) manual and (next) automatic feedback for water regulation to the mixer. The Micro-Moist unit is mounted on a 36-inch belt located under the sand mixer discharge. The belt moves 120 tons of sand per hour, with sand at a constant six-inch bed depth.

As installed, Micro-Moist provides a continuous reading of product moisture. Berthold technology relies on numerous microwave frequencies penetrating the product every half-second, with the instrument basing its moisture reading on changes in microwave attenuation and phase shift. Micro-Moist readings are independent of variation in product size, Output signal for use by the dryer operator is provided on an LED display, and a 4-20 mamp signal feeds a strip recorder and high/low moisture alarms.
The 4-20 mamp signal feeds the water valve controller.

Implementation: Initial calibration was performed in a matter of hours, using several product samples covering the range of expected moisture. Follow-up or dynamic calibration was performed over the first month. During dynamic calibration, QC staff took 31 samples from the belt stream for laboratory comparison with Micro-Moist readings.

After two months of operation, management reports Micro-Moist accuracy of 0.2% (one sigma, SSD). Berthold expects this to be reduced to under 0.2%, as samples of high and low moisture sand become available for calibration purposes.
Summary Benefits:

1. Greater output from the automatic casting machine, through improvement of sand mold quality.

2. Greater mixer output, by eliminating the pre-wetting operation and more rapid adjustment of sand moisture.

As a result, pre-tax payback is justified at well under one year.