

Spotlight: Mixing & Size Reduction

Stirred ball mill technology boosts process efficiency

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Problem:

NCR's Morristown, TN plant employed a sand mill to produce fine iron-oxide particles in a coating slurry. The slurry was used for the production of magnetic ink character recognition (MICR) ribbon. A uniform fine grind is required to get an MICR ribbon that will produce well defined characters. Iron oxide must be ground to a particle size of less than 4 microns. The particles must be uniformly dispersed and thoroughly wetted in the slurry before application to the ribbon. The sand mill was taking 6-7 hours to process a batch. NCR wanted to upgrade its facilities to boost process efficiency.

Solution:

Tests on the MICR iron oxide slurry were run in laboratory size stirred ball mills in NCR's Miamisburg, OH research facilities. Parameters such as the initial and end size of the particle, the production rate, and the percent solids, and temperature limitations were determined.

Pleased with the successful laboratory results, NCR performed scale-up tests. Over the course of several runs, various process rates were tried by changing the media volume and machine speed (RPM).

Operation of the stirred ball mill is simple and effective. Material to be ground is placed in a stationary tank with grinding media. No premixing is necessary. Grinding tanks are jacketed for temperature control. Cooling or heating can be employed. Carbon steel, stainless steel, chrome steel, tungsten carbide, and ceramic type balls (3/32" to 3/8") are commonly used media. Material and media are agitated by a rotating, vertical shaft with arms. The final result is a fine, even particle dispersion.

Two production size stirred ball mills were purchased for the Morristown plant. The media used for the iron oxide, oil, wax, solvent, and adhesive slurry was 3/16" stainless steel balls. These are dense and able to cause dynamic impingement.



Results:

The stirred ball mill grinds the MICR ribbon coating slurry to a final particle size that is less than 4 microns. It is:

- About twice as fast and more efficient than a conventional sand mill;
- Safe, easy to maintain, and with its compact, vertical profile, it requires minimal space;
- And it is energy efficient.

NCR uses the stirred ball mill exclusively for wet grinding – grinding with liquid and dispersing at the same time. The stirred ball mill's performance is of key importance to the finished product.

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