

## Suppliers' Tips

# How can I improve my size reduction equipment's throughput?

The first step in improving size reduction equipment's throughput is understanding not only the size reduction equipment, but upstream and downstream processes. These processes could offer simple-to-implement productivity gains. For example, in a closed-loop system if a size separation machine isn't operating optimally, it may affect a downstream crusher's output.

The next step is to examine the particle size distribution for current production versus the needed specification. If the size reduction equipment is over-processing the material, a simple machine adjustment such as increasing the operating speed may increase throughput and lower operating costs.

When initially designed, plants are usually equipped with the best available size reduction technology. Over time, as plant capacities increase and different raw materials or ingredients are introduced, consider going back to the equipment supplier to explore new features that may be available or finding a company with a broad product range, size reduction expertise, and process design expertise along with testing facilities to help you get more out of your size reduction equipment.

*Chris Nawalaniec, vice president sales and marketing,  
Stedman Machine, 812-926-0038*

When optimizing your size reduction equipment, it's important to consider not only the mill itself but the ancillary equipment as well.

- For some mill types, process airflow is directly related to throughput. Increasing the airflow and operating the coupled classifier drive at a higher speed (if available) may increase throughput.
- Replace worn internal parts. Even for slightly abrasive powders, internal parts like grinding elements (hammers) and liners wear out, increasing critical clearances in the mill and causing less efficient grinding.
- Consider alternate internal parts. Most mills can be equipped with various rotor and classifier types. Fibrous materials tend to grind more efficiently with shear forces. Granular-, round-, or crystal-shaped materials grind better with direct, normalized impact forces.
- Provide more uniform, consistent feed material delivery to the mill by operating the mill at or as close to the mill's full load (typically determined by the power rating in horsepower or kilowatts of the rotor and classifier motors) as possible without overloading the motor(s). Minimizing material surges to the mill reduces the variation amplitude, yielding a higher average feedrate and optimizing the mill's throughput.
- For most powders, less grinding energy is required to reduce a smaller feed particle, so pre-sizing the material prior to milling by using a pre-crusher or other coarse milling machine yields higher throughput. Consider testing smaller feed sizes to determine the impact on grinding energy and throughput.
- In certain cases, a milling circuit, such as a mill coupled with an inline air classifier or screener, may yield higher throughput. Scalping the oversize particles and recycling them back into the milling system usually results in a higher capacity. Grinding energy increases exponentially for smaller material particle sizes and downstream separation with recycling often improves production efficiency.

*Bill Brown, division manager, and Chris Paulsworth, applications engineer,  
Hosokawa Micron Powder Systems, 908-273-6360*

Here are some tips for improving material throughput in a size reduction process:

- Use a volumetric dosing valve or some type of volumetric feeder to feed the size reduction equipment.
- Accurately monitor the rotor amp load and material discharge temperature. If, for example, the rotor motor full load amp rating is 20 amps, you should slowly increase the speed of the volumetric feeder until either you're milling at close to full load or you're at or below the maximum material discharge temperature (the material temperature will increase as you push the throughput). It's easy to program a PLC to do this.
- Replace any damaged or worn "tools" in the milling chamber such as hammers, screens, liners, etc.
- Use the largest screen opening size possible while still obtaining your desired particle size distribution (PSD) to optimize your throughput. Also, try to use a screen with square hole openings instead of round holes. The square hole openings offer the larger percentage of open screen area, resulting in higher throughput.
- If your equipment offers a variable-speed rotor, try to use the fastest rotor RPM you can while still maintaining your desired PSD
- Pneumatically convey material away from the size reduction equipment if possible. This helps to sweep heat away from the milling chamber and optimize throughput.

*John Ciasulli, CEO, Frewitt USA,  
908-829-5245*

*Equipment suppliers are a valuable source of information about equipment and processes. In light of this, each month we ask suppliers a question of concern to our readers. Answers reflect the suppliers' general expertise and don't promote the suppliers' equipment. If you have a question you'd like suppliers to answer, send it to Kayla Carrigan, Associate Editor, Powder and Bulk Engineering, 1155 Northland Drive, St. Paul, MN 55120; fax 651-287-5650 (kcarrigan@cscpub.com).*