

How can I choose a mill that will safely handle my combustible material?

The first step in choosing any mill is to find one that fits your primary objective. Whether you require an ultrafine particle size distribution, a tight distribution, or a distribution void or near-void of undersized or oversized particles, mills are available with differing process rates and energy efficiencies. Start by choosing the mill that not only gets the job done, but also produces high-quality final products consistently and efficiently.

Once you define the proper technology and processing system, secondary issues such as material combustibility can be examined. There are several ways to safely handle combustible material, including venting, suppressing, containment, and inertion devices. Which method is most effective depends on your process. Most explosions occur during the material collection process, such as in a cyclone or dust collector. Focus on that aspect of the system first. Depending on the type of dust being generated, an adequately sized explosion vent on the collector may suffice. The explosion vent's size will depend on the maximum pressure that could be reached and how quickly it reaches that pressure. It will also depend on if you want the collector to be designed in the plastic or elastic mechanical range for containment and the vent's pressure direction. If the plastic range is adequate, then a less costly collector can be used. However, the collector will most likely deform well beyond its usable range. If the elastic range is necessary, then the collector will survive the explosion but the unit's initial cost will be higher. Make sure all discharge valves are adequately designed for your application. Ductwork should also be examined and designed for efficient containment. If the shock wave can be contained in the ductwork, then it can travel to the dust collector where it's safely vented.

Regarding the mill, start by determining whether it's operating by dense- or dilute-phase during steady-state processing. Typically, coarser grinding mills like ball mills, roller mills, and hammermills will operate in such a dense phase that it will be above the material's upper explosive limit (UEL), so there's little concern when processing combustible materials. The risk increases significantly when a more dilute-phase processing technology is used. Any process with a high air-to-material ratio is suspect. The most likely offenders are air-swept hammermills and fluid-energy (jet) mills as well as any milling equipment with an internal air classifier used during the grinding process. Since it's impractical to use venting in a process grinder, containment becomes the only way to safely handle combustible material.

Inerting is always a possibility. Basically, this is a process of starving the process fluid stream of oxygen to such an extent that combustion can't be supported. Typically, this involves running under a nitrogen blanket or using nitrogen alone as the process fluid. This can be done economically with a relatively friable material where smaller quantities are required. However, it quickly becomes uneconomical with larger quantities. Control configurations — oxygen level measurement, automatic nitrogen bleeding into the process, high- and low-level warnings, and emergency shutdowns — are important.

In addition to proper system design, pay attention to the operating environment. Are explosion-proof motors required? Do electrical components and control panels need to be installed in the processing area? Do you want to seal or purge these components? What about lights and other potentially exposed electrical components? All of these things must be considered before you design your initial system or facility.

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What are some tips for choosing grinding equipment for my sticky material?

The key to grinding sticky materials is to keep the temperature down. As most sticky materials get warmer, they get stickier. The secret to cool grinding is airflow. The more airflow you can get through the pulverizer mill, the cooler you will be able to keep the grinding process and the more throughput you will get with your pulverizing machine.

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Sticky and cohesive materials are very challenging to process; in selecting proper equipment choose a manufacturer with proven experience with applications similar to yours and the ability to give advice on ancillaries with a 360-degree view of your process and product requirements and a selection of equipment that will satisfy your demanding application.

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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).