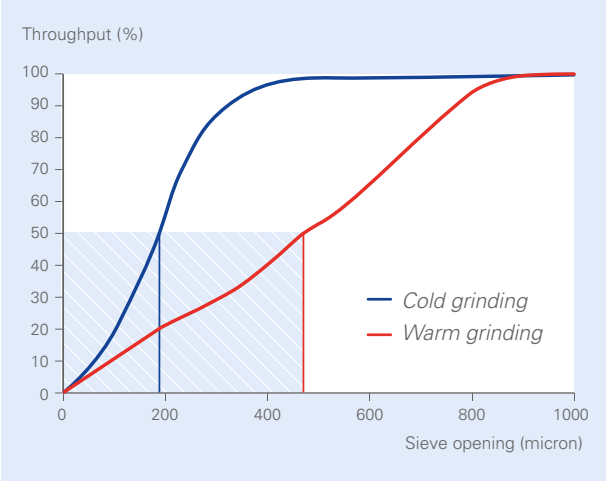
MESSER
Gases for Life

Cold grinding and recycling

Cryogenic cooling facilitates efficient production of fine powder

Grinding with cryogenic technology: versatile and efficient

Cold grinding ensures that the material being ground does not coalesce and agglutinate. Spices retain their fl avours.



SBR/NR particle size distribution curves for a cold and warm grinding process

High efficiency, low temperatures

During cold grinding, the material is cooled and embrittled using extremely cold liquid nitrogen or carbon dioxide. This process results in the production of fine particles that have the same high product quality as the original material. Particularly when grinding heat-sensitive materials, the process of cooling with cryogenic gases prevents an increase in temperature as a result of the conversion of the mill motors' electrical energy. The throughput capacity of the mills is also increased considerably.

Many materials can be used much more effectively in powder form. It is often the case that these materials are difficult to crush as they tend to melt, are temperature-sensitive, tough or elastic. When it comes to spices, the high temperatures generated during the grinding process may result in a loss of aroma or flavour. There are also risks ranging from oxidation right up to dust explosions.

The cryogenic process from Messer makes it possible to grind or recycle a wide range of different materials.:

- Thermoplastics such as PA, EVA, TPU, PVC, PS, PE and PP
- Rubber / elastomers such as EPDM, SBR, NBR, FKM
- Waxes
- Spices such as nutmeg, pepper, ginger, cardamom or cloves
- Medicines

Advantages at a glance:

- High throughput of material to be ground
- Larger percentage of finer powders
- Lower specific energy demand
- No melting or sticking of temperature-sensitive plastics
- No thermal damage
- No loss of aromas while grinding spices
- Greater protection against dust explosions

Our "Gases for Life" nitrogen (N_2) and carbon dioxide (CO_2) are used during cryogenic grinding and recycling.

Cryogenic technology for product cooling

It is necessary to use liquid nitrogen in cryogenic grinding processes to produce very high-quality powders. The material to be milled is sent from the feed hopper through the dosing screw to the paddle screw cooler. Liquid nitrogen is sprayed onto the material to be ground, which is then fed into the mill together with the nitrogen, thereby cooling the entire grinding process occurring within the mill. A special temperature controller and liquid nitrogen control valve unit supplied by Messer monitor and regulate the amount of nitrogen necessary to achieve the required temperature.

Cryogenic technology for mill cooling

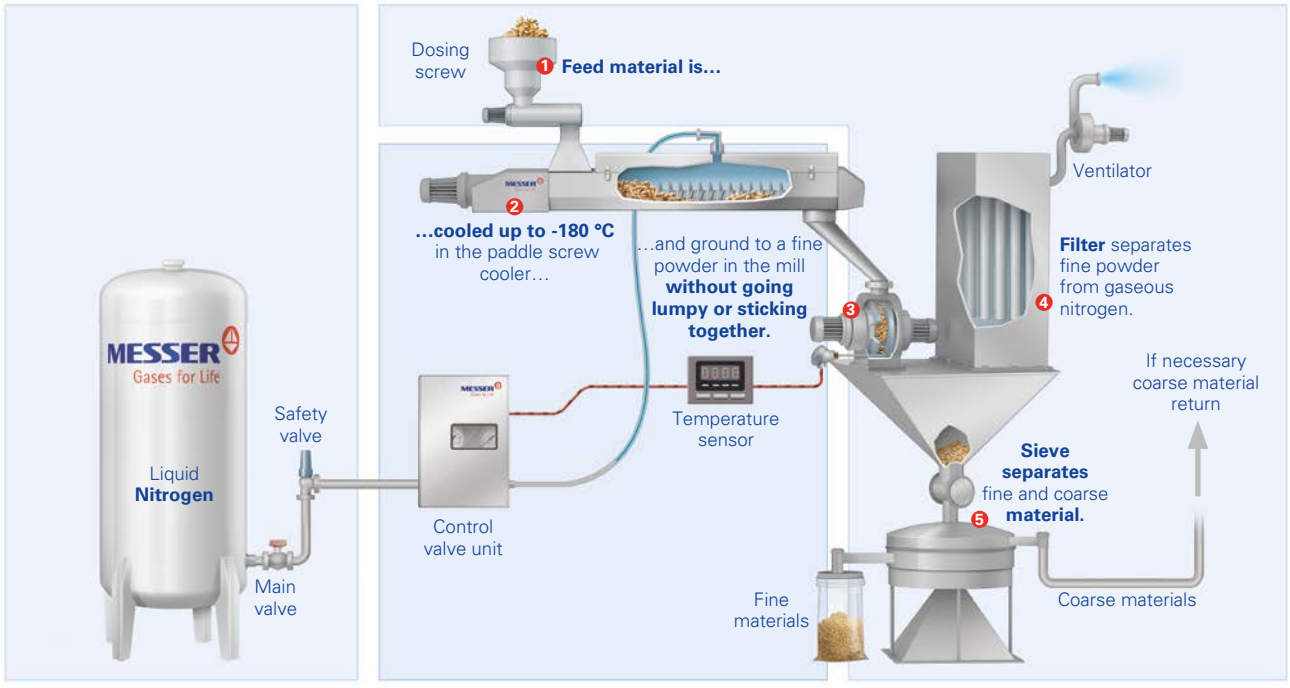
Mill cooling is an alternative to the product cooling process described previously. Liquid nitrogen or carbon dioxide is sprayed directly into the grinding mechanism to reduce the temperature. This cooling technique ensures a stable process and increases the quality of the ground product.

Inerting of grinding plants

Nitrogen or carbon dioxide is used to displace oxygen, providing an inert atmosphere for effective protection from fires and explosions. This ensures that the process of grinding flammable materials and products that carry the risk of dust explosions is made significantly safer.

Cryogenic grinding techniques for separation of composite materials

Cryogenic grinding can be used to separate composites such as fibre or wire-reinforced thermoplastics (for example hoses for liquids or bulk goods), fibre or wire-reinforced elastomers (such as cooling water hoses and tyre granules) or galvanized plastic parts (for instance sanitary fittings). It is difficult to separate these materials using conventional grinding techniques. Thanks to cryogenic grinding processes it is possible to separate them into their individual components. Successful separation with the help of cooling is possible due to the different coefficients of linear expansion and degrees of brittleness of the materials.



Cryogen technology for product cooling

The cold grinding and recycling lab

Messer operates a highly specialized testing facility in Krefeld, Germany, that offers you the chance to profit from process developments, estimate production costs or manufacture sample batches. One example of this is professionally produced grinding samples, made using liquid nitrogen.

All grinding parameters, such as the throughput, energy and nitrogen demand as well as particle size distribution are measured, evaluated and made available to the customer. The plant construction is the same as that of a production facility, making it an ideal reference. The results gathered here are also particularly interesting because they can be applied to full scale production plants.

In addition to being able to produce grinding samples, Messer can estimate production costs under a number of different conditions while comparing different grinding processes.

It is also possible to optimize existing mills. We provide precoolers, nitrogen control valves and temperature controllers to conduct on-site trials.

Find out more!

Messer provides tailored advice and delivery
On the basis of their many years of comprehensive practical experience, the experts at Messer will be happy to advise you on all matters relating to cryogenic grinding technologies. We are also your reliable partner when it comes to providing a supply of liquid nitrogen and carbon dioxide appropriate to your needs.

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