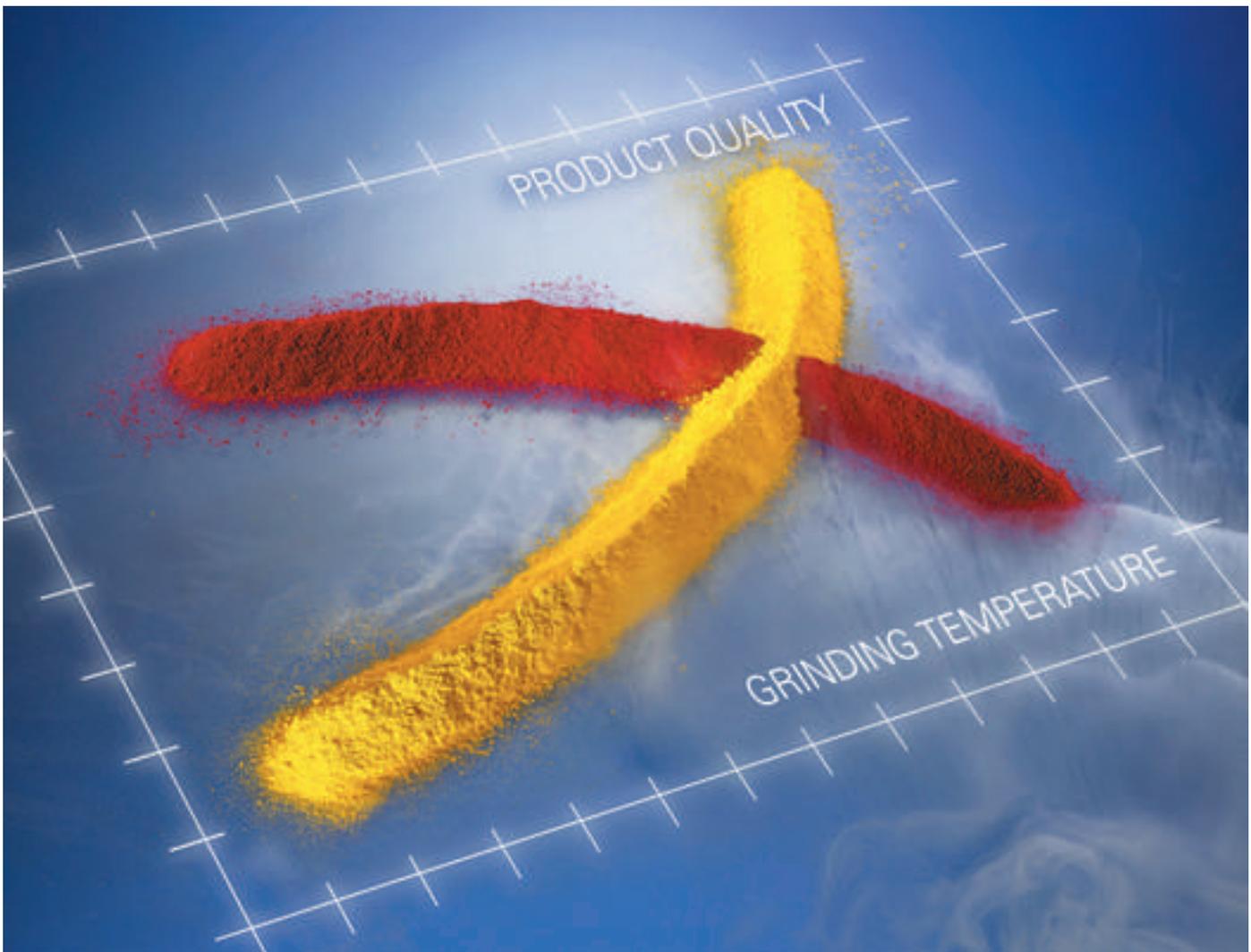


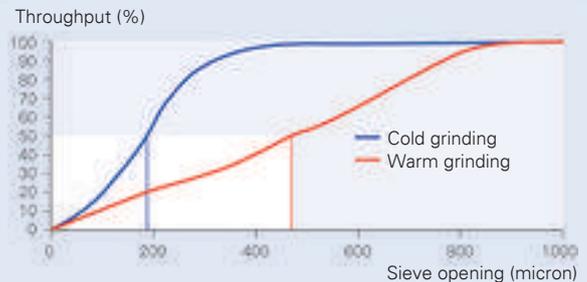


## Fine powder with a major impact

cold grinding and recycling,  
cooled by Messer



# Cold grinding and recycling, cooled by Messer



Particle size distribution curves of SBR/NR of a cold and warm grinding process



Economic production of fine particles

## Producing ground samples and interpreting results

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. These include thermoplastics such as PA, EVA, TPU, PVC, PS, PE and PP, elastomers like EPDM, SBR, NBR, FKM, waxes, paint additives and several metals.

When it comes to spices, such as nutmeg, pepper, ginger, cardamom or cloves, the high temperatures generated during the grinding process may result in a loss of aroma or flavor. There are also risks ranging from oxidation right up to dust explosions.

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

## High efficiency, low temperatures

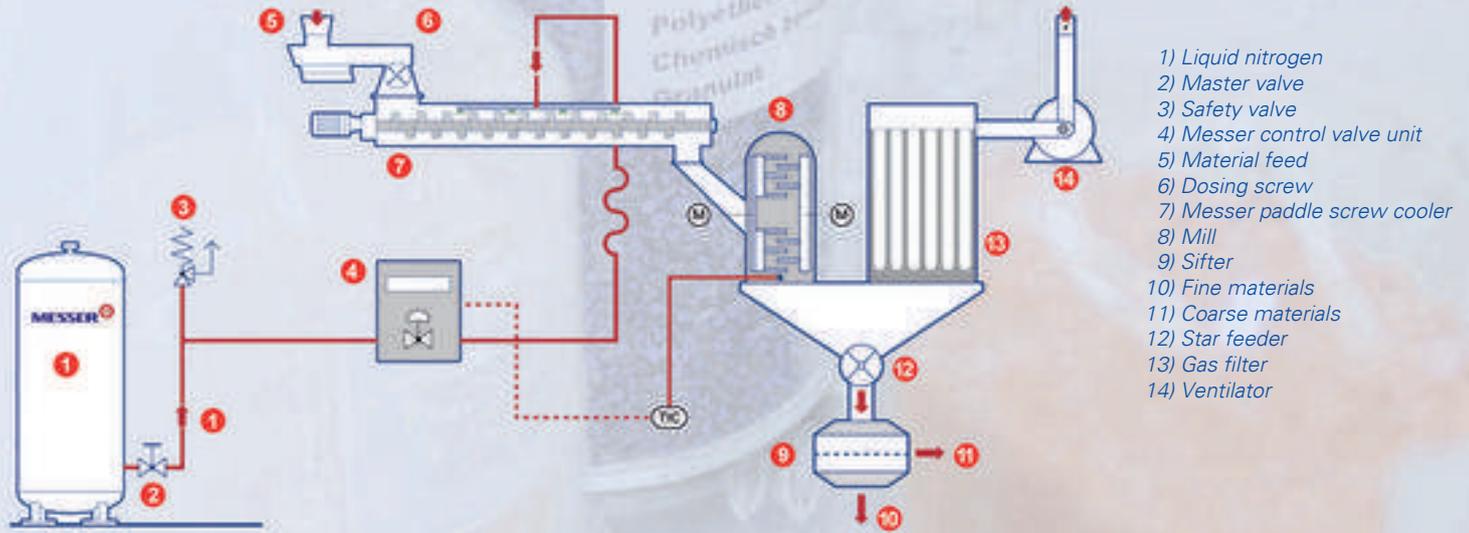
During cold grinding, the material is cooled and embrittled using extremely cold liquid nitrogen or carbon dioxide. This process results in the production of fine particles that have the same high product quality as the original material.

The throughput capacity of the mills is also increased considerably. Using cryogenic gases for cooling during the grinding process protects temperature-sensitive materials from becoming warmer due to the energy input by the mill motors.

As a result, the materials do not melt or become sticky during grinding.

PVC hoses before and after cold grinding





- 1) Liquid nitrogen
- 2) Master valve
- 3) Safety valve
- 4) Messer control valve unit
- 5) Material feed
- 6) Dosing screw
- 7) Messer paddle screw cooler
- 8) Mill
- 9) Sifter
- 10) Fine materials
- 11) Coarse materials
- 12) Star feeder
- 13) Gas filter
- 14) Ventilator

Layout: Cryogen technology for product cooling

### Cold grinding is suitable for a wide range of materials, including:

- Thermoplastic materials
- Rubber / elastomers
- Wax
- Spices
- Medicines

### Cryogen 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, and then they are fed into the mill, 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.

### Cryogen 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 suppresses the heat produced during grinding, ensuring a stable process and increasing the quality of the ground product.

### Inerting of grinding plants

Nitrogen or carbon dioxide is used to displace oxygen, providing an inert atmosphere that effectively prevents 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

It is difficult to separate composite materials, such as fiber-reinforced thermoplastics, packaging (e.g. tin cans with product residues) and galvanized plastic parts (e.g. sanitary fittings or old tyres) 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.



### The cold grinding and recycling lab

The Messer Group operates a highly specialized testing facility 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



*Cold grinding lab*



*Cryogenic grinding with pin mill*

conditions while comparing different grinding processes.

It is also possible to optimize the mills at our customers' locations. We provide granulate coolers, nitrogen control valves and temperature controllers to conduct on-site trials.

### 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
- Controlled grinding temperatures prevent thermal damage
- No loss of aromas while grinding spices
- Greater protection against dust explosions



*Pre-crushing with cryogenic cutting mill*

### Messer provides tailored advice and delivery

On the basis of their many years of comprehensive practical experience, the experts at the Messer Group will be happy to give you objective advice on all matters relating to cryogenic grinding technologies. We are also your reliable partner when it comes to the needs-based supply of liquid nitrogen and carbon dioxide.

**This and many other brochures can also be downloaded as a PDF file from the Internet at: [www.messergroup.com](http://www.messergroup.com)**



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