

# Know-how Navigator

Gases and Application of Messer



## Processing and Finishing of Plastics

A fascinating property of gases is that they consist of "almost nothing". A truism? Not at all. Just imagine comfortable foam furniture without (gas-filled) pores. Foams consist of over 90% gas by volume. Especially high comfort, but super-lightweight, polyurethane soft foams, as used in mattresses or durable sofas, are frequently foamed today with carbon dioxide from Messer. Gases and know-how from Messer do not necessarily have to be visible to make our life both more comfortable and safer. In materials science, nearly everything revolves around the enormous cold potential contained, in particular, in liquid nitrogen. For example, in plastics technology: Polymer materials soften or melt when they are heated. That is important for their processing. In injection molding, for example, liquid plastics can be molded into virtually any shape. Cold gases can help to cool the hot mold parts quickly, so that the expensive machines can be more effectively utilized.

### **Cold plastics are easy to grind**

The low melting temperature, however, may also become a problem. When plastics have to be ground, for example, for the manufacture of hot melt adhesive powders. Here too, the solution is to cool the mill with liquid nitrogen by a Cryogen® process developed by Messer. This does not just prevent the plastic from melting. The cold treatment also makes it brittle, so that very fine powder can be produced at high flow rates. The Messer Group operates a new and highly specialized testing installation. Here, qualified sample grindings can be carried out using liquid nitrogen. All milling parameters, such as throughput performance, power and nitrogen requirements and grain size distribution, are measured, analyzed and supplied to the customer.

A similar principle to that used for the embrittlement of plastics is also employed for the deburring of rubber moldings. When it is cooled with liquid nitrogen, even rubber becomes so brittle that unwanted burrs, which are elastic at room temperature, can be automatically broken off in special deburring machines. Even small paint flaws on plastic components are easier to "iron out" with the help of cooling. Polishing disks cooled with carbon dioxide (Cryostyl® process) prevent paint from melting and smearing when vigorously polished.

### **Non-scratch surfaces and more ...**

The scratch resistance of plastic surfaces imparted by painting and hardening can be further consolidated, in the true sense of the word, by treatment of the surfaces with fluorine. Plastics treated in this way are more readily covered by the paint, so they are also better protected. So fluorine does not just help to protect our teeth. With Messer know-how, plastics problems are simply there to be solved.



*The Messer Group Cold Grinding and Recycling Laboratory*





*Fine plastic powders through cryogenic milling separation*



*Cold polishing of painted plastic surfaces*

<b>Application:</b>	<b>Know-how from Messer</b>	<b>Advantages:</b>
Fine shredding of thermoplastics and elastomers	Cryogen®-cold grinding process with liquid nitrogen, milling and classification in one operation(Cryoclass®-process)	Appreciably improved grinding performance, no smearing of grinding tools, no dust explosions or fires, finer grain sizes
Removal of rubber from rubber/metal composites	Embrittlement of the rubber coating, followed by mechanical separation	Recycling of metal parts possible, environmentally friendly process
Deburring of rubber moldings	Embrittlement of the burrs with liquid nitrogen, followed by deburring by means of tumbling and blasting	Deburring can be mechanized, no more manual work necessary
Repair of small paint flaws on plastic components	Polishing of the repaired paint flaw with CO <sub>2</sub> -gcooled polishing disk (Cryostyl®-process)	No softening and smearing of the paint during the polishing process, less waste means cost savings
Hardening of paints, lacquers and adhesives	Electron or UV irradiation hardening in a nitrogen atmosphere	Saving of chemicals, higher processing speeds, no solvent emission, lower ozone formation
Manufacture of powder-based paints	Precipitation of small particles from supersaturated solutions of supercritical CO <sub>2</sub>	Very fine, homogeneous particles
Paint stripping, cleaning	Embrittlement of paint residues with liquid nitrogen, followed by mechanical removal or, alternatively, blasting wit CO <sub>2</sub> -pellets	Environmentally friendly process without solvents, without smoke emissions, no blasting agent pollution
Manufacture of polyurethane foams	Foaming with CO <sub>2</sub> under high pressure	High foam quality, replacement for extremely environmentally unfriendly or combustible propellant gases
Manufacture of injection molded components (internal gas pressure process)	Creation of controlled cavities in the still soft melt by means of high pressure nitrogen	No sink points due to contraction of the plastic while cooling, material and weight savings
Extrusion blowing of hollow plastic objects	Internal cooling with nitrogen or carbon dioxide during the blowing process	Short cooling times, higher production speed



*Manufacture of injection molded components by the internal gas pressure process*

