

Know-how Navigator

Gases and Application of Messer



Purification and Utilization in Recycling and Environmental Protection

Recycling remains an important, but not always simple task. For when it is correctly understood, recycling does not just mean collecting and reutilizing, but often also the separation of materials which have been united for the lifespan of the product. This close attachment can often only be separated with the help of gases and their cooling power.

Deepfrozen plastics are easier to separate

Even intimately connected composite materials of soft and elastic plastic/fiber or metal composites can be separated into their component parts by cryogenic embrittlement when they are cooled with liquid nitrogen (Cryogen® process). When these are then ground, their components separate from one another and can be separately reutilized. Speaking of grinding... If you occasionally run a few laps around a track, you are doing your bit for the environment. For the elastic track surface is often made of rubber granulate produced from old tires. Rubber can be optimally shredded when it is cold and brittle. Cold mills have also been used for years for the shredding of production waste from the plastics industry for return to the production process. Here too, Messer know-how sets the highest standards, for deepfrozen materials can be ground particularly fine – and the finer the powder, the better it can be reintroduced to the running production process without loss of quality.

Cold helps in refrigerator breaking

A very different application for cold is refrigerator recycling: Here, the Rekusolv® process, developed by Messer, ensures that CFCs (chlorofluorocarbons) escaping when the old devices are shredded are frozen onto cold metal surfaces. This prevents the CFCs from getting into the atmosphere and damaging the ozone layer. At the same time, the nitrogen used for cooling can protect the grinding or cutting mechanism used for shredding the refrigerators from dust and gas explosions. If not only liquid CFCs, but also gaseous coolants have to be recovered, the DuoCondex® process is the right choice. This new development is our answer to the requirements of the "Kyoto Protocol" for a reduction of greenhouse gases and for protection of the climate.

Clever solution without solvents

The excellent solvent properties of supercritical carbon dioxide, i.e. carbon dioxide under high pressure, permit the optimum solution of difficult recycling problems. Thus, for example, used catalysts from the reactors of the chemicals industry can be quickly freed of soot by "washing" in supercritical carbon dioxide. Oily metal shaving or grinding debris can also be very effectively cleaned in this way. What remains is pure oil and there are no solvents produced which themselves have to be recycled. That is recycling and environmental protection in its finest form from Messer.

Oxygen for the environment

The enormous cooling potential of liquid nitrogen, the special physical characteristics or the special solvent effects of carbon dioxide are not the only jokers dealt to the hand of recycling engineers with the gases and know-how from Messer. The combustion promoting properties of oxygen can be used, for example, to reduce exhaust gas emissions in hazardous waste incineration. Severely polluted waste water can also be decontaminated with oxygen – the treatment is practically equivalent to the "liquid combustion" of pollutants.



Nitrogen cooling against CFCs - Rekusolv® and DuoCondex® processes optimize refrigerator recycling



Rubber granulate from old tires: Elastic materials – not just rubber – are easier to grind at low temperatures



Hazardous waste incineration: Rotary furnaces can swallow almost anything – and do so more efficiently

Application	Know-how from Messer	Advantages:
Recycling of composite materials	Embrittlement with liquid nitrogen Cryogen®-milling and separation	Material reutilization of plastic wastes and plastic-metal composites
Cleaning of exhaust air flows from industrial plants and storage tanks	Condensation, freezing out (or adsorbance) of pollutants by means of liquid nitrogen cooling ®-/ Combisolv®-processes)	Compliance with clean air act, lower solvent consumption
Recovery and disposal of CFCs from refrigeration equipment	Condensing out of CFCs (R11 and R12) by means of liquid nitrogen cooling (Rekusolv®- und DuoCondex®-Ve processes)	Environmentally friendly disposal of CFCs which damage the ozone layer. Nitrogen simultaneously protects against dust and gas explosions
Cleaning and washing of used chemical catalysts, oily metal shavings and grinding debris	High pressure extraction with carbon dioxide as solvent	Environmentally friendly recovery of valuable oils. Solvent can be reused
Recycling of old tires, production of rubber granulate	Embrittlement and cold grinding with liquid nitrogen	Many uses for rubber granulate, e.g. as a track surface for sports grounds
Processing of rubberized containers, removal of stubborn residues	Embrittlement with liquid nitrogen, followed by mechanical removal	Cleaning of large area, stubborn contamination in plants (e.g. oil, soot etc.)
Cleaning of large area, stubborn contamination in plants (e.g. oil, soot etc.)	Blasting with dry ice pellets to embrittle, contract and remove the contamination	Gentle cleaning, dry ice does not have to be disposed of
Purification of highly contaminated waste water	Low pressure wet oxidation with oxygen	Short dwell times, high turnover rates
Hazardous waste incineration	Oxygen -injection or O ₂ -burners in shaft or rotary furnaces	Less exhaust gas, inert slag



Environmentally friendly recovery of valuable oils with carbon dioxide under high pressure

