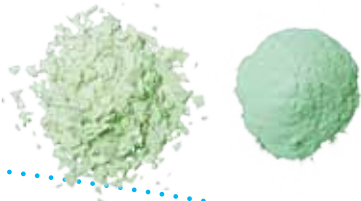




“At Air Products, we offer a ‘cool’ approach to size reduction. We can help you increase throughput, achieve uniform particle size and distribution, and save energy.”

**Jon Trembley**  
R&D Manager  
Cryogenic Applications

# PolarFit® Cryogenic Grinding Solutions . . . for Efficient Size Reduction



Thermoplastic



Silicone

At Air Products, we understand that grinding applications may differ. The desired end result, however, is often the same – achieving the finest particle size and most uniform particle distribution while maximising production rates and minimising overall operational costs.

### Air Products can make this happen.

You can count on our leading-edge technology, equipment and experienced engineers to help you efficiently grind a range of materials from multicomponent scrap to tough composites and heat sensitive materials.

Our PolarFit size reduction systems use the cooling power of liquid nitrogen to remove heat produced in the grinding process, allowing you to achieve finer, more consistent particle size distribution and higher throughputs for a wide range of products. With our systems, you may be able to grind the toughest of materials to particle sizes as small as 10 microns.

### Advantages

Our cryogenic specialists can help you determine which part of your process needs to be cooled to help achieve your goals, including particle size and distribution, throughput, and cycle time. PolarFit size reduction systems use liquid nitrogen to control the temperature of your product or mill to grind more efficiently in an inert atmosphere. These systems offer many benefits over conventional grinding methods.

These benefits can include:

- Higher production rates
- Improved product quality, including contained taste and aroma
- Finer particle size and more uniform particle distribution
- Improved separation and dispersion of composite materials
- Lower capital investment
- Improved safety

### Applications

PolarFit size reduction systems can help you more efficiently grind materials such as:

- Adhesives and waxes
- Carpets
- Masterbatch
- Composites
- Cereals and grains
- Pharmaceuticals
- Thermoplastics
- Powder coatings
- Metals
- Multicomponent materials
  - Chrome-plated ABS
  - Plastic/metal laminates
  - Plastic/plastic laminates
  - Vinyl-coated fabric
  - Wire/cable
- Tyres and technical rubber
- Spice and herbs



Extruded Wire



Cinnamon



ABS Chrome



Carpet

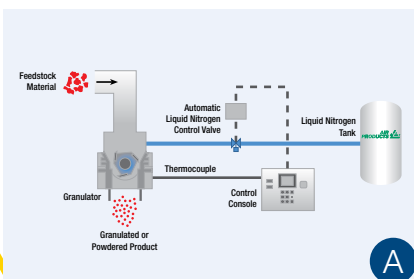


# PolarFit Size Reduction Systems

Air Products experienced engineers can help determine which PolarFit system is best for your operation based on your current system, the material you process, and your goals—whether it's our turnkey cryogenic grinding system or components of the system that we retrofit to your existing equipment. Below are descriptions of the four size reduction system configurations we offer.

## A. Temperature control - for heat sensitive polymers

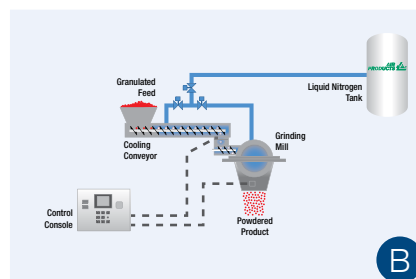
A system designed to eliminate excess heat within a grinding process by the direct injection of liquid nitrogen into the grinding chamber. Used for polymers that may experience chemical and physical deterioration from the heat generated during conventional granulation or grinding. Examples include uncured rubber, hot melts, plastic films, organic pigments and some thermoplastic resins such as ABS. The liquid nitrogen cools the process and stabilises the temperature below the critical reaction point. As the liquid nitrogen vapourises, it leaves the chamber atmosphere purged of oxygen and virtually inert. This minimises oxidation and reduces the hazard of explosion. This system has an automatic temperature control and a low capital cost.



A

## B. Cryogenic grinding – for tough, resilient materials

Tough, resilient materials require complete embrittlement prior to actual grinding. With our PolarFit cryogenic grinding system, you can process materials such as retread rubber, shoe soles/heels, weather stripping, urethane foam, chrome-plated ABS and vinyl-coated fabric. The cooling conveyor transfers the feed from the hopper to the grinding mill. Liquid nitrogen sprays onto the material as it moves along the conveyor, resulting in a high heat transfer coefficient on the pellet surface. This rapid cooling makes the material brittle and easier to grind by a variety of impact-type mills.



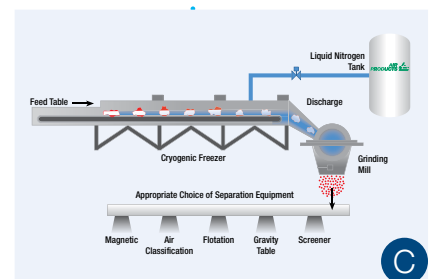
B

## C. Cryogenic grinding and tunnel freezer – for large materials

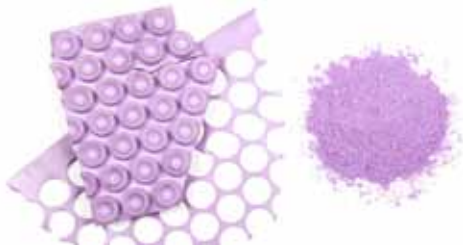
This size reduction system configuration can help you process larger materials such as steel-belted tires, V-belt scrap, reinforced hose, and electrical cable. Embrittled material passes from the tunnel freezer to an impact mill where the individual components are separated and ground. Our tunnel cooling system can also be retrofitted to many types of existing mills.

## D. Inert Grinding - for Sensitive Organic Materials

Organic materials have an increased risk of explosion when very fine particles combine. The use of nitrogen to make the atmosphere inert reduces the possibility of this occurrence.



C



Halogenated Butyl Rubber



Cereal

## PolarFit Technology and Service

Air Products has over 40 years of laboratory and plant experience in cryogenic grinding. As a leader in cryogenic applications, we offer complete technical service from our experienced staff and fully equipped facilities. Our cryogenic specialists can work with you to meet your product and process needs.

At our trial facilities in Asia, Europe and North America, we can run your product on production-scale equipment to help determine the feasibility of using cryogenics in your process and also help quantify the benefits versus the cost.

## tell me more

**Air Products can provide a range of solutions, from nitrogen supply to turnkey cryogenic grinding solutions. Please contact us to better understand how we can help you achieve your goals.**

### **Air Products PLC**

2 Millennium Gate

Westmere Drive

Crewe CW1 6AP

United Kingdom

Tel +44(0)800 389 0202

Fax +44(0)1932 258652

Email [apbulkuk@airproducts.com](mailto:apbulkuk@airproducts.com)



[www.airproducts.co.uk/cryogenics](http://www.airproducts.co.uk/cryogenics)