



**PolarFit[®] cryogenic
grinding solutions for
industrial hemp**

tell me more



Making the most out of every part of the hemp plant

There is more to hemp than just CBD oil. Whether it be seed, fiber, or flower — potential uses for food, nutrition, fiber, and fuel are increasing. That is why using liquid nitrogen or carbon dioxide in your milling or grinding process can help to preserve valuable chemical compounds and oils by preventing heat buildup and volatilization, plus keep the mill cool to break down high strength fiber or hurd into finer, more uniform particles . . . all while maximizing production rates and minimizing 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 high-oil content seed products to tough hemp stalk and fiber.

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.

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 yield of particles in your target range
- More uniform particle size distribution
- Higher production rates
- Improved product quality
- Improved process safety due to the nitrogen inertness
- Enhanced oil retention, flavor and fragrance



Applications

PolarFit size reduction systems can help you more efficiently grind a variety of hemp materials:

- **Hemp seed** is highly valued for its nutritional content. It is high in protein and amino acids. It also has a high oil content which when further processed to powder form by milling can cause issues with buildup on screens as well as loss of volatile oil content. Using cryogenic liquid nitrogen or CO₂ that is food grade and already widely used and proven in other food products, can prevent this. Because nitrogen is an inert gas and does not easily react with most materials, it protects sensitive materials and prevents fires and explosions.



Clean Mill screen using liquid nitrogen



Clogged with seed oil buildup without liquid nitrogen



- **Biomass** - Use of cryogenics can improve biomass material preparation for extraction. Cryogenics can play a dual role (1) to pre-cool biomass material so the material temperature is lowered to that of the extraction process and (2) to grind product to achieve a uniform particle size for extraction. In order to preserve maximum CBD, terpene, and other phytocannabinoid content, adding cryogenics to the milling process freezes and embrittles the biomass to lock in the oil content plus allows for a consistent particle size generation to maximize extraction efficiency.



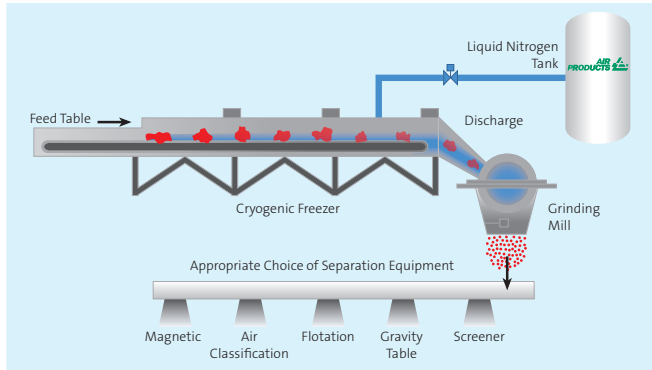
- **Flower** -Industrial hemp flower processors sometimes need to pulverize flower for end products. Use of cryogenics in the flower milling process can help to maintain valuable oil and chemical compound as well as aroma content. End uses that require maximum flavor and fragrance can benefit by protecting delicate flavor and fragrance compounds.

- **Hemp hurd and fiber** – Both are known for its strength and physical properties and are growing in use in engineering materials like composites and other building materials like concrete blocks. Being a natural, renewable product makes hemp a potential game changer in building and structural materials of the future. Adding cryogenics to the milling process can help to provide a very fine, uniform particle size for incorporation into resins or composite mixtures. Since hemp is abrasive and tough, heat can rapidly build up when milling the fibrous biomass causing downtime and inefficiency in the milling process. Cryogenic grinding allows for smoother operation of the milling process.



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 is one example of a size reduction system configuration we offer.



Cryogenically freezing tough, large shape materials with liquid nitrogen in a tunnel freezer

This size reduction system configuration can help you process larger shape materials. Cryogenically frozen 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.

PolarFit technology and service

Air Products has decades of laboratory and manufacturing 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 Allentown, Pennsylvania, 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.

For more information, please contact us at:

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.

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•Sales will only be made to customers who can show compliance with applicable state and federal laws and regulations.



Ask us about the power of cryogenics for grinding hemp fiber. This photo illustrates dried hemp fiber cryogenically ground to a D50 (particle size distribution) of less than 150 microns.



tell me more
airproducts.com/hemp