



## Why United Bio Freeze switched from traditional drying methods to flash freezing their hemp harvest [tell me more](#)

“Freezing industrial hemp using a cryogenic liquid-nitrogen system offered a cost-effective, faster alternative to traditional methods of drying and storing. Plus it retained more of the valuable cannabinoid compounds in the hemp product.”

Kellan Goertemiller, United Bio Freeze co-owner and chief technologist

Air Products' Freshline®  
flash freezing technology  
maximizes yield,  
preserves valuable CBD,  
terpenes, and flavonoids,  
and minimizes drying time  
at United Bio Freeze LLC



## Freeze. Grind. Extract.

Liquid nitrogen can improve hemp-CBD quality and yield.

### Introduction

Due to its extremely cold temperature, Liquid Nitrogen (LIN) can freeze industrial hemp within minutes instead of the hours required with more traditional methods like mechanical freezing. The major benefits of cryogenic freezing are speed and controlled cooling. This consistent, repeatable temperature control enables the process standardization needed to help meet compliance requirements for Good Manufacturing Practice guidelines and other required measures. In the harvesting process, it is critical to the value of the crop to preserve the plant's sensitive chemical compounds such as CBD.

Preserving hemp immediately after cutting the harvest can take days or weeks using conventional drying methods. Contamination from mold or other material changes resulting from these drying techniques may decrease the quality of the crop due to loss of valuable compounds or other issues. To ensure quality and integrity of preservation, LIN can be used in a cryogenic tunnel freezer to quickly freeze hemp directly after harvesting. Freezing hemp in minutes can help prevent mold formation and lock in the plant's rich chemical content. This results in quality and preservation benefits. In addition, freezing allows further biomass handling without smearing the oil-containing trichomes.

The same Air Products' gases that have been used safely and successfully for over 60 years in the food and pharmaceutical industries can also be used by hemp processors to help improve quality and yield of product.



**United Bio Freeze**

## United Bio Freeze's Success Story

United Bio Freeze LLC (UBF) located in Stayton, Oregon is an innovative industrial hemp company with offerings including commercial drying, extraction and consulting. In this fast-growing industry, UBF was searching for an innovative approach to speed up the hemp drying time as well as maximize retention of valuable CBD oils and other chemical components to provide their clients with the highest quality product..

United Bio Freeze (UBF) has been growing and harvesting hemp since 2018. After several harvests they quickly realized that the labor-intensive drying and storage process after harvesting hemp was costing them valuable time, quality and yield of product, and ultimately loss of profit. Focusing on the end product quality needs of their end customers, UBF knew that better quality control of their entire process could improve the level of safety, consistency and predictability of their end product. Talking with fellow hemp growers in the region, they found this was a common challenge. Each was struggling with process inefficiencies due to mold or aerial contamination resulting in crop loss.

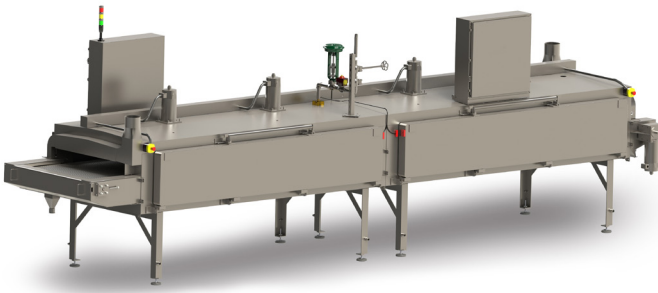


To solve the issue, UBF contacted Air Products, a leader in the field of cryogenic freezing technology and industrial gas supply for the food, nutraceutical and pharmaceutical industries. Kellan Goertemiller, co-owner, and chief technologist at UBF called in Air Products applications engineering team to thoroughly assess the facility's hemp operation.

The recommendation: **Flash freezing with cryogenic liquid nitrogen** to quickly freeze fresh hemp straight from UBF's growing fields. This would avoid the laborious, time-consuming drying process and potential loss of the hemp's valuable chemical compounds. The process was easy to execute with little capital expenditures. Using Air Products mobile cryogenic freezing test chamber, a portion of UBF's crop was flash frozen and bagged in super sacks for long-term frozen storage at a nearby cold storage facility. UBF secured long-term cold storage space to allow for the year's frozen harvest to be stored in highly controlled conditions for testing and processing over the year as needed. The storage space needed was substantially smaller than the square footage required for the traditional drying process. When stored in cold storage after flash freezing, the hemp's delicate trichomes remain intact and its strong odor is minimized thus preventing complaints or issues from nearby occupants.



Goertemiller reported that “With traditional hang drying methods, on average we have seen 2-4% loss due to all the handling that occurs both to hang the hemp and later removing it to strip and bag. Big losses also occur handling it after it's dry. Heated drying would be orders of magnitude more in losses. Additionally, the biomass continues to degrade over time if processing is delayed or as material is drying to a suitable moisture level for storage.”



The Freshline® IQ tunnel freezer provides quick, thorough freezing with a low-initial capital expenditure. Based on ten-foot modular units, it is easily expandable on-site to grow with production needs.

With flash freezing, the speed and minimized handling of the material has provided an advantage for their end product and the overall efficiency of their hemp operation. Geortemiller found clear advantages of flash freezing vs. standard drying stating “the flash frozen hemp can be removed from storage and is ready for extraction by any lab or processor with the ability to later remove water from finished concentrate. Typically, this is completed at the lab level using rotary vaps or falling film to remove any water.”



Figure 1



Figure 2

Center of figure 1 shows the difference in appearance of frozen chopped hemp compared to chopped dried hemp stored in sack for the same time period. Note the fresh green color of the frozen hemp. Figure 2 is a close up showing the trichomes are still intact after freezing.

Based on this success, UBF will continue to use flash freezing for their future harvests using an Air Products Freshline®IQ tunnel freezer to efficiently process their hemp and lock in the rich chemical content of their end product. UBF and Air Products will continue collaborating this fall conducting additional studies using cryogenics to enhance hemp quality and yield.



## Process options after harvesting

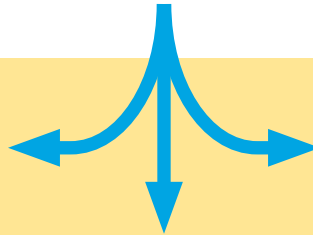
Drying fresh hemp needs to begin within hours of harvesting to avoid product losses and chemical changes. There are many options to choose from depending on your location, available storage space and time constraints including, hanging plants in a storage barn to mechanical heated air drying. The flash freezing option is one that differentiates itself by eliminating time and space constraints and its ability to lock in its chemical compounds through ultra-low temperature freezing.

Frozen hemp in long-term cold storage also provides the grower with an option for the material to be safely preserved until market conditions are most favorable, a buyer can be found, or extraction processing equipment becomes available. In addition, avoiding excess drying heat helps to keep flavor and aroma intact, while preserving the plants' chemical attributes for maximum extraction yields. Due to liquid nitrogen's extremely cold temperature when used in a cryogenic system, it can freeze hemp within minutes under a controlled process to help meet standardization requirements that consumers demand.

## Choosing the right path for your hemp processing



High Heat Rapid Drying



Traditional hang drying



Cryogenic Flash Freezing

## Make the Comparison: Traditional Drying vs Flash Freezing

### Traditional Drying Methods

- Hemp can typically lose CBD content when hang dried or heated
- Risk of mold or aerial contamination
- Large storage space requirements and long drying time
- Hemp can continue to degrade over time, if processing is delayed
- If optimal long-term storage options are limited, moisture can be reintroduced causing mold or rotting
- Dryer facilities are common, but can be non-standardized, therefore end-product may not have consistent CBD content
- Drying temperatures can exceed 200 °F and potentially vaporize volatiles (terpenes, trichomes, etc.)
- Dried product can continue to degrade over time if processing is delayed or even reintroduce moisture or mold

### Cryogenic Flash Freezing

- UBF test case shows higher yield of desirable compounds (e.g., CBD) with freezing at harvest
- Flash freezing takes minutes per pound, and is significantly faster than drying methods
- Flash freezing prevents damage to delicate trichomes, preserving terpenes, and other desirable components for flavor and aroma
- Flash freezing allows for a consistent freeze throughout the biomass for processing (i.e., center of material) to avoid degradation of product
- Immediate cold storage after flash freeze helps to maintain biomass condition comparable to the organic state when harvested
- Flash freezing can reduce costs by saving time, labor, space and chemical compound losses

## We're ready for your harvest

Harvesting and preserving your crop is a critical stage in your hemp process. Don't risk loss, mold or mildew, or your crop going hot while waiting in the field for drying space to open. Our team of experts can review your process and help to evaluate your hemp operation. Our state-of-the-art applications lab can be used to test your product, or we can provide a field visit for a customized assessment. We have numerous cryogenic delivery methods and cooling system options.

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

**Put our experts to the test.  
Contact us to discuss your  
needs.**

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