

# **WHY AODD PUMPS ARE THE RIGHT CHOICE FOR THE PRODUCTION OF HEMP-BASED CBD OIL PRODUCTS**



The production of hemp-based cannabidiol (CBD) oil has exploded globally over the past several years. Hemp-based CBD is taking on countless form factors, from topical treatments to edibles and beverages. There are also countless methods of extracting CBD oil from hemp plants, with the most common being ethanol, supercritical CO<sub>2</sub>, and hydrocarbon.

All extraction processes present unique pumping challenges, such as extremely low temperatures, combustible, viscous, and solids-laden fluids. Whether you're a large-scale producer, small-scale lab, equipment maker, or consultant, you need a resource you can trust to find the right pump for your application.

This whitepaper will explain the advantages air-operated double-diaphragm (AODD) pumps have over other technologies when used in the production of CBD oil. It will also provide guidance on where and how these pumps can provide safety and reliability in various processes, including extraction, pre-winterization, solvent recovery, product filtration, and more.



# REASONS TO CHOOSE AODD PUMPS OVER OTHER PUMPING TECHNOLOGIES

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No electricity required and can be fully grounded (ATEX compliant)



Ability to pump fluids as cold -40°F/C



Self-priming; work in suction lift applications



Can run dry without damaging the pump or system



Deadhead safely, with no pump or product damage

With so many pumps on the market, including centrifugal, lobe, gear, screw, hose, and piston/plunger, it can be tough to find the information you need to make the right choice.

One type of pump, however, has proven itself as a market leader when it comes to reliability, versatility, and ease of maintenance: the AODD pump.

AODD pumps deliver unique benefits that are unrivaled by other pump technologies, which is why a wide range of industries rely on them to keep their operations running smoothly. These pumps require little maintenance and are cost-effective solutions for transferring almost any viscous fluid safely. Here are some additional AODD pump benefits:

- **Safety:** AODD pumps don't require electricity and can be grounded to prevent static buildup/explosive situations for pumping flammable solvents like ethanol.
- **Solids handling:** They can handle solids and slurries, such as biomass.

- **Deadheading:** When the pressure on the fluid discharge equalizes air inlet pressure, the pump will deadhead with no damage. This is common in filter press filtration applications.
- **Dry running:** They can run dry without damage. This is very beneficial when transferring products from tank to tank, common in the CBD oil manufacturing process.
- **Low initial cost:** Their purchase price is generally less than that of other pumping technologies.
- **Low-temperature operation:** They can run at temperatures as low as -40 degrees Fahrenheit/Celsius, which is crucial in the production of CBD oil.
- **Simple installation:** They have a very simple, forgiving design versus other pump technologies. There's no need for an elaborate setup or control systems.

# PRIMARY CBD OIL EXTRACTION METHODS

There are three primary methods of extracting CBD oil from hemp.

## 1. SUPERCRITICAL CO2 EXTRACTION

This method has been commonly used for years to decaffeinate coffee and create vanilla extract. It's been adopted more recently for CBD oil production. Supercritical CO2 extraction is when CO2 (at high pressure and very low temperatures) is forced through cannabis biomass. The process extracts the CBD oil out of the biomass while also removing unwanted substances, like chlorophyll.

## 2. ETHANOL EXTRACTION

Chilled ethanol (-40 to -80 degrees Fahrenheit) is mixed with cannabis biomass to create a reaction. The oils, waxes, and lipids are released from the cannabis biomass and attach to the chilled ethanol molecules. The ethanol is then distilled to remove the ethanol and leave the remaining extracted product, known by many as crude oil. The remaining CBD crude oil is distilled and refined to separate the cannabinoids (clear valuable oil) and non-cannabinoids (dark waste residue).

## 3. HYDROCARBON SOLVENT EXTRACTION (BUTANE, PROPANE, AND PETROLEUM)

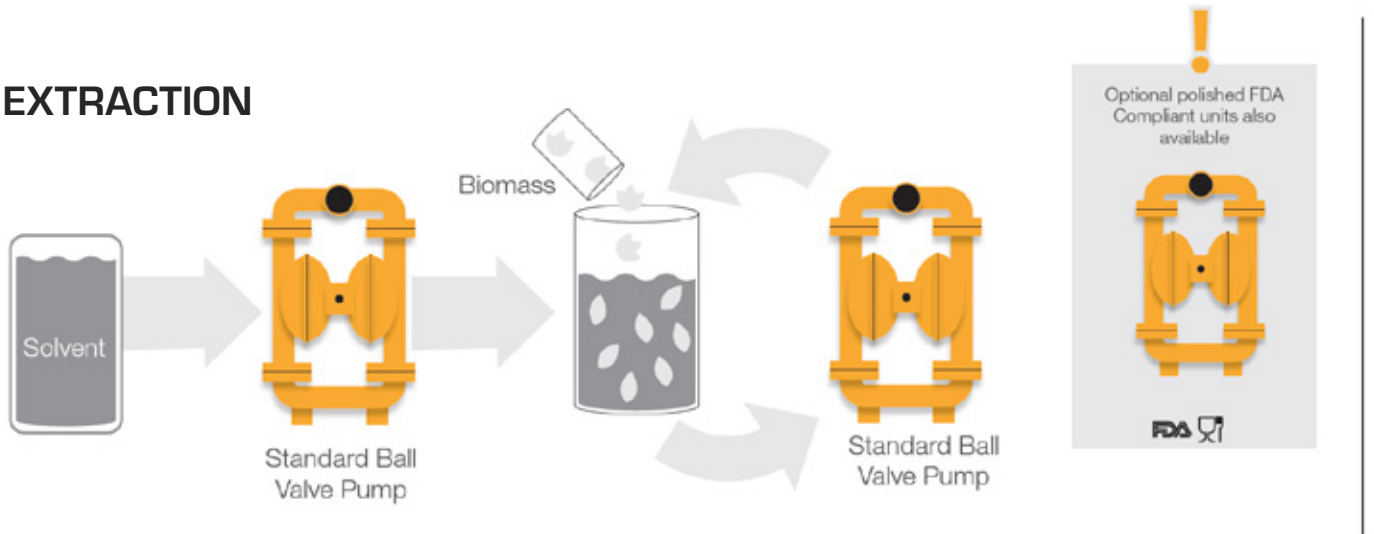
Hydrocarbons are introduced to the cannabis biomass and the oils bond to the hydrocarbon molecules. The hydrocarbons are then removed, leaving the CBD crude oil to be processed as in the ethanol extraction process.



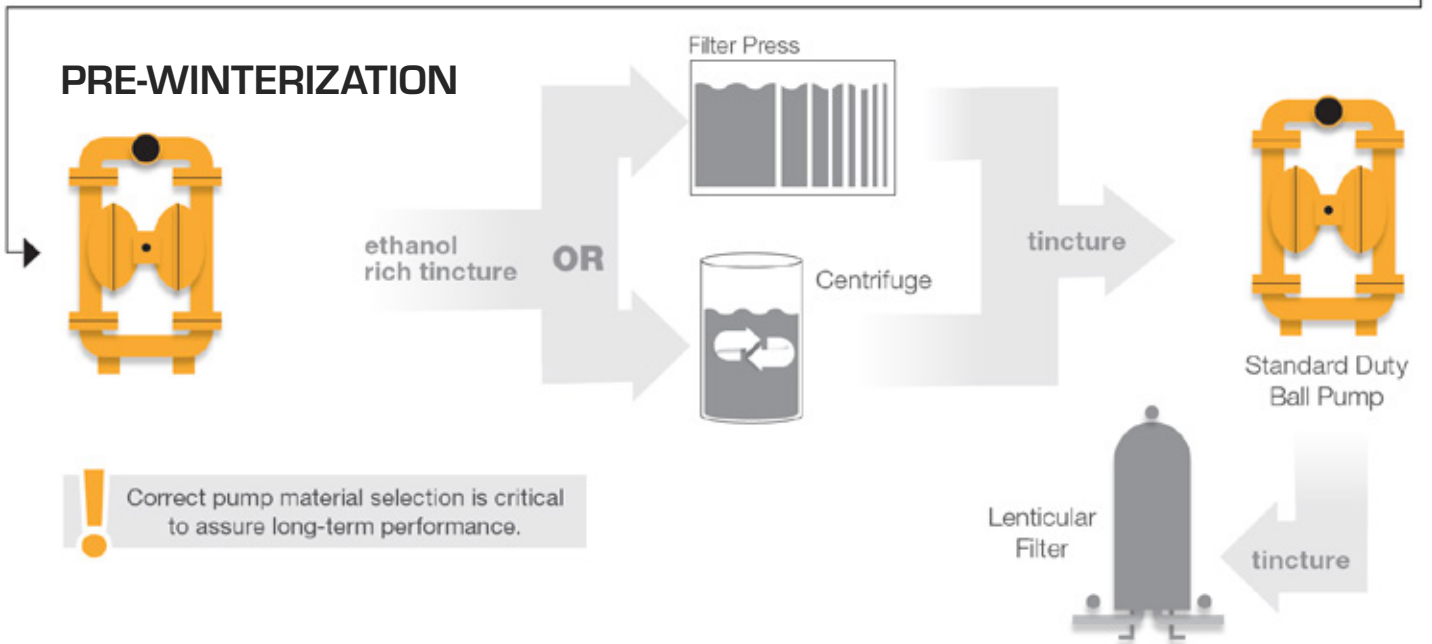
There are many methods for extracting CBD oil from cannabis biomass. AODD pumps are mainly used as key process pumps in the ethanol extraction process, providing the safe and efficient delivery of liquids.

# AREAS WHERE AODD PUMPS ARE THE BEST SOLUTION

## EXTRACTION



## PRE-WINTERIZATION



AODD pumps can deliver ethanol to a vessel full of hemp-based biomass. They can also deliver a biomass slurry (biomass ethanol mixture) to the vessel using the AODD pump for winterization and extraction.

# THE CBD OIL PROCESSES WHERE AODD PUMPS ARE THE BEST SOLUTION (CONT.)

## WINTERIZATION

AODD pumps can deliver and circulate the chilled ethanol (at -40 degrees Fahrenheit) to extract the CBD oils from the biomass. If the biomass is free in the ethanol, you might need a flap valve-type pump. But if the biomass is in a “teabag” or is contained, then a standard AODD unit will work fine, as solids will not be a factor.

## FILTRATION/DECOLORIZATION

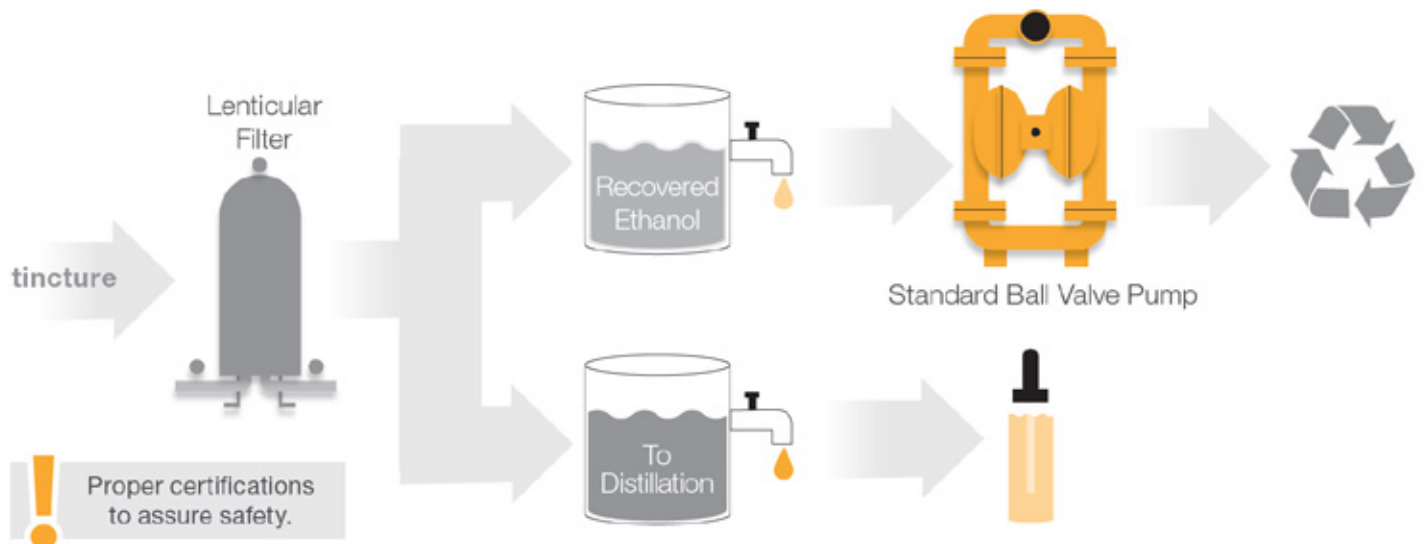
AODD pumps are widely utilized in the filtration process of the tincture. They are an optimal choice because AODD pumps can produce a wide range of pressures. They can also deadhead without damage when the filter plates become filled with cake/waste. Commonly used in conjunction with a decanter centrifuge for oil extraction from the hemp-based biomass. Once the filtration and distillation phase removes waxes, lipids, and fine particles of biomass, the tincture is pumped by an AODD pump to a lenticular filter for additional refinement.



# THE CBD OIL PROCESSES WHERE AODD PUMPS ARE THE BEST SOLUTION (CONT.)

## SOLVENT RECOVERY/PHASE CHANGE

The final phases are the process of recovering the ethanol from the tincture and then distilling the remaining crude oil/distillate into the final product. This ethanol is then heated and condensed off, leaving just the crude oil/distillate. An AODD pump is used to pump this ethanol back for reuse in the process.



The final distillation removes any remaining unwanted materials, such as lipids, waxes, cannabinoids, chlorophyll, terpenes, and other impurities. The final distillation phase creates the golden final product that is clear, bright, and enjoyable.

# THE VERSAMATIC DIFFERENCE

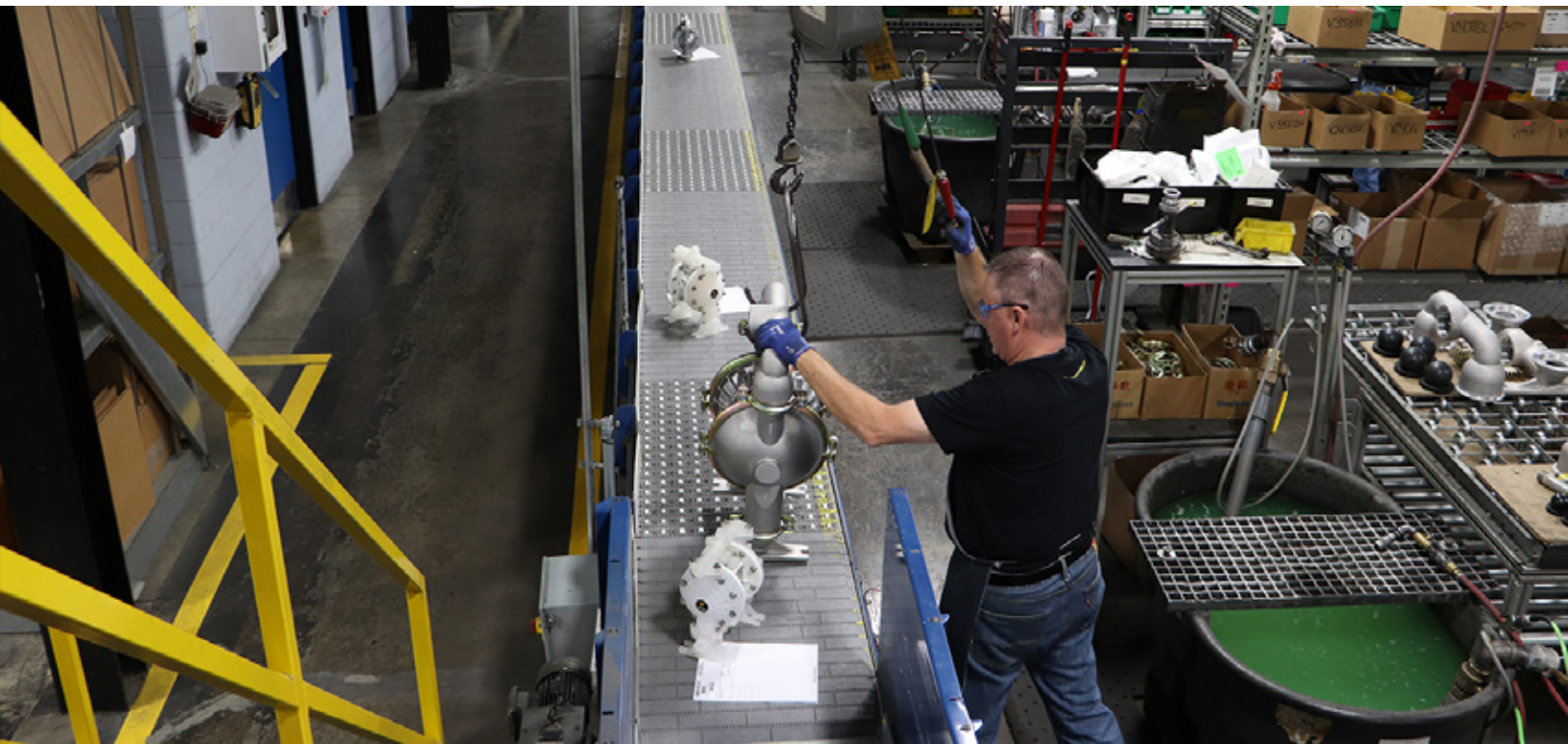
When it comes to safety, Versamatic offers each of its designs in groundable, ATEX-certified models for the safe transfer of flammable liquids, such as ethanol.

Versamatic FDA-complaint food processing pumps are also available for the safe, clean transfer of CBD oil products and solutions. In clamped style or bolted construction, they are simple to disassemble for cleaning and repair. Electropolished casting and FDA-compliant materials ensure cleanliness can be maintained. These styles of AODD pumps can be used when adding flavors and mixing CBD with other edible products.



## COMMONLY USED APPLICATIONS FOR VERSAMATIC AODD PUMPS IN HEMP-BASED CBD PRODUCTION

- Chilled ethanol transfer (winterization)
- Biomass slurry transfer
- Ethanol-rich tincture transfer
- Filter press systems
- Centrifuge systems
- Lenticular filter systems
- Ethanol recovery
- Wax and lipid removal





## COMMONLY USED VERSAMATIC AODD PUMPS IN THE HEMP-BASED CBD INDUSTRY

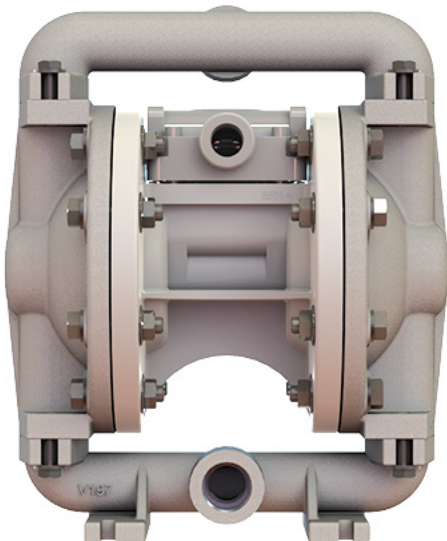
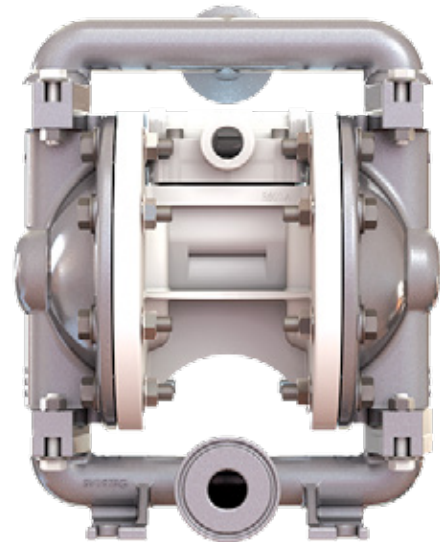
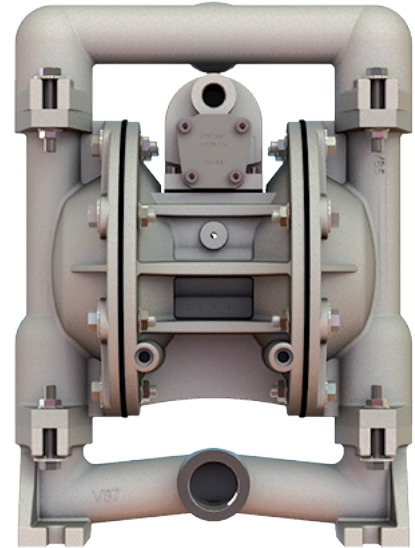
### Solvent Filling, Transfer, and Recovery

- [½" \(13mm\) Bolted Metal AODD Pump](#)
- [½" \(13mm\) Bolted Metal Food Processing Pump](#)
- [1" \(25mm\) Bolted Metal ATEX Pump](#)
- [1 ½" \(38mm\) Bolted Metal ATEX Pump](#)
- [2" \(51mm\) Bolted Metal ATEX Pump](#)

## CONTACT US TO FIND YOUR SOLUTION

At Versamatic, we have a broad, versatile AODD pump portfolio and quick solutions that are perfect for hemp-based CBD oil extraction and post-recovery and filtration systems.

[Reach out to one of our seasoned application engineers to find your solution today.](#)



**FDA**   
COMPLIANT

## GLOSSARY OF TERMS COMMONLY USED IN THE PRODUCTION OF HEMP-BASED CBD OIL

**Biomass:** Hemp-based CBD biomass refers to excess hemp plant material that is rich in CBD. This kind of biomass is best used to extract CBD oils, distillate, or isolate. It can be used ground or in pellet form.

**Cannabidiol:** This is the scientific name for CBD. It is a phytocannabinoid (one of 113 found in the hemp plant).

**Cannabis:** A plant that is part of the hemp family. Cannabis is a genus of plants from which CBD is derived.

**CBD Oil:** An abbreviation for cannabidiol oil, CBD can only contain no more than .03 percent THC by law and does not have any psychoactive properties.

**Crystalline Isolate:** This is CBD oil that has been processed to eliminate all cannabinoids, which include THC. This product is preferred by those who take drug tests as standard CBD oil contains trace amounts of THC.

**Flavonoids:** Flavonoids are plant compounds that are abundant, biologically active, and water-soluble. For humans, flavonoids are important antioxidants that are reported to have a variety of benefits, such as reducing free radicals and producing anti-inflammatory and anti-allergic effects.

**Full-Spectrum Oil:** A full-spectrum CBD oil is an extract that has not been purified, isolated, or refined in any way, which would remove the other naturally occurring elements of the hemp plant, such as terpenes, lipids, waxes, or other cannabinoids.

**Hemp:** Hemp is a variety of the cannabis plant, which is grown for industrial purposes and contains extremely low concentrations of THC (less than 0.3 percent), as defined by the Agricultural Act of 2018. Hemp does, however, contain high quantities of CBD, making it a common source for CBD products.

**Hemp Oil:** The term "hemp oil" most commonly refers to oil made from the seeds of the hemp plant. It can also be called hemp seed oil. While hemp oil does contain trace amounts of CBD, it is only present in extremely low concentrations, making it an unreliable source of CBD.

**Lipids:** Any of a class of organic compounds that are fatty acids or derivatives. They include many natural oils and waxes.

**Marijuana:** Marijuana is any plant in the cannabis family defined by its THC content being higher than 0.3 percent by dry weight, as opposed to hemp, which contains a lower percentage of THC. Marijuana includes two types of plants: cannabis Sativa and cannabis Indica.

**Terpenes:** Terpenes are natural, organic compounds present in a wide variety of plants that are responsible for taste and scent.

**THC:** THC, or tetrahydrocannabinol, is the main psychoactive compound in marijuana. THC is responsible for producing the "high" sensation or mind-altering effect of marijuana consumption.

**Tincture:** Tinctures are most commonly a mixture of alcohol and water, which is used to naturally extract CBD oil, although other methods can be used, such as glycerin, vinegar, or oils. Other ingredients may then be added to a tincture to create a more distinctive product, such as essential oils for flavoring.

**Supercritical CO2 Extraction:** This process uses highly pressurized carbon dioxide and forces it through hemp-based biomass to extract CBD in a clean and efficient way.

**Winterization:** Winterization is a refinement process of taking "raw" hemp oil once extracted, adding an alcohol to it, and then freezing it. This process separates any phytonutrients, chlorophyll, waxes, and fats, as well as most terpenes, from the oil, leaving a more purified CBD product.