



Cannabis Processing 101

Welcome to Cannabis Processing 101

The Basics of Temperature Control & the Equipment You'll Need

Welcome to Cannabis Processing 101, an introduction to the basics of scientific temperature control and the types of equipment you'll need. We've created this guide to familiarize you with some of the scientific processes used to create cannabis extracts and products. We'll also walk you through why these processes are important and how they affect your final product. The following information is a representation of a common scientific approach, but your approach may vary. If at any time you need assistance with your workflow or have questions about any of the terms, processes, or information in this guide, please feel free to [contact us](#).



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The Cannabis Workflow

Temperature affects nearly every aspect of cannabis processing. It influences purity, potency, and yields by either enhancing or degrading cannabinoids and terpenes. Throughout the workflow, you'll need to apply accurate, consistent temperatures to the plant material. Depending on the process and method you use, you may need to heat things up, cool them down, or chill them at a super-low temperature.



1 Extraction uses a solvent to remove or extract desired compounds such as cannabinoids and terpenes from the plant material. In the cannabis industry, extractors typically use supercritical carbon dioxide, liquefied hydrocarbons (such as butane or propane), or ethanol as the solvent. The extent to which you'll need to further refine the extract and engage in the other processes depends on the solvent/extraction method you've used.

2 Winterization further refines your extraction by removing fats, lipids, waxes, chlorophyll and other unwanted compounds from the extraction. It's achieved by placing the extracted solution in freezing alcohol to precipitate or solidify the unwanted compounds. You may not need this step if you've used super-cold ethanol in your extraction process.

3 Solvent Recovery is often built into the extraction when using supercritical carbon dioxide or liquefied hydrocarbons such as butane and propane. This is a cost-efficient and eco-conscious process that allows you to recover & recycle ethanol during the extraction and winterization processes and recycle it for reuse.

4 Decarboxylation is a chemical process that uses heat and time to convert THCA/CBDA into active THC/CBD. Decarboxylation not only activates the psychoactive properties of THC it also activates the effects of CBDA so that it can be used in the body. There are differing opinions on when to decarb. Some processors believe that decarbing the plant materials may lead to undesired flavors in the extract. If you choose to decarb the plant material before removing the solvents, then decarbing can help lower the risk of botulism and bacteria growth by reducing moisture in the plant material. If you are working with a solvent-free extract, you don't have to worry about lowering the risks for botulism or bacteria growth.

5 Distillation is used to further refine the decarboxylated and winterized extract in order to isolate smaller quantities of high purity terpenes, CBD, or THC. The cannabis industry uses short-path vacuum distillation, a method of distillation performed under reduced pressure, which separates compounds based on differences in boiling points. Common methods include batch short-path distillation and continuous forms of short-path distillation known as wiped-film or rolled-film distillation.

Note: You may see others in the industry suggesting a slightly different order, do not worry. The step-by-step process we outline is just one of the ways to achieve your goals. The [account managers](#) at JULABO USA, along with our [senior product manager and application scientist](#), can help you arrive at the best workflow for your specific outcomes.

Extraction

Supercritical Carbon Dioxide Fluid Extraction

Supercritical Carbon Dioxide is a form of CO₂ where pressure and temperature are increased beyond the critical point (31°C for temperature and 1,071 psi for pressure). By adjusting pressure and temperature, you can target specific terpenes and cannabinoids, and produce extracts with a complete terpene profile. Using recirculating chillers, you can recycle the CO₂ by condensing the gas back into a liquid state. Recirculating heaters are used to assist in the removal of CO₂ and create a solvent-free extract.

Temperature control equipment used in supercritical CO₂ extractions:

- Heating Circulators
- Recirculating Chillers

JULABO products
commonly used



FL4006



PRESTO W91



CORIO CD-BC12

Liquefied Hydrocarbon Extraction

Liquefied hydrocarbons, such as butane and propane, are fast and efficient solvents. Due to the flammability of hydrocarbons, attention must be paid to temperature and pressure. Heating and cooling capacities need to be calculated based on the size of the application. Recirculating temperature control units that cool down to < -30°C are required to maintain the butane and propane in a liquid state. A reduction in pressure, along with heating circulators, help evaporate the residual hydrocarbons to produce a solvent-free extract.

Temperature control equipment used in liquefied hydrocarbon extractions:

- Heating Circulators
- Refrigerated/Heating Circulators
- Ultra-Low Refrigerated Circulators
- Dynamic Temperature Control Systems

JULABO products
commonly used



PRESTO A80



SL-12



FP89-HL



DYNEO DD-1000F



DYNEO DD-BC4

Extraction (continued...)

EtOH (Ethanol) Solvent Extraction

Unlike other methods, warm and cold EtOH extractions don't require the use of high pressure. Warm EtOH extraction pulls out the plant lipids, fats, waxes and chlorophyll with the cannabinoids and terpenes and may lead to an extract with a strong, unpleasant taste. Most cannabis processors want to eliminate unwanted extractants by using cold EtOH methods. Lowering the extraction temperature decreases the solubility of unwanted components (fats, waxes, chlorophyll, etc.) and can eliminate the need for a separate winterization step, which is needed for CO₂ and liquefied hydrocarbon extractions.

Temperature control equipment used in EtOH extractions:

- Refrigerated/Heating Circulators
- Ultra-Low Refrigerated Circulators
- Dynamic Temperature Control Systems

JULABO products
commonly used



PRESTO A85



PRESTO W92



FP90-SL



CP-1000F



Winterization

During winterization, the cannabis extract is submerged in EtOH (ethanol) and the temperature is lowered to ≤ -20 °C. The colder temperature causes fats, lipids, and waxes to solidify or precipitate for removal. When we use a vape pen or a dab, unwanted fats and compounds can cause a burned taste from the heating element or coil.

Extraction Methods & Winterization

- Supercritical CO₂ extractions typically pull a larger amount of waxes, lipids, fatty acids, and chlorophyll.
- Liquefied hydrocarbon “butane and propane” will pull a moderate amount of these unwanted compounds.
- Cold EtOH extractions using a temperature around ≤ -20 °C may be able to skip the Winterization process.

Temperature control equipment used in Winterization:

- Refrigerated/Heating Circulators
- Ultra-Low Refrigerated Circulators
- Dynamic Temperature Control Systems

JULABO products
commonly used



CD-1000F



FPW91-SL



PRESTO A80



PRESTO A85



Solvent Recovery

Supercritical CO₂ and liquefied hydrocarbon systems normally have solvent recovery built-in the extraction process. With these methods, the gasses are typically recompressed and recovered using a closed-loop system. EtOH extractions generally require additional steps for solvent recovery. Small volumes of EtOH extractions often use a rotary evaporator to recover the EtOH while larger volumes will use falling/rising film evaporators and rotary evaporators to complete the process. Heating circulators can be used for rising/falling film systems. Recirculating chillers and industrial chillers are used for small falling/rising film systems. There are many solvent recovery systems available with a growing number of options. If you have questions about other solvent recovery applications, the team at JULABO USA can address them directly and make sure you get the equipment you need to enhance your recovery process.

Temperature control equipment used in Solvent:

- Heating Circulators
- Recirculating Chillers
- Industrial Chillers

JULABO products
commonly used



FL7006



FL4003



FL20006



SL-12 HST



INDUSTRIAL CHILLERS

Decarboxylation

If your plant material doesn't undergo decarboxylation prior to the extraction process, you'll need to heat the solvent-free extract to ≥ 130 °C.

Temperature control equipment used in Decarboxylation:

- Heating circulators
- Dynamic Temperature Control Systems

JULABO products
commonly used



SE-12



SL-26 HST



PRESTO A80T



PRESTO A45T

Distillation

Depending on the amount of material you're working with you may want to use a traditional short-path vacuum distillation or a wiped/rolled film short-path vacuum distillation apparatus. The main difference is that the wiped/rolled film apparatuses have a series of blades that move the material through the system and can provide continuous processing.

Benchtop short-path distillation apparatus (up to 20L) utilize a refrigerated/heating circulator (like a CD-300F). Since the distillate is very hot the condenser requires a temperature above 50°C to condense the THC or CBD. Since the vapor is hot, the system needs cooling capacity even with the condenser temperature at 50 °C.

Wiped/rolled film instrumentation requires multiple heating circulators to ease the flow of the viscous materials through the feed-piping zones, distillation body, and collection areas. Condensation zones require units with refrigeration capabilities. Additionally, since this process operates under deep vacuum conditions, you'll need either refrigerated circulators or immersion coolers with cold traps to protect the diffusion or turbo-pumps.

Temperature control equipment used for Short-Path Vacuum Distillation:

- Heating Circulators
- Refrigerated/Heating Circulators
- Ultra-Low Refrigerated/Heating Circulators
- Immersion Coolers
- Dynamic Temperature Control Systems

JULABO products
commonly used



CORIO CD-BC4

SE-6

CORIO CP-600F

FP51-SL

FT900



Wish you had more information about Cannabis Processing?



For more in-depth, scientific information, [download our whitepaper](#) "The Cannabis Workflow and the IMPORTANCE OF TEMPERATURE CONTROL." For specific support in finding the right temperature control equipment, [contact us](#) today. We also offer NRTL Certification for our products for an additional fee. Our certification takes place prior to shipment and may impact delivery dates.

For more information visit: <https://www.julabo.us>

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