

VACUUM TECHNOLOGY for Cannabis Processing



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Making the Right Choice – Vacuum Technology for Cannabis Processing

Vacuum technology is highly useful in the majority of cannabis purification processes. Evaporation, extraction, distillation, and crystallization are the most common. These processes can be complicated and time-consuming, but vacuum pumps can simplify the process by reducing the dangers from extreme temperatures and the time that it takes to concentrate the cannabinoid oil.

There are several types of vacuum pump technologies used for cannabis processing. Producers should consider vacuum pump manufacturers which offer various design technologies and demand the best pump selection for every unique application. Below we outline the most commonly used vacuum technology in the cannabis industry:

Dry screw vacuum pumps are ideal for distillation applications as they generate high vacuum in a single stage. As these pumps run without operating fluids, they are able to extract the distillate as a vapor without contamination. As a result, the distillate can be reused after condensation. An extensive range of sizes and models are available, including explosion-proof versions (ATEX) (Figure 1).

Liquid ring vacuum pumps are extremely robust vacuum generators that are used in a number of distillation processes. They can be supplied in a wide range of series, stages, sizes and material of construction options to suit specific applications (Figure 2).

Dry claw vacuum pumps were developed for a wide range of applications and are used in processes where constant vacuum and high pumping speed are required. They are contact-free, simple to disassemble and are easily maintained (Figure 3).



Figure 3: Busch Mink MM 1142 BV dry claw vacuum pump. Mink sizes range from 40 - 680 CFM.

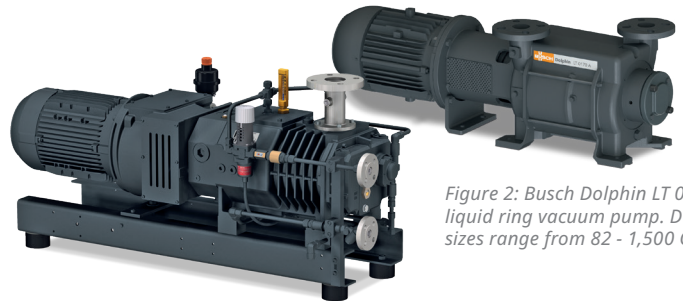


Figure 2: Busch Dolphin LT 0170 A liquid ring vacuum pump. Dolphin sizes range from 82 - 1,500 CFM.

Figure 1: Busch COBRA NC 0200 B dry screw vacuum pump. COBRA sizes range from 82 - 1,500 CFM.

2-stage rotary vane vacuum pumps are a proven technology designed to suite the requirements of a wide range of applications from research labs to production lines. They are simple to operate and maintain (Figure 4).

Dry scroll vacuum pumps are hermetically sealed, 100% oil free, and ideal for pumping air or conveying gases without leakage or ambient air contamination (Figure 5).

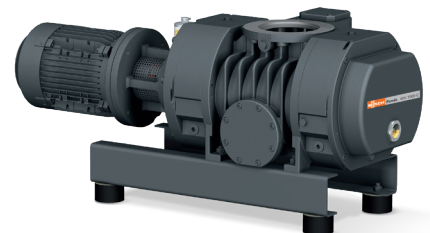
Figure 5: Busch Fossa FO 0015 A dry scroll vacuum pump. Fossa sizes range from 10 - 25 CFM.



Figure 4: Busch Zebra RH0030 B 2-stage rotary vane vacuum pump. Zebra sizes range from 1.7 - 55 CFM.

Dry rotary lobe vacuum boosters are ideal to increase the pumping speed, together with a backing pump in a vacuum system. Some rotary lobe blowers use bypass valves whereas others can be equipped with a pressure switch or Variable Frequency Drives (VFD) (Figure 6).

Figure 6: Busch Panda WV 1000 C rotary lobe vacuum booster. Panda sizes range from 315 - 6,800 CFM.



With an understanding of the various vacuum pump technologies, we can further elaborate on the ways you can use these technologies in the following processes.

Evaporation

Evaporation is simply the process of applying energy, typically in the form of heat, to a liquid to cause it to become a gas. Solvents are needed to remove the desired oils from the hemp plant. This will generate a large volume to be reduced. By simply heating the solvent at standard pressures, a large amount of energy is required to cause it to evaporate, which increases the risk of burning the crude hemp oil. By using a vacuum pump, the user can reduce the pressure in the container causing the liquid to become a gas at a lower temperature, which reduces the energy demands and improves the product yield. Ideal vacuum pump technologies to consider for this process are dry screw, 2-stage rotary vane and liquid ring.

Extraction

Extraction is the method of removing desired products from the undesired ones. To isolate the CBD, there are three major extraction methods, CO₂, ethanol, or hydrocarbons (propane, butane, etc.). The CO₂ method requires no solvent/liquid to draw out the oil from the plant material. This results in a cleaner product after the first extraction, however this process is more ideal for smaller scale operations because of the high pressure required to make the super critical fluid. The other two methods are liquid based which will require additional stages of evaporation later. The preferred solvent is ethanol, not because of how well it isolates the CBD, but because people consume this daily in their favorite adult beverages. Because the filtration of the desired product from the raw plant material can be thick and difficult to pass through the filter, a vacuum pump is used to generate a low-pressure area in the receiving vessel to speed up the process. Ideal vacuum pump technologies to consider are liquid ring and dry claw.

Distillation

Distillation is a purification method that takes advantage of the unique boiling point of different molecules to separate them. The raw material is heated and at a specific temperature the CBD will become a gas, leaving the other contaminants behind. The gas of the compounds travels into a colder area, the condenser, causing the gas to become a liquid once again. There are several types of distillation methods in this industry, but the bulk is done through a short path distillation process. CBD has a higher boiling point than the solvents that were needed in the evaporation steps, so to prevent the material from burning, a deeper vacuum is required to aid in the transition to the gas phase. In some cases, this will require a secondary or high vacuum pump. Ideal vacuum pump technologies to consider are dry screw, 2-stage rotary vane and dry rotary lobe blowers.

Crystallization

Crystallization is the final method to obtain the 99% pure CBD material. This is also commonly known as winterization. The material that was purified from the distillation process can be further purified by making a concentrated solution of the distillate. The solution is then chilled, thereby lowering the amount of CBD that can be dissolved. This causes the pure cannabinoid to form crystals. Once most of the CBD has come out of the solution, it is filtered and dried with the assistance of a vacuum pump. The vacuum pump improves the speed of the filtration and dries the crystals at the same time. Ideal vacuum pump technologies to consider are dry claw and liquid ring.

Regardless of the size or capacity of your CBD process, whether it's laboratory, pilot plant or full production, Busch Vacuum Solutions is ready to assist. Busch is an industry leader and one of the largest manufacturers of vacuum pumps, blowers and compressors in the world. An expert team of Busch engineers is involved in every step of the design, production and implementation processes, ensuring your needs are met efficiently and to exact specifications. Busch Vacuum Solutions also provides crucial after-installation support through their Field Service professionals at Busch Service Centers nationwide. Busch Service Centers are fully staffed with factory-trained Sales, Service and Customer Service personnel for comprehensive installation, startup, product and service support needs. They also maintain an extensive on-site inventory of Busch vacuum products and Genuine Spare Parts, used to maintain an optimal level of vacuum pump performance and reliability, extending the life of your vacuum pumps.

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