



DESIGNING INNOVATIVE VACUUM
GAUGES AND CONTROLLERS FOR
OVER 30 YEARS

APPLICATION NOTE ROTARY EVAPORATION

Introduction:

The purpose of this application note is to explain low pressure vacuum distillation and how DigiVac's Vapor Pressure Controller (VPC) makes the process easier. While the method of distillation allows people to separate the various components of the product, remove any potentially harmful aspects and come away with the desired material, it can be challenging to work through all unknown factors. Some of those factors include proper temperature to prevent bumping, time to complete the process, etc.

One of our customers was able to operate quickly at a lower temperature with less oversight of the process while keeping more terpenes through the distillation process by using our VPC.

What is Distillation:

Distillation is a process that consists of expelling gas or vapor from liquids or solids by heating and condensing to liquid products. It is used for purification, fractionation, or the formation of new substances. Various applications and distillation techniques can be found in the field and there are a variety of apparatuses developed for distillations. Some methods for distillation include Schlenk Lines, fractional distillation, packed distillation, Perkin Triangle distillation and rotary evaporation.



Rotary evaporation distillation, a form of low pressure vacuum distillation allows you to effectively separate components of a mixture and condense the final product to what is needed. For example, using distillation to separate water and alcohol so you have one glass of mostly water and another with mostly alcohol. Using vacuum to reduce pressure enables you to lower the temperature of distillation.

Essentially, the rotary evaporation distillation process operates by heating a material to a temperature that allows the unneeded components to separate from the needed components. This distillation process can also be used to remove components that can be harmful to people.

How Distillation Assists in the Processing of Plant Material:

When processing plant material for medicinal purposes, one goal is to remove all contaminants that could harm a person when ingested. Distillation using a rotovap allows you to successfully remove many of these components with the use of the following:

- Heat
- Motion
- Vacuum

The actual distillation process time will depend upon the materials being separated with their associated vapor pressures, and the percentage of removal needed. Once at the appropriate temperature and being monitored by a vacuum gauge controller such as our Vapor Pressure Controller, the final product will consist of only desired material.



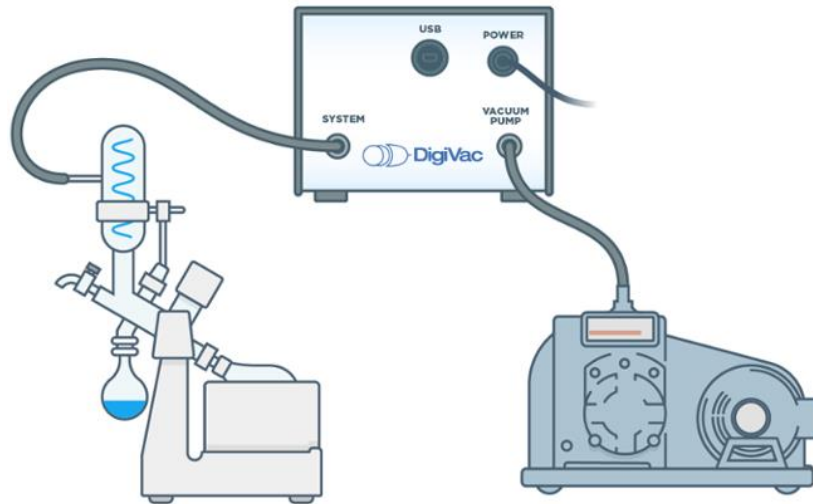
How controlling vacuum can help with rotary evaporation:

Vacuum control makes rotary evaporation easier because you become more aware of the effects of vacuum on your process. In general terms of vacuum control, experts are seeking to maintain the pressure within a system but have difficulty due to their current method. Vacuum control is the solution. With vacuum control the need for a close eye on the final product is not as detrimental. Technicians still need to examine the final product, but vacuum control eases the fear of error and can:

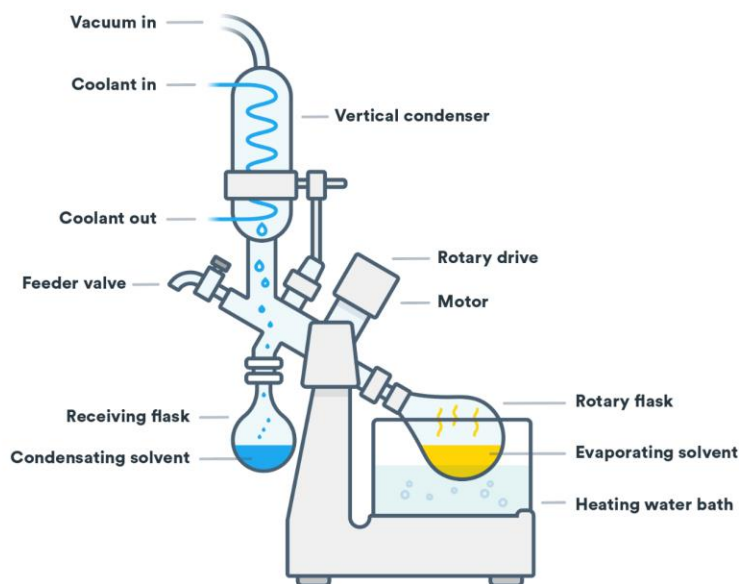
- Add precision to process
- Make tests more repeatable
- Reduce human error

The Vapor Pressure Controller:

Our new Vapor Pressure Controller (VPC) offers customers the control they have been searching for. It is an easy to use vacuum controller that displays both “actual vacuum” and “set point”. Our customers are able to set a set point and decide if they would like the VPC to follow the path of the vacuum system or regulate and maintain pressure at, or near, the set point. This means our customers have more accurate processes and safer final products.



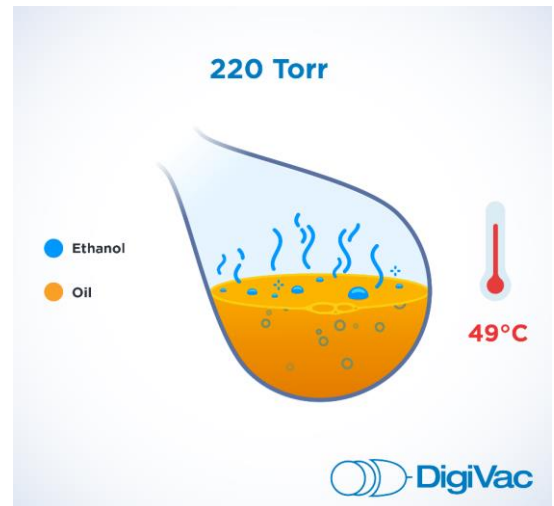
The unique thing about the VPC is the modified and isolated piezo sensor that is inside the instrument. Because the sensor is protected from process contaminants the sensor is able to run smoother and provide accurate pressure readings for a longer period of time. The flow path is also constructed of 316SS, and Teflon, making it more resistant to damage from process materials. Customers like this feature because the controller is more durable and reliable than other products and therefore they have more possibilities for placement in their facility. Additionally, the VPC comes with free software, Vapor Pressure Profile Manager, which allows technicians to generate profiles, run a programmed set of pressures and associated time durations, and prevent their system from bumping.



Botanical/Extraction Example

The technician who oversees the processing of their material expressed to us that the company had a problem maintaining vacuum pressure at the level they needed for proper processing. Being able to maintain set points has given him and his team the ability to manage their system better, control the amount of pressure entering at any given time, and yield a much more quality product. This company is now able to remove more of the botanical components they do not need with more confidence and assurance that the process was completed successfully because the DigiVac VPC now regulates their vacuum. The rotary evaporation is therefore improved because the percentage of error surrounding the process is decreased.

Furthermore, this customer was experiencing a temperature issue where he was not sure what temperature would be best to distill his material. He told us that specific targeting, or evaporating off each individual particle at its boiling point, was critical but was always difficult to do. Once he began using the VPC he contacted us again and said “we have found that we can now run our evaporator at 49 degrees Celsius which allows our product to become very fluid—by setting our vacuum level to about 220 torr (the pressure at which alcohol will boil at 49 degrees) we’ve been able to retain a huge amount of terpenes we were previously boiling off...” He and his coworkers did not know they were burning off terpenes, but the precision and control of the VPC unintentionally resolved the problem by leaving terpenes behind at the end of a run.



Definitions to know:

1. **Distillate** - vapor produced during distillation that is collected and further condensed
2. **Extraction** - The process of removing a portion of a material from the whole product