

HOW TO SELECT A PUMP FOR ROTARY EVAPORATION



Application
NOTE
LAB

methylene chloride and pentane, do not require as deep of an end vacuum to evaporate as solvents such as acetonitrile, benzene and chloroform. The removal of solvents with high boiling points, such as water, DMSO, DMF and toluene requires a relatively deep end vacuum. You must ensure that the pump is capable of reaching an end vacuum deep enough to remove the target solvents efficiently. For reference, see our Boiling Point Table (www.knfusa.com/downloads, then select the 'Technical Library' tab).

This topic then naturally progresses to the subject of chemical compatibility. Based on the solvent vapors going through the pump, one can determine the best materials for a long, trouble-free service life. Dry, oil-free pumps offer significant advantages in this area in comparison to rotary vane and water aspirators. In addition, they can feature premium corrosion resistant wetted parts, are easily maintained on

site, and do not create hazardous waste.

Evaporation is one of the most common tasks performed in a chemistry laboratory. But, how do you go about selecting the correct vacuum pump for your rotary evaporator? Or, if you already have a vacuum pump, how do you know whether it is well-suited for this application?

The key to correctly selecting and sizing a vacuum pump for rotary evaporation can be found in your answers to the following four questions:

What solvents are you working with?

This is important due to the different boiling points of solvents. Solvents with a low boiling point, like acetone,

What is the size of your evaporation flask?

This question allows you to select the best sized pump for your application. Bigger isn't always better. A pump that is too large or has too high of a flow capacity for a given application is difficult to control, terribly inefficient and more expensive to own and operate. On the other hand, a pump that's sized too small or doesn't have enough flow capacity will slow the evaporation and lead to longer processing times. A pump that is used for a 250 mL flask is probably not the best pump for use with a 20 L evaporation flask, and vice versa.

What is the temperature of your heating bath?

The goal is to determine whether or not the pump is able to provide the necessary vacuum level and handle the vapor temperatures. The closer the bath temperature is to the boiling point of the solvent, the faster the rate of evaporation. If the mixture is not sensitive to elevated temperatures, increasing the bath temperature will speed the process and reduce the need for a deep vacuum pump. This may have an effect on which pump is best for the job.

How do you want to control the vacuum?

Manual, two-point, or adaptive control? Vacuum control allows for optimization of the vacuum level in the system. Optimum vacuum level shortens evaporation times and provides superior product yields. Control of the vacuum also reduces bumping and enables greater solvent recovery and repeatability.

- **Manual vacuum control** involves the use of a stop cock or manual valve to adjust the vacuum level based on visual cues. Using this method, you will need to monitor throughout the process as the vacuum requirements may change throughout the evaporation.
- **Two point or on/off vacuum control** allows the vacuum in the system to cycle between a high and low set point by turning the pump on and off. This method allows you to leave the process unattended once the min/max settings are determined.

- **Adaptive vacuum control** provides the best results in terms of separation, speed and solvent recovery, and allows you to leave the process unattended once set. This type of control modifies the speed of the pump to precisely match the requirements of the process. It is the most accurate method; allowing for the system to operate at a specified vacuum level while responding to changing conditions without the need to monitor and adjust settings.

Ask the Expert

With answers to these five questions, you are now prepared to talk to your supplier about proper pump selection, or to evaluate the suitability of the pump you already have. You can also use our easy online tool at www.labpumps.com. Once there, click on the "Rotary Evaporator" icon, and enter your answers from the questions above. After clicking "Submit," you will see a list of KNF vacuum pumps that meet your criteria. For further support, please contact us.

