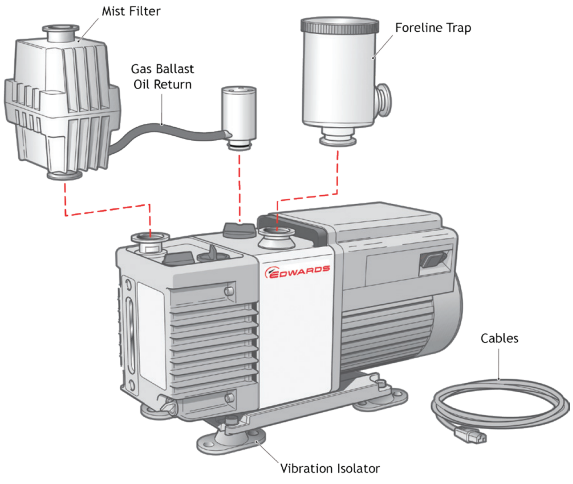
APPLICATION NOTE

PUMPING CONDENSABLE VAPOURS WITH A MODERN LABORATORY SIZED VACUUM PUMP

edwardsvacuum.com

Condensable vapours, such as water vapour, can be easily handled by a modern laboratory vacuum pump, provided that an effective pumping protocol is followed to allow the water to remain in vapour phase within the pump.
This applies to both oil sealed pumps and dry pumps.

Allowing vapour to condense inside the pump will result in performance degradation, failure to achieve ultimate, slow pump-down and cause mechanical problems. Not following a good pumping protocol will mean a very long time to pump down to target pressures. Once vapour condenses inside a vacuum pump it can lead to reduced reliability via accelerated corrosive effects; condensation can also increase pump-down times and limits ultimate pressures.



Edwards RV rotary vane pump with accessories

Firstly it is important for the pump to warm - up to its normal operating temperature before exposing it to condensable vapour, this will typically take up to 60 minutes.

This will prevent water vapour condensing inside the relatively cool pump. “Blanking” the inlet of the pump, by closing a valve, and allowing the pump to run pumping “nothing” is all that is required. Running gas ballast during this process will help the pump warm up faster.

Secondly the ballast should generally be run all the time that vapour is being passed through the pump. While the vapour being pumped is saturated, the vacuum pump’s ultimate pressure will be limited, not by ultimate pressure performance of the pump itself, but by the vapour pressure of the material being processed. For example, water has a saturated vapour pressure of ~24 mbar (18 Torr) at 20 °C (70 °F), this is the best pressure the pump can achieve until all the water has been pumped away.

Allowing water vapour to condense inside a pump will make the time to recover ultimate pressure much longer than if it remains in vapour phase because it has to be re-evaporated before it can be pumped out. Condensed water can reduce oil sealed rotary vane oil life-time and in all pumps condensed vapour can ‘accelerate’ corrosive effects of other materials being processed.

Gas Ballast control on RV oil sealed rotary vane pump

Allowing the pump to “clean up” after pumping vapours will extend pump life and performance. If the pump is switched off as soon as the procedure producing vapour is finished, vapour will remain inside the pump, condense and lead to accelerated wear by allowing the inside of the pump to corrode. Running the pump with the inlet “blanked off” with a valve will allow the pump to exhaust any residual vapours will give the longest life and fastest recovery when it is used next.

It is recommended the pump is run for a minimum of 20 to 30 minutes after finishing the vacuum process as best practice. Running gas ballast during “clean up” will ensure that the condensable vapours are expelled from the pump. Very importantly when pumping potentially flammable vapours inert gas such as nitrogen should be used as the ballast gas.

Edwards RV oil sealed rotary vane pump range

Publication Number: 3601 2027 01

Edwards Ltd, registered in England and Wales
No. 6124750, registered office: Innovation Drive
Burgess Hill, West Sussex, RH15 9TW, UK.