

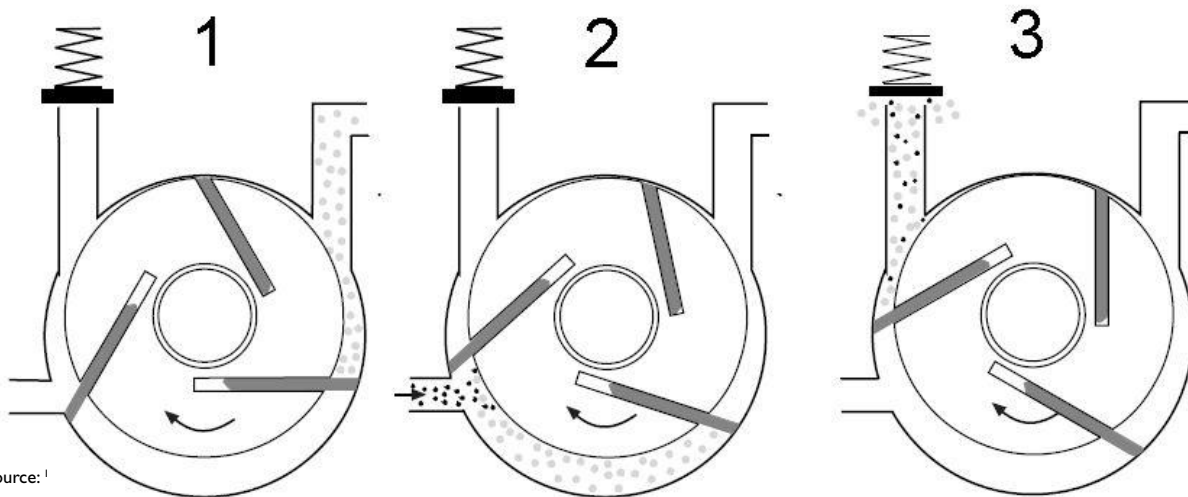
ROTARY VANE VACUUM PUMP

Lubricated Rotary Vane Vacuum Pump

The standard lubricated rotary vane pump is a single-stage pump with an integral, closed-loop oil-circulation system. The construction is heavy-duty and compact. Typical vane life is 50,000 hours.

The pump rotor is mounted eccentrically in the pump cylinder. As the pump rotor turns, inlet air is trapped between the rotor and vane segments (see #1 in the diagram below). This creates increasing cell volume on the inlet port side, creating vacuum.

Since the rotor is located eccentric to the pumping chamber, the volume between the rotor, vanes and housing decreases and increases rotor spins. Air is compressed and discharged into the exhaust box as rotation continues. See #3 in the diagram below.



Source: 1

Air then passes through several stages of internal oil-and-mist eliminators to remove 99.9% of the lubricating oil from the exhaust. Oil is then returned to the oil reservoir.

Features of the DEKKER Vacuum rotary vane pumps include:

- an automotive spin-on oil filter (on larger sizes)
- a built-in inlet anti-suckback valve that prevents the pump from rotating backwards when shut down with vacuum remaining in the process and prevents the rotor housing from flooding with oil
- a built-in gas ballast valve

The Principle of the Gas Ballast

At a given temperature, vapor may be compressed only as far as the saturation vapor pressure; beyond that point, the vapor condenses. For example, at 100°C, vapor may be compressed to only 1,013.2 mbar; the vapor will condense at higher pressures.

In a container of water (at room temperature), the pump will begin to lower the pressure to the water evaporation point (if the water is at 25°C at sea level, the evaporation pressure will be 31.67 mbar absolute). In phase 1 of the drawing above, the pump will begin taking in a mixture of air and water vapor.

During phase 2, the intake volume is isolated from the original container and exhaust pipe. In this stage, the valve on the gas ballast opens and adds a certain amount of air to change the saturation pressure of the mixture.



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Finally, in the last stage the mixture, (enriched with fresh air), is expelled, but since the saturation pressure was changed, no condensation droplets will form, and the intake vapor may be expelled from the pump without interfering with its operation.

Two factors are thus of vital importance: the temperature of the intake vapor and the temperature of the pump. The pump must be heated before beginning to operate with condensable gases, and the temperature of the intake vapor must be as low as possible.¹

Rotary Vane Vacuum Pump for Wet Applications

The operating principles for the rotary vane vacuum pump for wet applications are the same as the lubricated rotary vane vacuum pump. The differences include:

- The separator for the wet applications pump includes baffling to help the water settle out of the oil.
- The large sight glass gives visible indication of water in the oil.
- Water can be drained from the lower drain valve after the pump is stopped.

Oil-Free Rotary Vane

The operating principles for the oil-free rotary vane vacuum pump are very similar to the lubricated rotary vane vacuum pump.

The main differences include:

- The vacuum pump is not lubricated with oil, so there is no oil reservoir or mist eliminator. Graphite vanes operate in an oil-free environment.
- Typical vane life is 10,000 hours.
- Maximum vacuum is limited to 26.4" Hg.

[Click here to find your local authorized distributor](#)

¹ D.V.P.Vacuum Technologies 2006-2007 8701010 Rev 2, pages 10-11, Section 9.2.2

