

Rotary Vane Vacuum Technology for the Chemical Industry



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Huckepack Vacuum Pumps – Classic Vacuum Technology, Yet Still State-of-the-Art

The Busch Huckepack was the first product invented by Dr. Karl Busch in 1963, and over the past 50 years has been continuously improved and optimized. Building on the reliability of the Huckepack, the Busch group has become known for the quality and reliability of its products and solutions.

The Huckepack is an oil-lubricated rotary vane vacuum pump. It's a positive-displacement pump comprised of vanes rotating eccentrically in a cylindrical casing. The vanes are guided by slots in the rotor and utilize centrifugal force to keep the vanes always in contact with the cylinder casing. The rotation of the eccentrically mounted rotor creates cavities of variable volume that generates suction and compression.

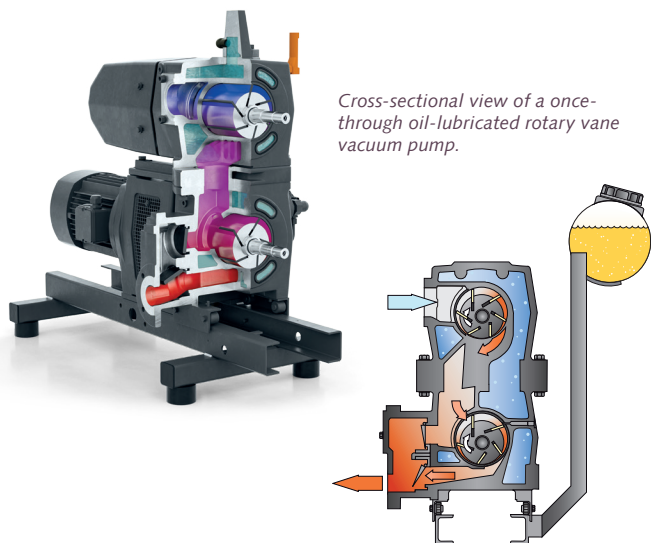
In traditional rotary vane vacuum pumps, a large amount of oil is recirculated through the pumping chamber to create efficient sealing and extract the majority of the heat generated by the compression. These pumps usually operate around 80°C and utilize forced-air cooling. However, when these pumps are used in applications involving condensable vapor, the recirculation of the oil can lead to potential accumulation of the condensable part of the process gases in the oil. This oil contamination leads to loss of pumping capacity, and can also lead to corrosion, polymerization and/or degradation of the pump materials (vanes, O-rings, filters, etc.).

To alleviate the issues encountered with the recirculating oil system and process accumulation, the Huckepack utilizes a unique once-through sealing (OTS) principle. The once-through sealing system constantly injects a small amount of oil into the pumping chamber at precise points in the pump to lubricate the internal surfaces and offer better sealing of the cavities. This lubricant passes through the pump, is discharged with the process vapor, and is then separated from the process vapor in the exhaust of the pump. Due to the smaller amount of oil present in the cylinders, the Huckepack has more vanes than a traditional rotary vane pump, and is water-cooled to remove the heat of compression. The Huckepack also has two stages in order to attain the 0.5 torr ultimate vacuum.

The lubricant only passes through the pump once, during which it provides a continuous flushing of the pump internals (vanes and cylinder) and protects the pump from corrosive or sticky compounds. These parts are continuously scraped and recoated with fresh lubricant by the sliding motion of the vanes, thus ensuring a long lifetime of the pump. This fresh lubricant principle can be compared to a Clean-in-Place (CIP) procedure and allows the pump to be used with different processes without risking a cross contamination (single minute exchange of dye principle). In more difficult applications, the Huckepack can be periodically flushed through inlet and interstage ports with additional clean lubricant or a lubricant/solvent mixture to provide supplemental cleaning of the vanes and internals. The Huckepack is also available with several vane material options to allow optimum matching with respect to the vapors being handled.

The cooling jacket allows the operating temperature to be optimized based on the vapors being handled to prevent condensation and/or reactions in the pump. The pumps are available with once-through cooling using a temperature controlled flow valve to allow the operating temperature to be adjusted based on the application, or with radiator-cooling using forced circulation and a thermostat in the circulating for temperature setting. Several thermostat options are available to set the operating temperature. Nitrogen can also be injected into the gas ballast port in the bottom stage or the interstage port to dilute the vapors in order to prevent condensation or reaction.

The Huckepack has several features designed to make it service-friendly. The primary feature that allows this pump to be service friendly is the design of the lubricating system. The lubricant supply lines are connected to a central mounting plate to which eliminating lubricant lines connected directly to the pumping modules must be removed in order to remove the pumping modules for repair. In addition, each pumping module can be easily removed for service by simply removing two bolts and either lifting the upper module off the
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mounting plate, or lowering the lower module onto the pump base and rolling it to the edge of the base on rollers that are mounted to the module. In the event a pumping module is damaged the pump module can be machined to remove any damaged areas and reused. Machining can generally be done several times before the module must be replaced. The vanes can also be easily replaced.

Busch offers several accessories to protect the Huckepack based on the application, including particulate filters, knock-out pots (liquid separators), purging packages and flushing packages. The accessories are matched to each size pump to optimize the sizing while minimizing the impact on the system performance.

Based on these advantages, the Huckepack was originally designed for use in food applications where high water vapor loads as well as corrosive and sticky sauce carry over was encountered which caused damage in oil recirculated vacuum pumps. The self-cleaning principle of the Huckepack is perfect in these conditions. If necessary, food grade lubricants can be used. The Huckepack has since evolved for use in difficult chemical or pharmaceutical applications, especially when dealing with acidic vapors, sticky materials or monomers able to polymerize with the other technologies.

Since 1963 thousands of Huckepack pumps have been put into operation worldwide. The reliability of the Huckepack is demonstrated by an average lifetime over 30 years. This unique product is specially tailored for difficult applications.

The Busch vacuum pump portfolio is now one of the largest worldwide and includes the Dolphin LRVP and the well-known COBRA dry screw vacuum pump. Our range of solution includes advice and technical support, training, system design and building, commissioning, maintenance and decommissioning. For more information please visit our website or contact your Busch representative directly.



From left to right: The Busch Dolphin liquid ring, COBRA dry screw and Huckepack once-through oil-lubricated rotary vane vacuum pumps.



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