Answer on Question #44450 - Chemistry – Inorganic Chemistry

What is the difference between vacuum pump and compressor and also describe the working principle of liquid ring compressor and liquid ring vacuum pump?

Answer:

It is believed that the compressor is the same pump which pumps the gas instead of liquid. To some extent it is, but between them there are significant differences, investigated below in detail.

To begin, consider the similarities:

Both the principle of operation are divided into three-dimensional and dynamic (blade).

The pumps and compressors are capable of providing a wide range of capacities and pressure.

Piston pumps and compressors are used in low productivity and high pressure.

Centrifugal pumps and compressors are good at performance but low head. A centrifugal compressor according to another is called a blower.

Finally, screw pumps and compressors used to provide average values of performance and pressure.

In compressors as pumps may be used several working steps (impellers) if necessary to ensure a high pressure.

Both are used seals, bearings, lubrication systems. However, the similarities end.

The primary difference between the pumps and compressors due to the thermodynamic nature of the gases. Due to the incompressibility of the fluid's behavior can be explained by the relatively simple Bernoulli equation, in which fluid density is assumed constant throughout the entire process.

Gas, on the other hand, is quite good squeeze. Because of this, the compressor is a much more complex process as compared to the pump for moving fluid.

The design of the dynamic head of the compressor is determined by the properties of the gas such as its density, molecular weight and specific heat ratio at the inlet of each impeller. Another significant difference is that the energy accumulated in the gas while increasing the pressure and physical compression of the gas molecules.

Furthermore, with increasing pressure of the gas mixture, the liquid fraction can be separated depending on the actual compression ratio and composition (humidity) gas. Compressed air line if necessary, must contain desiccant, for trying to squeeze the liquid will lead to compressor failure.

An interesting side effect is that the compression of the gas results in an increase in its temperature, as its extension, opposite to the cooling. The effect is usually observed in the aerosol (eg, deodorant or paint), but is also used in refrigerators, air conditioners, and the liquefaction of gases. At ordinary temperatures and pressures all real gases except hydrogen and helium, heated by compression. British physicist James Joule and William Thomson investigated this phenomenon in the second half of the 19th century.

In order to improve the efficiency of the compressor is required to lower the temperature of the compressed gas. For this purpose, heat exchangers, liquid or air. Possible side effect of cooling the compressed air is the allocation of a liquid fraction (in fact, dewing). Liquid instantly displays compressor failure. For this reason, most compressors require the

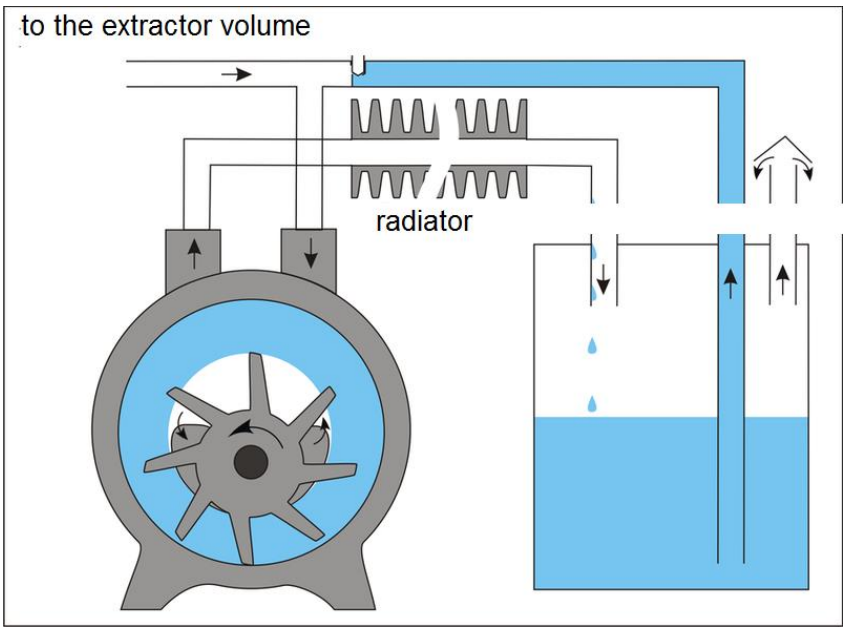
installation of dehumidifiers in the suction line, and also between the levels of multistage compressors. Excessive moisture from entering the centrifugal compressor can result in corrosion of the impeller, motor overload and even failure of the bearings. In reciprocating compressors when exposed to water will lead to immediate damage to the head due to lack of internal clearance in the piston chamber.

Compressors potentially much more traumatic. Compressed gas contains a large potential energy, which is always to be treated with respect. Add to this the risk of fire, if you are dealing with flammable gases, and get an explosive mixture of technological risks arising from the operation of the compressors. For this reason, the design, selection and installation of compressors requires great skill and expertise than using pumps.

Compressors - it's not just a pump that transports gas. This is a separate class of equipment, dealing with other physical processes and require a different approach and knowledge for their correct operation.

Liquid ring pumps are often called liquid ring as the working fluid in them is preferably used water, but sometimes with a liquid piston machines. Eccentrically positioned rotor with radial vanes (impeller) rotating in a cylindrical housing which is partially filled with liquid. The blades of the impeller during rotation of the liquid captured and discarded in its housing. As a result, inside the body formed by a rotating ring of liquid, which gave the name of this type of pump. Between the hub of the impeller and the liquid ring occurs crescent space that is working chamber of the machine. This space is divided impeller vanes on the individual cells of variable volume.

When the volume of the cell is the process of absorption and decreases - the process of compression and discharge. The compression process in the pump is accompanied by intense dissipation of heat from the compressed gas to the liquid. Low szhimaemogo gas at the outlet of the pump is not very different from the temperature at the inlet and the working fluid is heated, so it must be continuously replaced. Working fluid is introduced either into the suction pipe or through the hydraulic seal of the impeller shaft in machines working chamber and out through the discharge window together with the compressed gas. The main advantage of liquid ring vacuum pumps - easy to work. The pump consists of a small number of components - the housing, the impeller and the two end caps.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