Applied Compression Systems

ACS
APPLIED COMPRESSION SYSTEMS
"Complete Compressor Packaging Solutions"

TECHNICAL BULLETIN

PISTON VS ROTARY VANE COMPRESSORS

As a distributor of both piston and rotary vane compressors the question most often asked of us is, "which is better?"

Simply stated, the answer depends on the specific end-use application. Both offer reliable service when they are installed in the right application.

Reciprocating Compressors trap consecutive quantities of air in a cylinder, and compress it by a piston with a reciprocating motion, much like a conventional automotive engine. Inlet and discharge valves open and close to allow air to enter the cylinder and be discharged into an air storage tank.

Control is accomplished by starting and stopping the electric motor of the compressor by means of a pressure switch. The contacts on the pressure switch open at the high pressure point to shut the unit down and close on low air demand to re-start the compressor as air is used up in the air receiver tank.

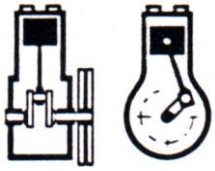
Starts and stops should not exceed about 8 times per hour to prevent damage to the electric motor, which results from excessive cycling. In addition, running an air-cooled piston compressor fully loaded for excessively long periods of time will cause it to overheat resulting in breakdown of the lubricating oil and premature valve wear. This is particularly critical with SINGLE-STAGE compressors, which will run as hot as 350^{o} F. The compressor should run for no more than 2-3 minutes and then stop for 4-5 minutes to allow it to cool.

The size of the air receiver is matched to a compressor by the manufacturer, based on the CFM output of the compressor.

The common notion is that the larger the air receiver tank, the longer it takes for the pressure to drop, which is correct.

What users forget to consider however, is that the larger the receiver tank, the longer it takes for the compressor to pump the tank back up to pressure.

This is particularly important with piston compressors since an excessively large receiver tank will result in excessively long run times, causing overheating and valve damage.

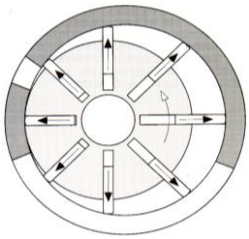


Reciprocating Compressor

Where should an air-cooled piston compressor be used?

- Piston type air compressors are generally used only where the demand for air is occasional and the demand does not exist for prolonged periods of time such as automotive shops, home workshops and small industrial applications.
- If pressures above 110 PSIG are required.
- Where pressure fluctuations of 20 – 25 PSI can be tolerated.
- Because piston compressors have a strong similarity to conventional automotive engines, they can be easily serviced ro repaired by the owner's maintenance staff.

Rotary Sliding Vane Compressors use vanes sliding in a rotor, which is eccentrically mounted in a cylindrical casing. Air, trapped between the vanes, is compressed and displaced. They are generally of single stage design and most widely used for pressures in the 100 – 110 PSIG range.



Rotary Vane Compressor

Where should rotary vane compressors be used?

- Rotary vane compressors are designed for applications where the demand for air is relatively constant throughout the day or where a fairly high demand for air is required for prolonged periods such as abrasive blasting cabinets, pulse bag systems etc.
- These compressors are also well suited for installations where the available electrical power limits the size of compressor that can be run and the demand for air is relatively high. For example, if a constant air capacity of 15 – 20 CFM is required, but electrical power limits the motor to 5 HP a rotary compressor is your best choice.
- Where some demand for air exists constantly throughout the day or where a high demand exists for durations of time that would cause a piston compressor to start and stop excessively. Rotary vane compressors can be operated FULLY LOADED 24 hours a day, seven days a week without damage.
- Where pressure fluctuations cannot be tolerated. The modulating control system used on rotary vane compressors maintains the air pressure at $\pm$ 2 PSIG unlike piston compressors which require pressure fluctuations of 20 – 25 PSIG in order to allow proper cycling times.
- Where reliability is critical. Vane compressors do not have piston rings, pistons, valves or connecting rods and therefore require less maintenance than conventional piston machines. When properly maintained, rotary vane compressors will often operate for up to 75,000 hours between major overhauls.
- Because an air receiver tank is not generally required, rotary vane compressors are typically far smaller than piston compressors.
- Operating temperatures play a key role in oil life expectancy, breakdown of mechanical components and moisture carryover. Rotary vane compressors typically operate at only 180^{o} F (before aftercooling), while single stage piston compressors operate at temperature as high as 350^{o} F and two stage piston compressors operate in the range of 250^{o} F.
- Because of their rotary design, vane compressors are ideally suited if noise and vibration are a consideration.

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