

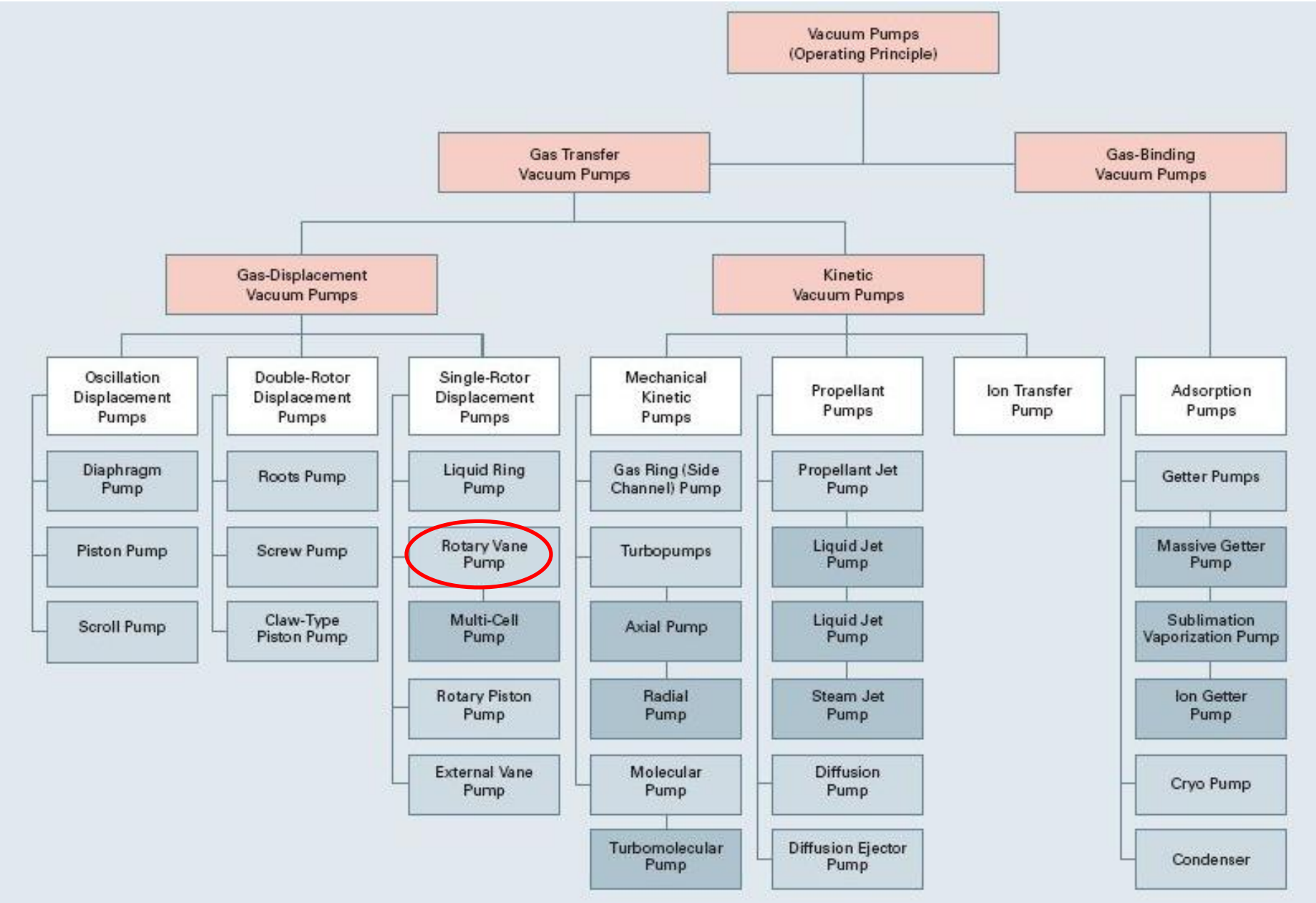
Rotary Vane Pump

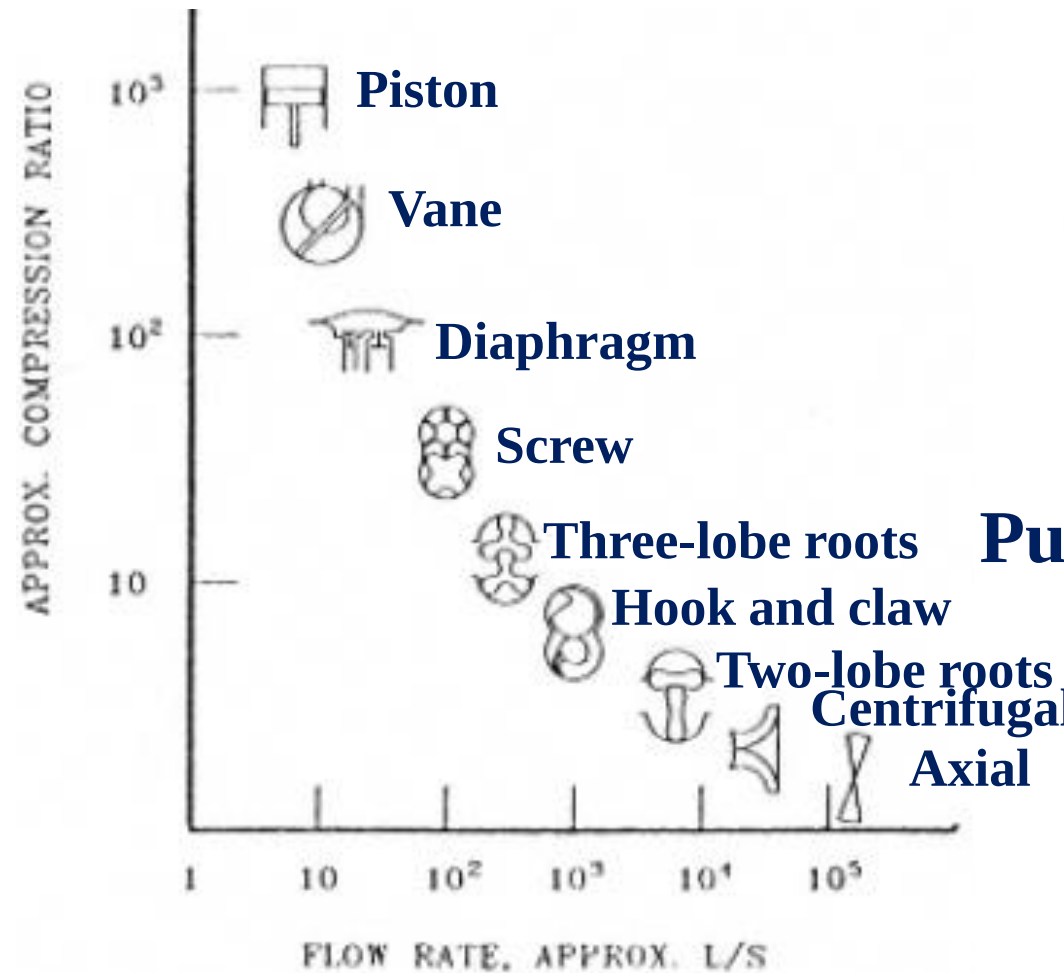
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CY08D021
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Introduction:

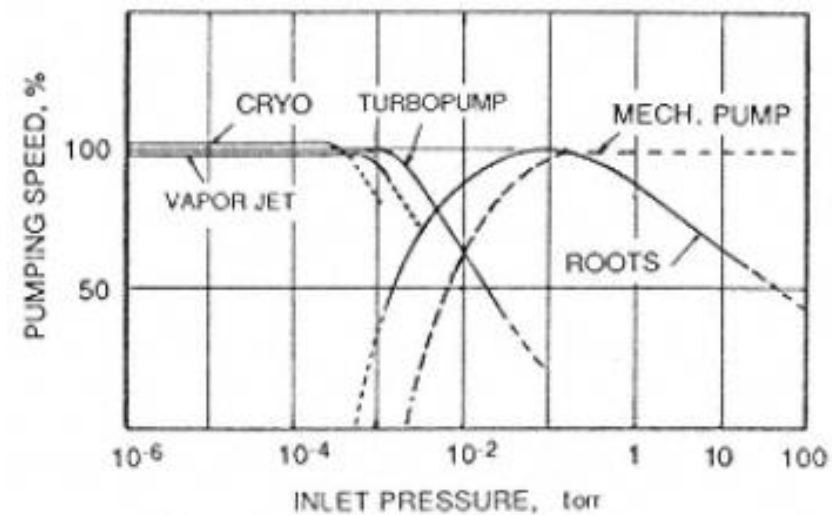
- Rotary vane pump is a vacuum pump. Its a positive displacement pump.
- Vacuum refers to a state where the pressure is lower than that of its surrounding atmosphere (usually $\sim 10^5$ Pa or 760 torr).
- Vacuum pump can be described as a device that removes gas molecules from an enclosure and create a certain partial pressure.
- It was invented by Otto von Guericke in 1650.
- Typical plastic or rubber sealed-piston pump can create minimum of 10^3 Pa pressure. Scroll pump can create ~ 1 Pa pressure.
- Rotary vane oil pump can easily create 0.1 Pa (10^{-3} mbar) pressure. From atmosphere to this particular vacuum range called coarse vacuum.

Classification of vacuum pumps:

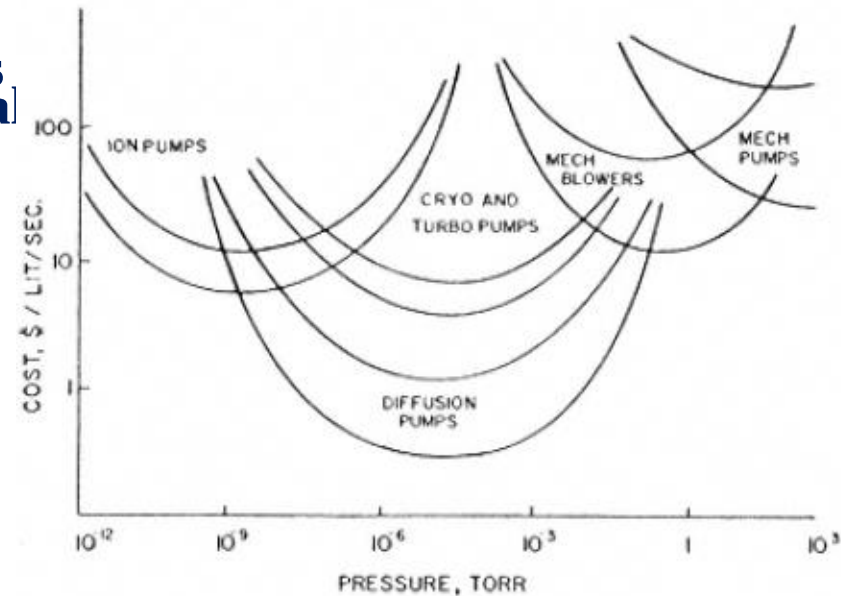




Compression ratio of various pumps



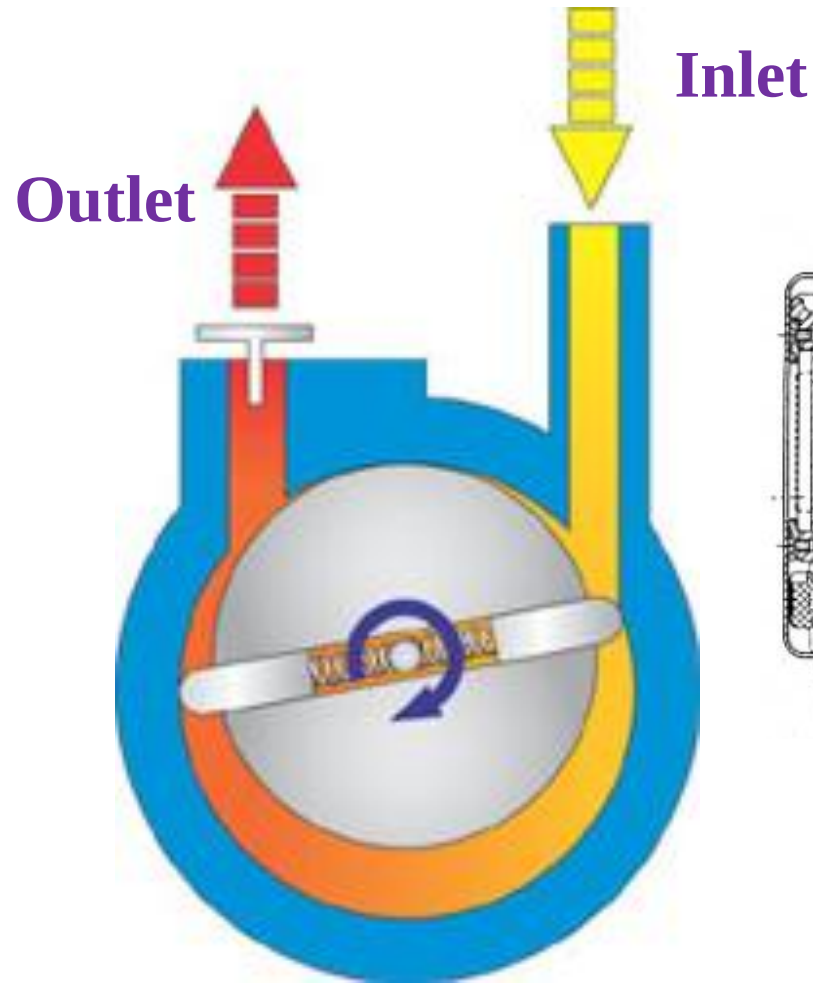
Pumping speed vs. flow rate



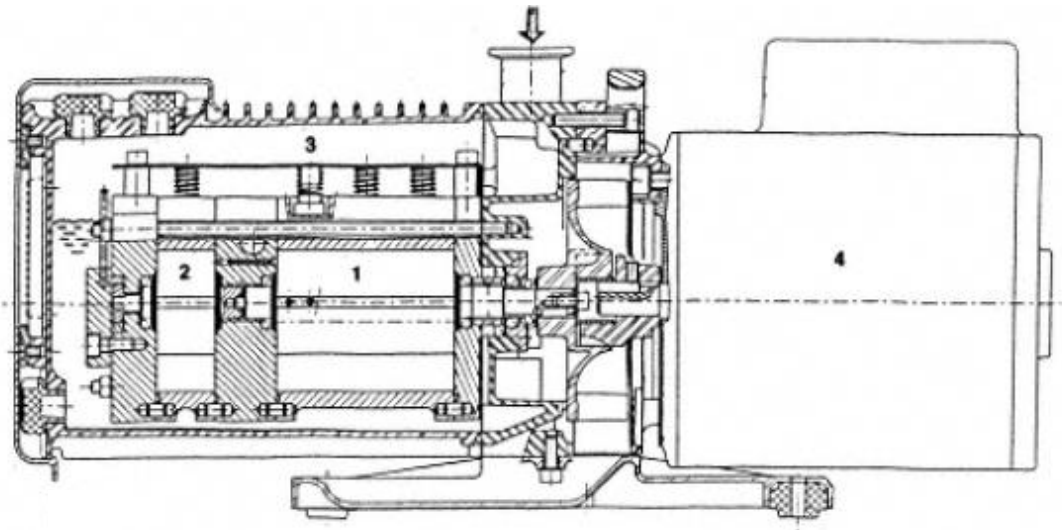
Pressure regions in which particular pumps are effective

Price of a double stage rotary vane pump ~ USD 2500

Working principle of rotary vane pump:



Schematic

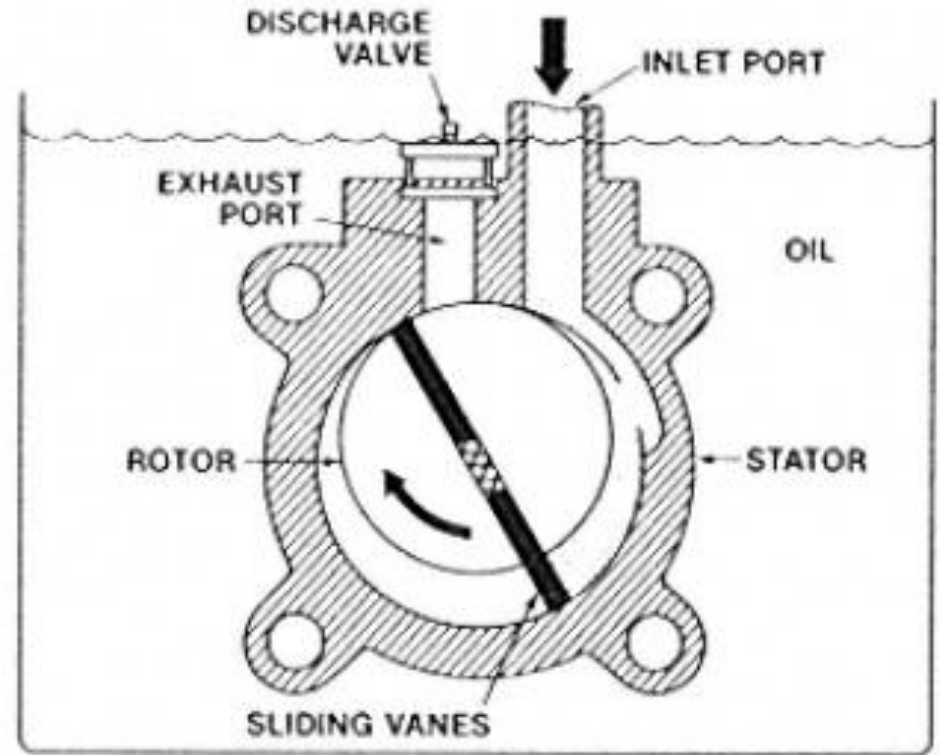


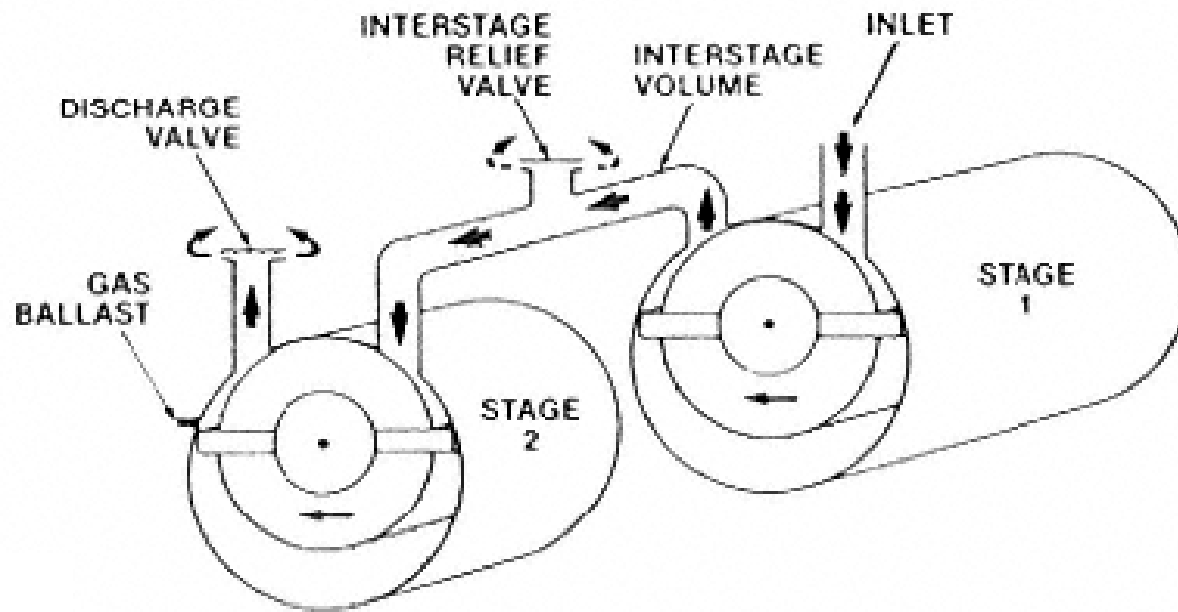
Cross section of the pump

1. Inlet stage, 2. second stage, 3. relief valve,
4. motor

Basic mechanism of the pump:

1. There is sliding spring-loaded vane in the stator.
2. The vane remains in contact with an eccentric cam that may be called a rotary piston.
3. The distances between the cam and the stator walls are kept at a practical minimum.
4. The pumps used by us are having 2 or 3 sliding vanes placed in the rotor.
5. The oil (M.W. 280-440) is being used to effect the seal between inlet and discharge areas, to lubricate, to fill the area under discharge valve, to serve as a heat transfer medium etc.
6. In the modern pumps an arrangement is made to interrupt the oil flow automatically when the motor stops.

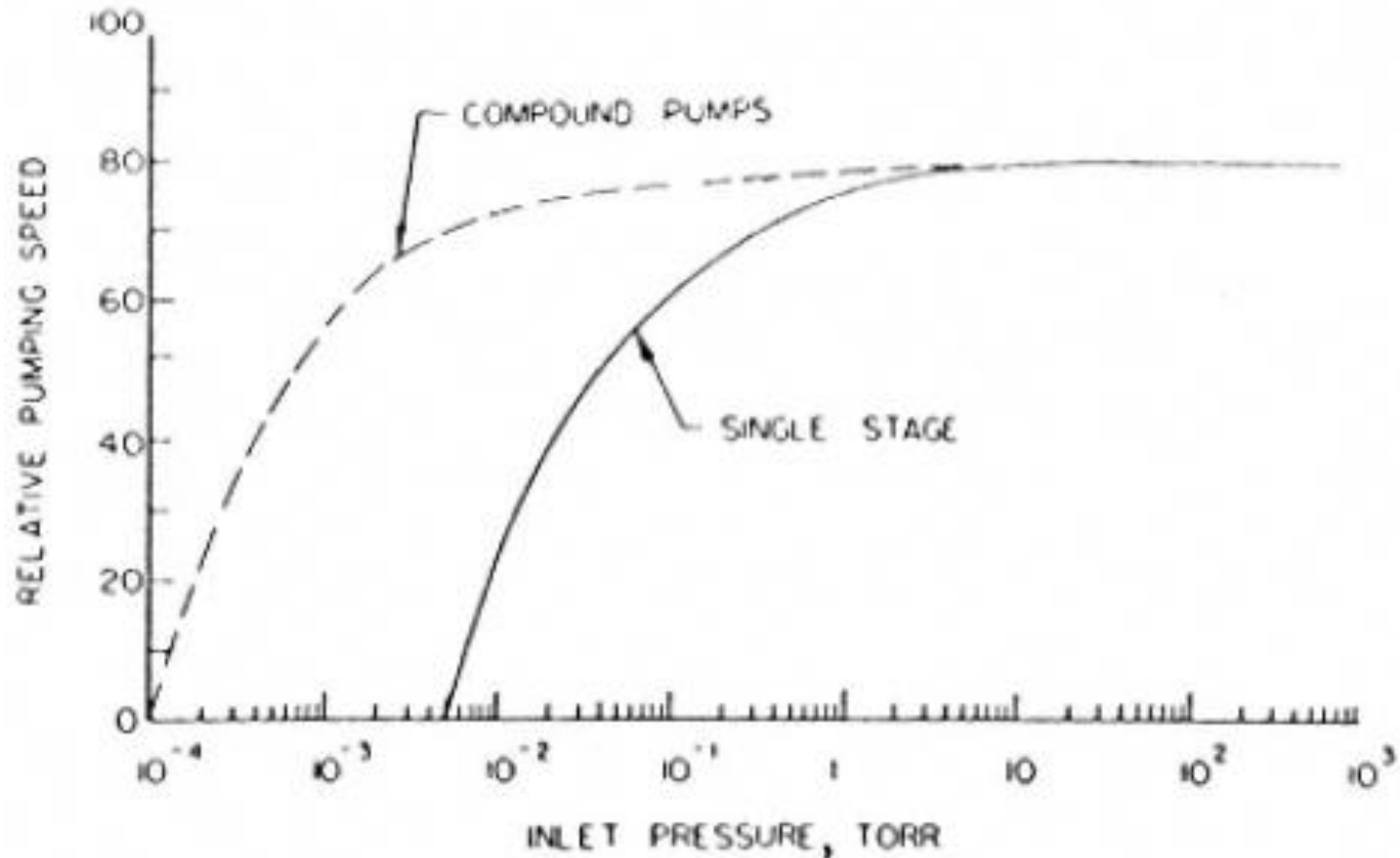




Schematic of the double stage pump

7. This prevents filling the pumping mechanism with oil and also prevents air leakage into the pump and subsequently into the vacuum system.
8. The major limitations with this rotary vane pump are backstreaming of the oil vapors into the vacuum chamber and the destruction of the oil by corrosive gases.
9. To improve upon the performance with the corrosive gases and the oxygen, the oil that is used are perfluoroethers and polychlorofluoroethylenes.

Performance characteristics:



Pumping speed at various inlet pressure

