

1. Types of Fluid Machinery

Two basic categories of fluid machines:

1. those that do work on the fluid:
 - a. pumps (used for liquids)
 - b. fans (used for gases/vapor; $\Delta p < \text{a few inches of H}_2\text{O}$)
 - c. blowers (used for gases/vapor; $\text{a few inches of H}_2\text{O} < \Delta p < 1 \text{ atm}$)
 - d. compressors (used for gases/vapor; $\Delta p > 1 \text{ atm}$)
2. those that extract work from the fluid:
 - a. turbines

Types of Pumps

1. Positive Displacement Pumps (PDPs)
 - a. force fluid movement using changes in volume
 - b. e.g., reciprocating piston engines, heart, gear pumps, rotating screw pumps, bellows
 - c. typically produce a periodic flow rate
 - d. large Δp (pressure rise) possible but usually have a small Q (flow rate)
2. Dynamic Pumps
 - a. no closed volumes as in PDPs
 - b. Δp due to changes in fluid momentum
 - c. e.g., axial flow and radial flow pumps (aka turbomachines), jet pumps, electromagnetic pumps
 - d. ($\Delta p_{\text{dynamic pumps}}$) typically $< (\Delta p_{\text{PDP}})$
 - e. ($Q_{\text{dynamic pumps}}$) typically $> (Q_{\text{PDP}})$

The operating principles for a wide variety of pumps may be viewed at:

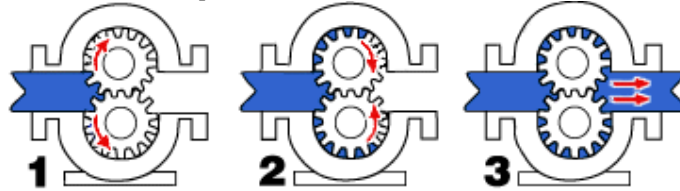
<http://www.animatedsoftware.com/elearning/All%20About%20Pumps/aapumps.html>

Some Examples of Positive Displacement Pumps

This section remains incomplete.

Gear Pumps

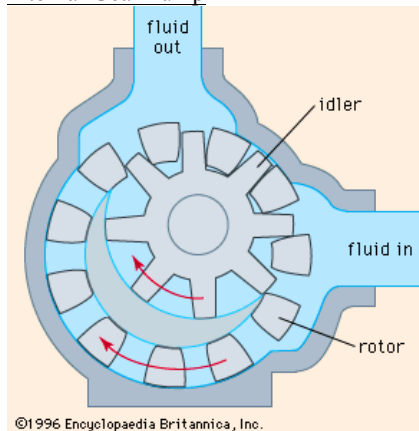
External Gear Pump



< Click Here to Animate >

(Image from: <http://www.pumpschool.com/principles/external.htm>)

Internal Gear Pump

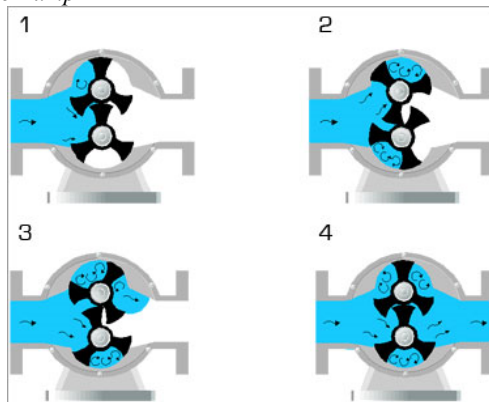


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(Image from: <http://media-2.web.britannica.com/eb-media/56/3656-004-5CA4041D.gif>)

Gear pumps are often used in automatic transmissions.

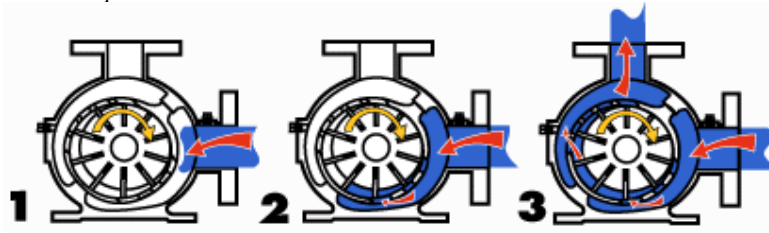
Lobe Pump



(Image from: http://www.megator.co.uk/lobe_pump.htm)

Two and three lobes
Commonly used in diesel superchargers.

Vane Pump

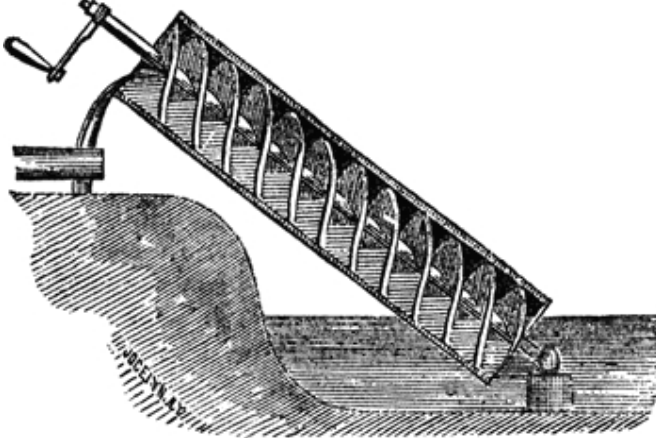


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(Image from: <http://www.pumpschool.com/principles/vane.htm>)

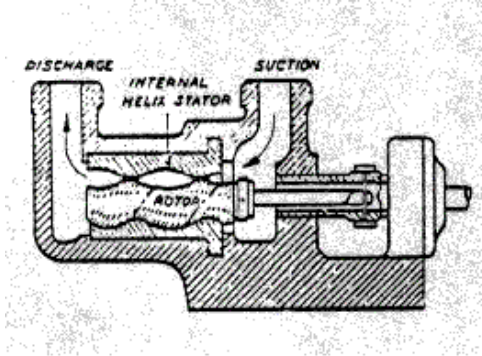
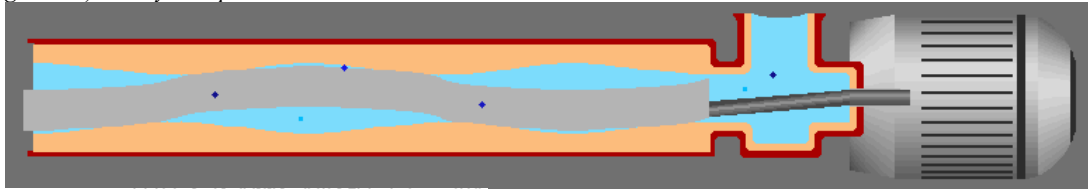
Centrifugal force or springs are used to push out the vanes.
Often used in power steering pump, automatic transmissions

Screw Pump



(Image from: http://en.wikipedia.org/wiki/File:Archimedes_screw.JPG)
Archimedes Screw Pump – 2000 yrs old, often used for irrigation

(Progressive) Cavity Pump



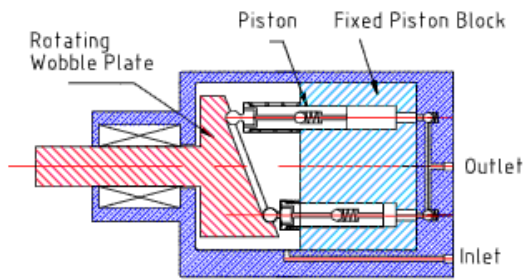
Flexible rotor (mono) pump

(Top image from: <http://www.animatedsoftware.com/pumpglos/progrssv.htm>)

Bottom image from: <http://www.roymech.co.uk/Related/Pumps/Rotary%20Positive%20Displacement.html>)

Piston Pump

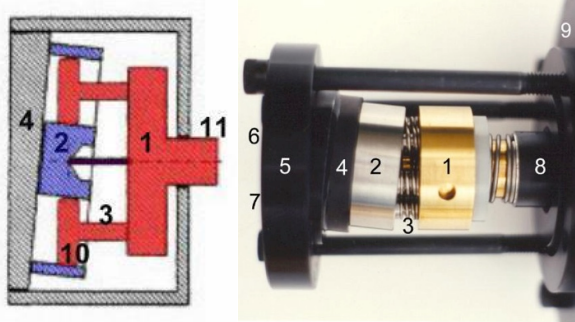
Wobble Plate Piston Pump



Wobble Plate Piston Pump

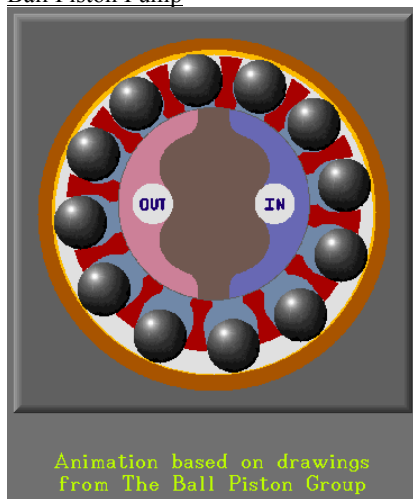
(Image from: <http://www.roymech.co.uk/Related/Pumps/Rotary%20Positive%20Displacement.html>)

Wolfhart Principle Pump



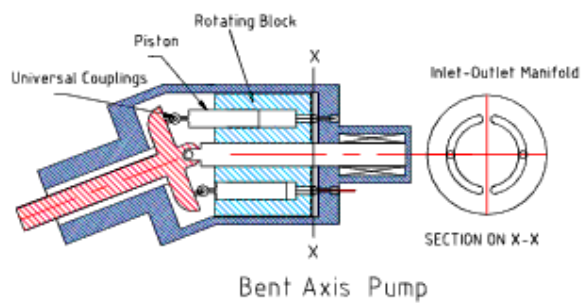
(Images from: http://www.allstar.fiu.edu/aero/wolfhart_pump_principle.htm)

Ball Piston Pump



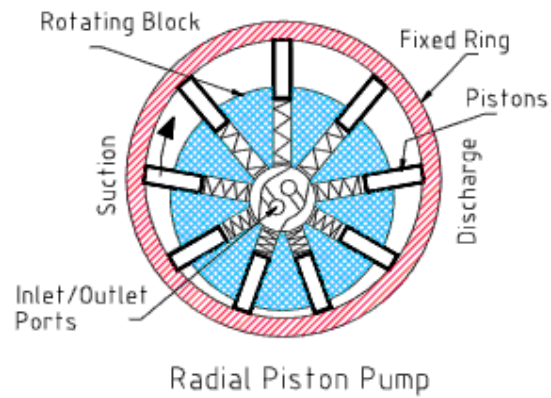
(Image from: <http://www.animatedsoftware.com/pumpglos/ballpist.htm>)

Bent-Axis Piston Pump



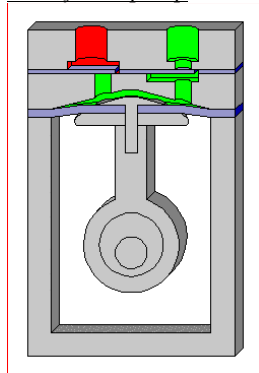
(Image from: <http://www.roytech.co.uk/Related/Pumps/Rotary%20Positive%20Displacement.html>)

Radial piston pump



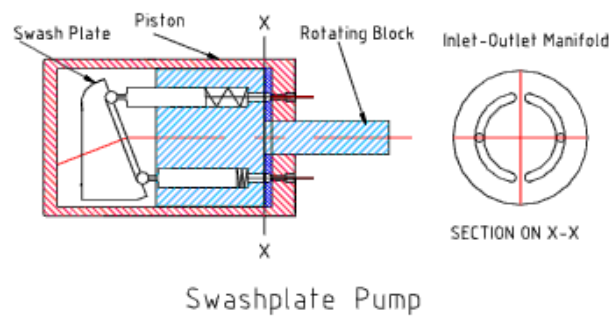
(Image from: <http://www.roytech.co.uk/Related/Pumps/Rotary%20Positive%20Displacement.html>)

Rotary cam pump



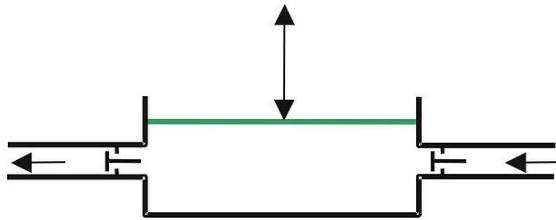
(Image from: <http://www.labpump.co.kr/data/aboutpump.htm>)

Swash plate piston pump



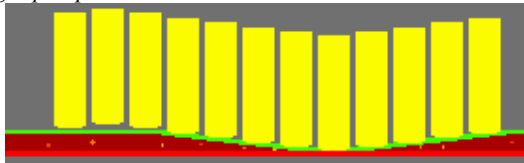
(Image from: <http://www.roytech.co.uk/Related/Pumps/Rotary%20Positive%20Displacement.html>)

Diaphragm Pump



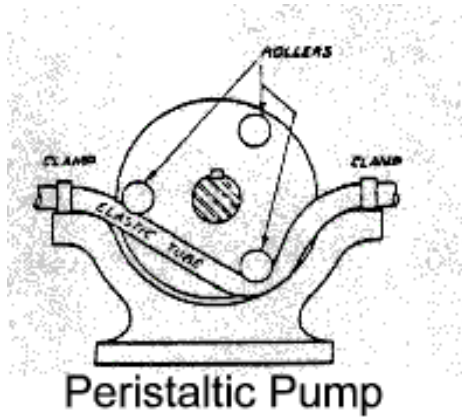
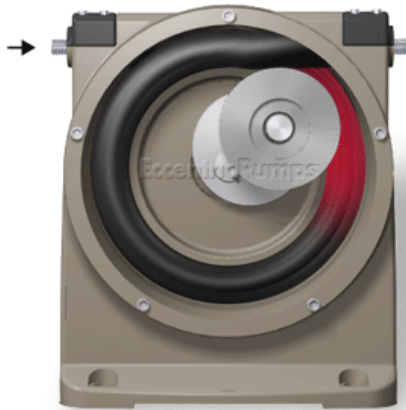
(Image from: http://en.wikipedia.org/wiki/File:Bomba_diafragma.jpg)

Finger pump



(Image from: <http://www.animatedsoftware.com/pumpglos/fingerpu.htm>)

Peristaltic pump



(Left image from: http://en.wikipedia.org/wiki/File:Eccentric_pump.gif

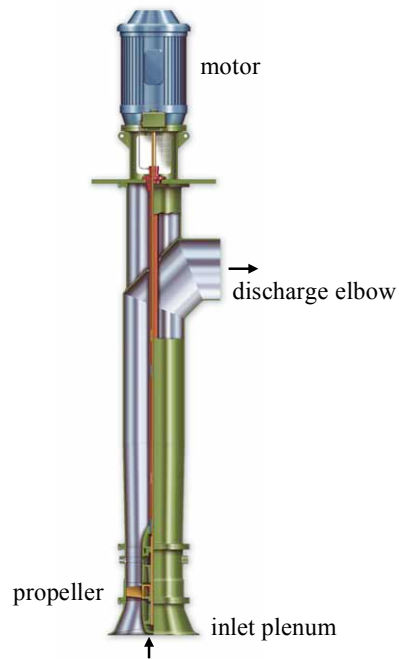
Right image from: <http://www.roymech.co.uk/Related/Pumps/Rotary%20Positive%20Displacement.html>)

Often used as fuel pumps.

Some Examples of Dynamic Pumps

Axial Pump

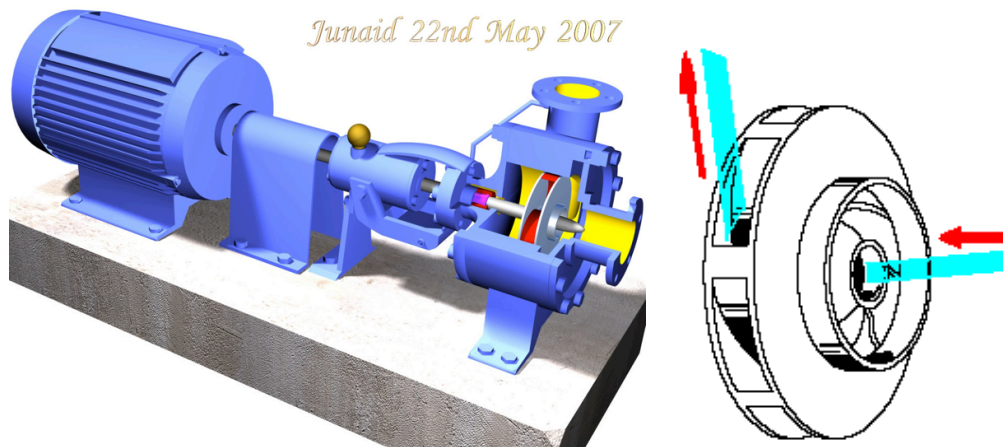
Propeller pump



(Image from:

http://www.sulzerpumps.com/Portaldata/9/Resources/brochures/power/vertical/JP_Vertikal_E00635.pdf)

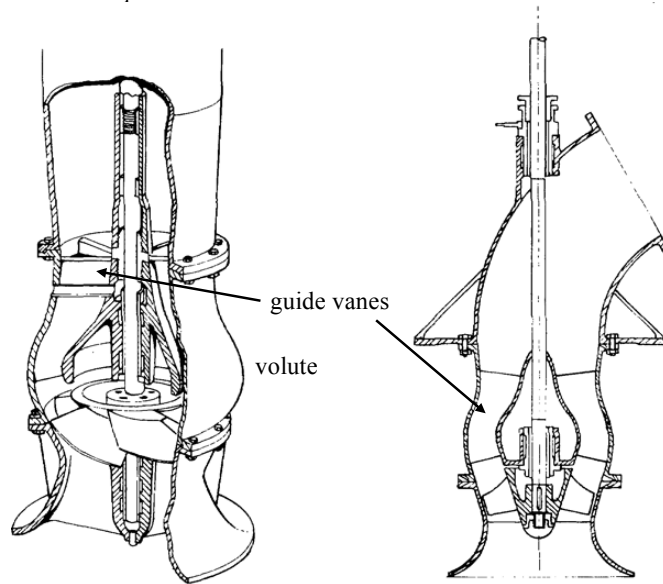
Radial Pump



(Left image from: http://commons.wikimedia.org/wiki/File:CetriFugal_Pump.jpg

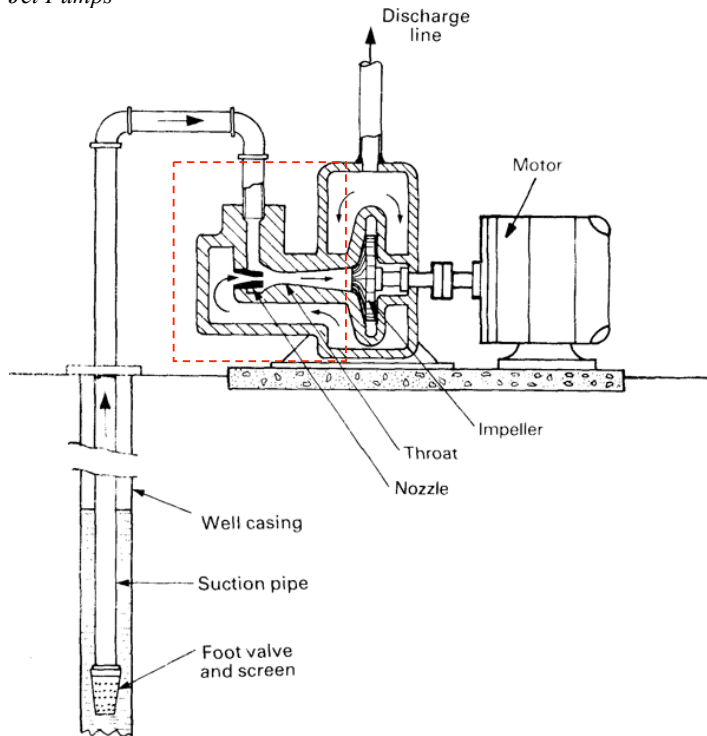
Right image from: http://www.motorera.com/dictionary/pics/r/Radial-flow_pump.gif)

Mixed Pump



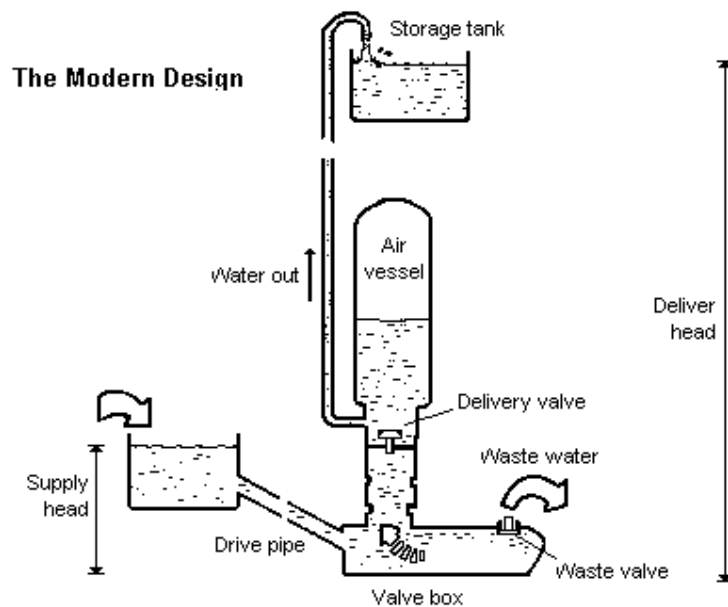
(Image from: <http://www.fao.org/docrep/010/ah810e/AH810E07.htm>)

Jet Pumps



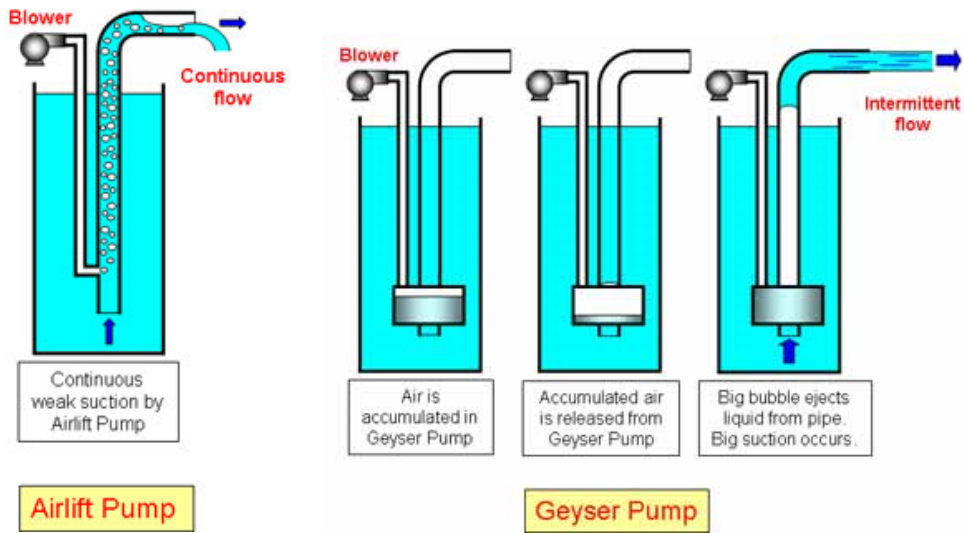
(Image from: <http://www.fao.org/docrep/010/ah810e/AH810E07.htm>)

Ram Pump



(Image from: http://www.lifewater.ca/ram_pump.htm)

Air Lift Pumps



(Images from: <http://www.airliftpump.com/index.htm>)