INSTRUMENTAL TECHNIQUE

High pressure pumps for HPLC

Manju C K
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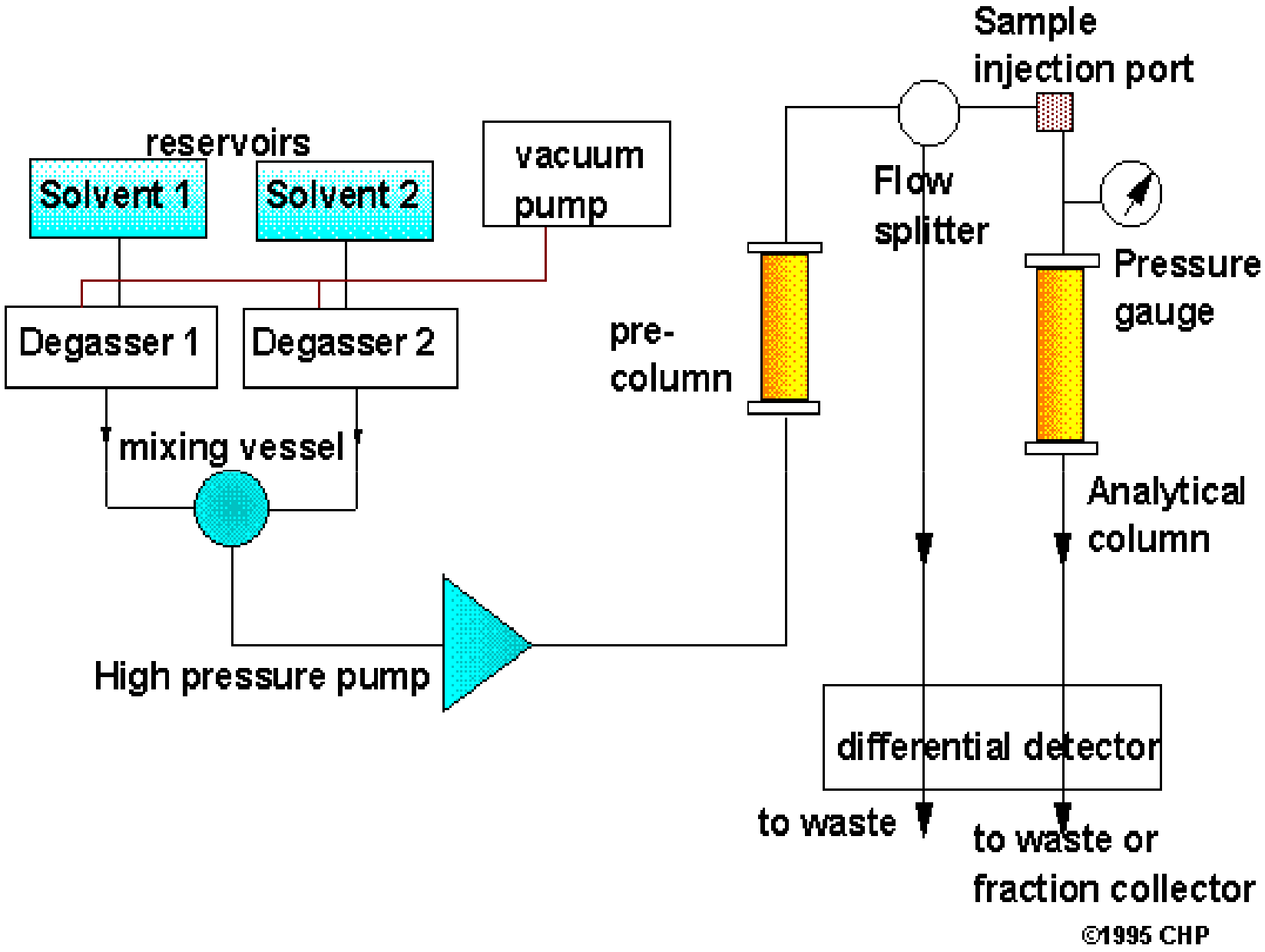
HPLC Instrumentation

- Solvent Reservoirs
- Pump
- Sample Injector
- Column(s)
- Detector
- Data System


reservoirs
Solvent 1
Solvent 2
vacuum pump
Degasser 1
Degasser 2
mixing vessel
High pressure pump
pre-column
Sample injection port
Flow splitter
Pressure gauge
Analytical column
differential detector
to waste
to waste or fraction collector
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❖Pump provides continuous and consistent flow of mobile phase through the HPLC system

❖HPLC pump is required to deliver flow of mobile phase at constant pressure and flow rate. Pumps performance directly affects the retention time reproducibility and detector sensitivity

❖The operational pressure limits have a vast range depending upon analysis requirements. In normal analytical operation the pressure can vary between 2000 – 5000 psi but in applications covered under UHPLC mode operating pressure can be as high as 15000 – 18000 psi

HPLC Pump Criteria

- Constructed of materials inert toward solvents to be used
- Deliver high volumes (flow rates) of solvent (to 10 mL/min)
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- Deliver precise and accurate flow (<0.5% variation)
- Deliver high pressure (to 6000 psi)
- Deliver pulse free flow
- Have low pump-head volume
- Be reliable

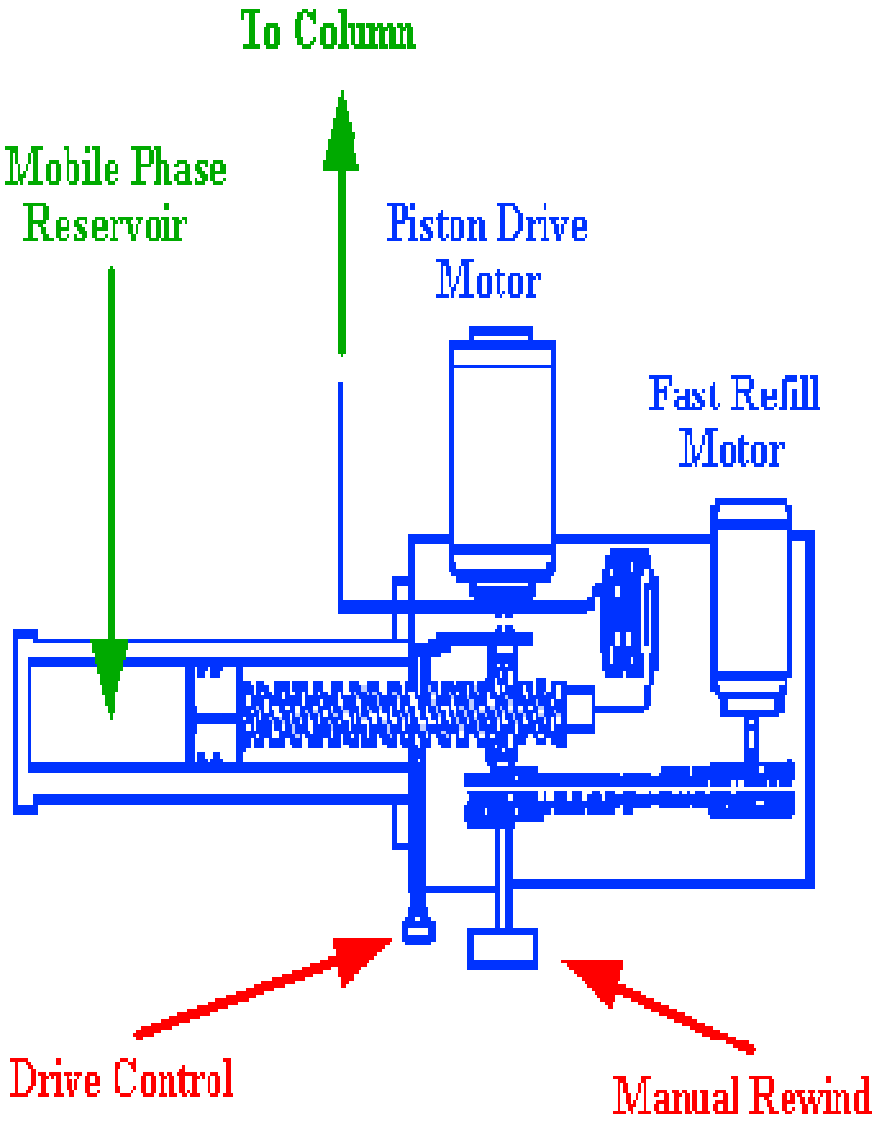
HPLC Pumps: Types

❖ **Constant pressure pumps**

- Constant pressure pump, not constant flow
- Can deliver high pressures
- Stable flow during delivery stroke
- Stop flow on refill stroke
- Low cost

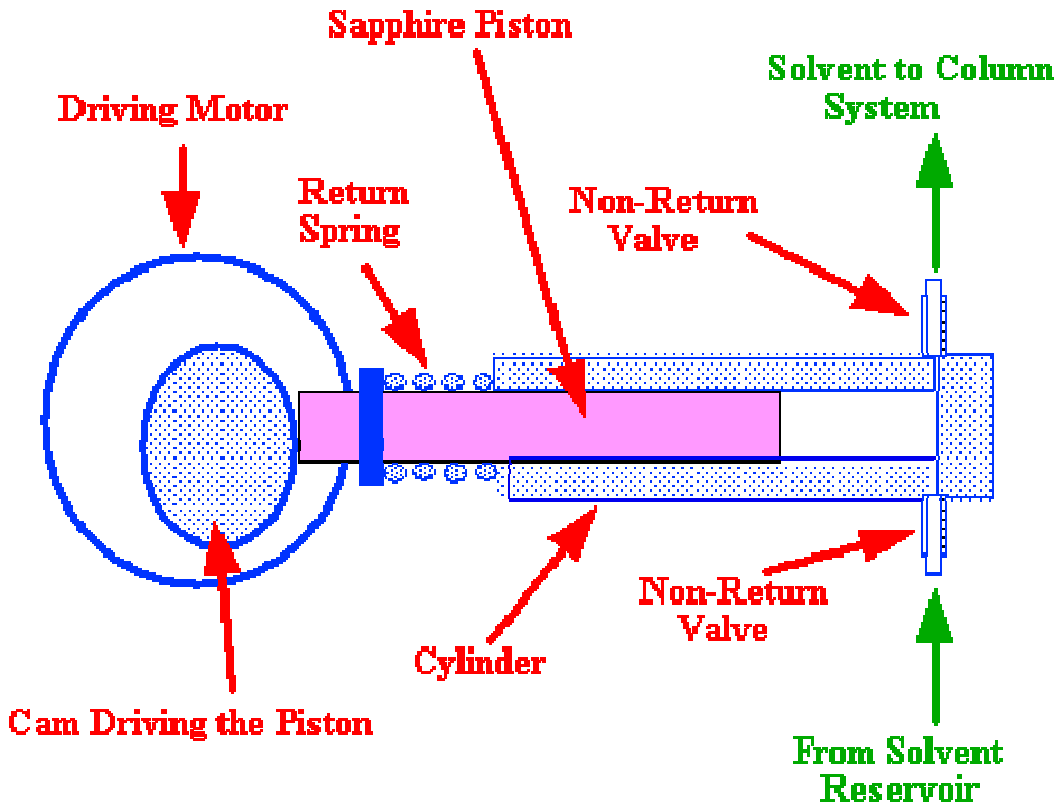
❖ **Syringe pumps**

- Constant flow rate pump
- Non-pulsating flow
- Low flow rates
- Isocratic flow only
- Refill required when reservoir expended



❖ Reciprocating pumps

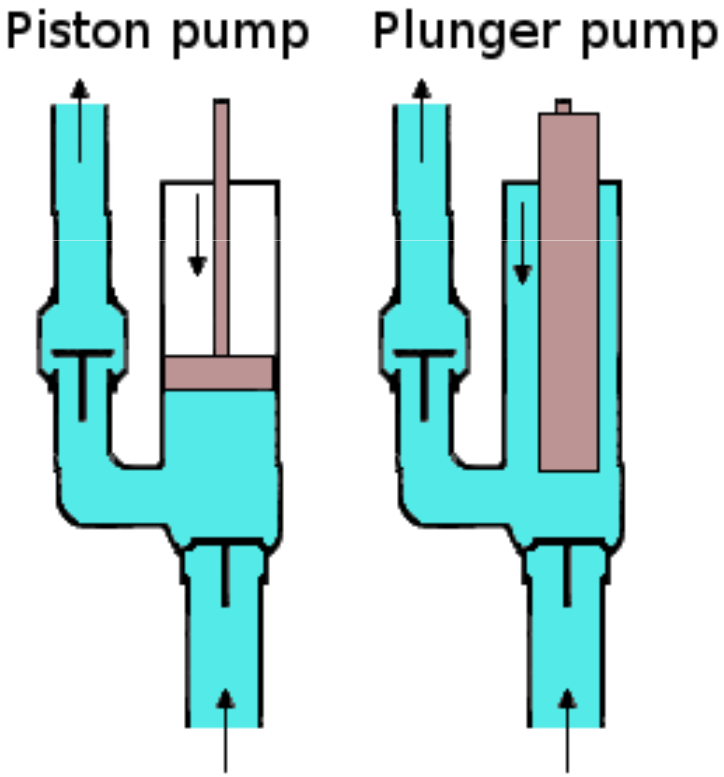
- Deliver solvent(s) through reciprocating motion of a piston in a hydraulic chamber
- The solvent delivery of reciprocating pump systems is smooth because while one pump is in filling cycle the other is in the delivery cycle
- High pressure output is possible at constant flow rate and gradient operation is possible



The Single Piston High Pressure Reciprocating Pump

❖ **Reciprocating pumps**

- Diaphragm pumps
- Piston and plunger pumps



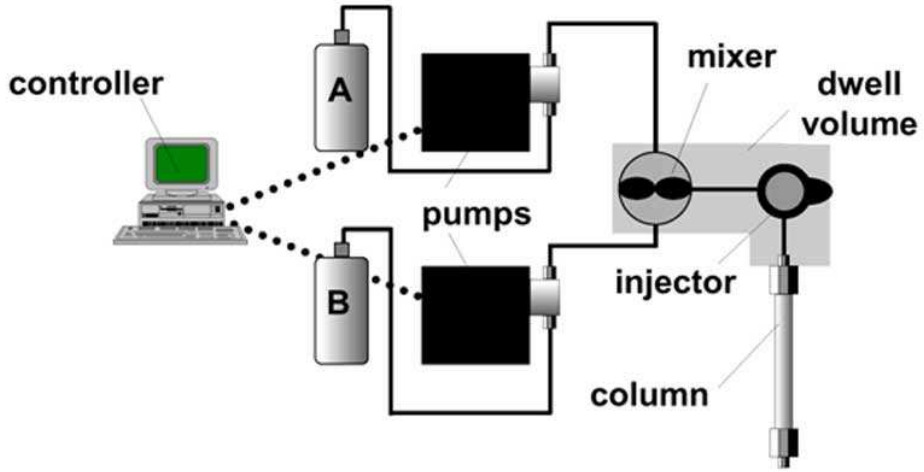
- Able to generate high pump pressure
- Plunger pumps in particular are the best means for achieving the highest pump pressures, while piston pumps are a better option for handling abrasive liquids

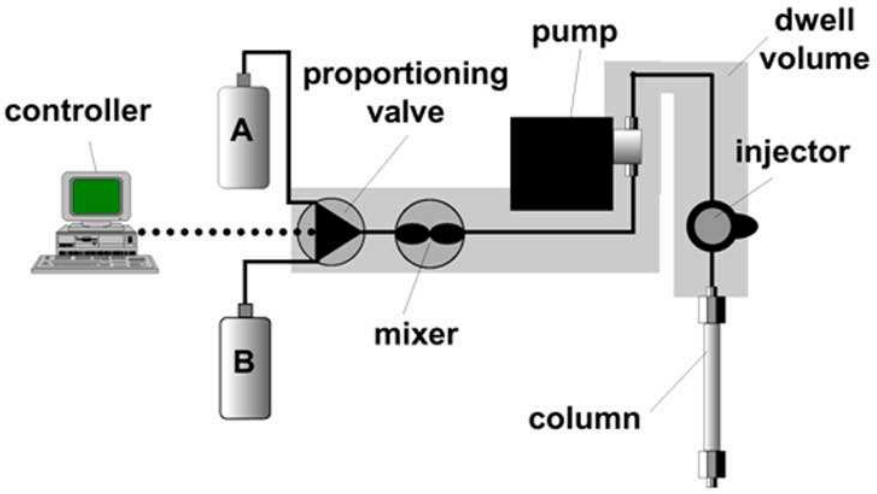
❖**Simple pumping system**

•Single piston pump
•Double piston pump

❖**Mixing solvents, Binary pumps**

•High pressure gradient pumps
•Low pressure gradient pumps





Thank You