



SNS COLLEGE OF ALLIED HEALTH SCIENCES
SNS Kalvi Nagar, Coimbatore - 35
Affiliated to Dr MGR Medical University, Chennai



DEPARTMENT OF CARDIO PULMONARY PERFUSION CARE
TECHNOLOGY

COURSE NAME : PRINCIPLES OF PERFUSION TECHNOLOGY PART 1
2ND YEAR

TOPIC : SAFETY DEVICES



FLOW METERS

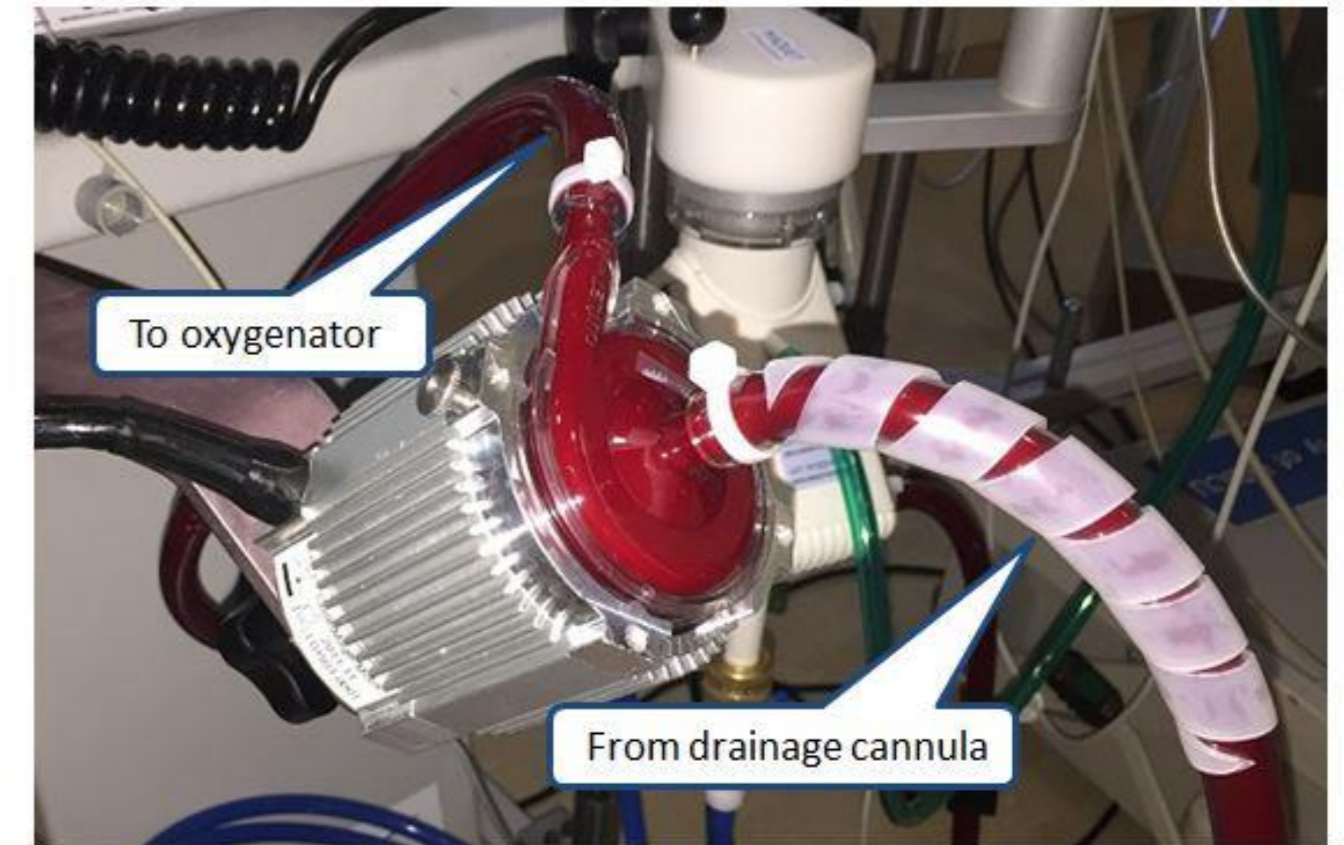


- The centrifugal pumps and the **non – occlusive pumps are pressure sensitive**, so they require a separate sensor of a flow meter.
- Flow meters are used to **monitor the blood flow** of the pump.



LOCATION OF FLOW METER IN ECC

- The flow meter should be incorporated into the “**arterial outflow**”.
- The flow meter can also be located downstream of any “**purge**” or “**recirculation line**” in the circuit to accurately **measure blood flow** delivered to the patient.





TYPES OF FLOW METERS



- Flow meters are the **indispensable part** of the centrifugal pump.
- Two types of measuring techniques are used clinically, one is working with an **ultrasonic principle**, the other with an **electromagnetic principle**.



ELECTROMAGNETIC FLOW METER

- Electromagnetic flow probes depend on the fact that blood flowing through an electromagnet alters the magnetic field in a manner that can be measured continuously.
- It requires the connector that need to be build into the tubing and this will affect the blood flow.
- A disadvantage of the electromagnetic flow probes is that, there is the **difficulty in obtaining the good zero value**.



ULTRASONIC FLOW METER



- Ultrasonic flow meter is a type of flow meter that **measures the velocity of a fluid** with the ultrasound to calculate volume flow.
- The ultrasonic flow meter utilize either the **Doppler principle** or a variant known as **ultrasound transit –time**.



DOPPLER ULTRASONIC FLOW METER



- In doppler ultrasonic flow meters an acoustic pulse is transmitted into the stream of liquid by the transducers.
- These transducers then receive an echo of the pulse reflected by the particles of matter within the fluid.
- By comparing the transmitted and reflected signals, the rate of the flow can be computed.



DISADVANTAGES OF DOPPLER PRINCIPLE



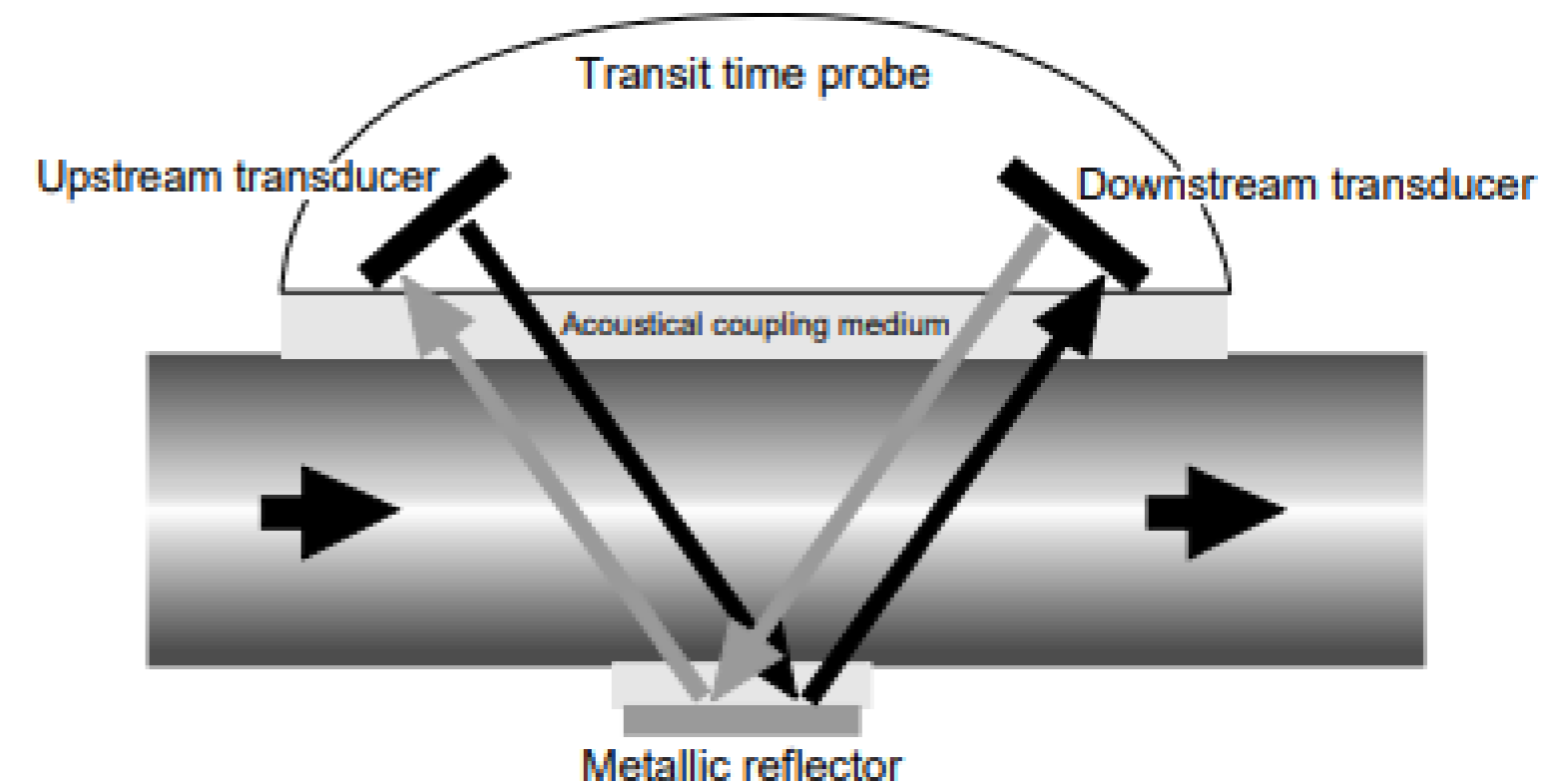
- The doppler principle is less frequently used in flow meter probes because the signal becomes “noisy” at low velocities and this results in inaccurate, low flow readings.
- It will only work properly if there is sufficient particulate material to reflect the pulses and if that material is flowing homogeneously within the fluid.



ULTRASOUND TRANSIT -TIME



- A transit –time flow probe consists of flow small **piezoelectric crystals**, one “upstream” (i.e., against the flow) and one “downstream” (i.e., in the direction of flow) mounted in a common tip that can be clipped on the tubing.
- The time it takes for a signal to travel downstream is compared with the time taken for a signal to travel upstream velocity is then calculated





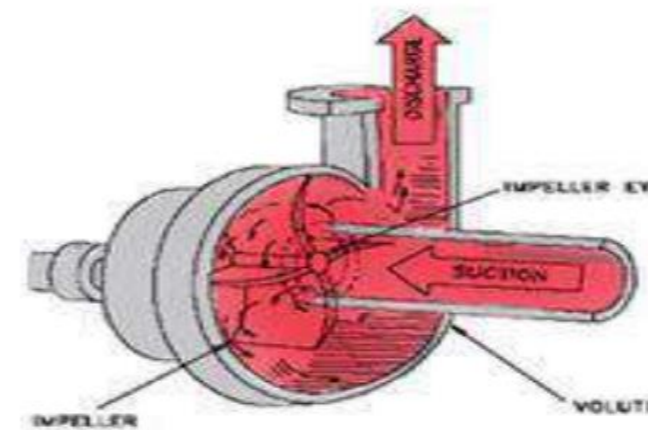
ADVANTAGES OF TRANSIT -TIME FLOW METERS



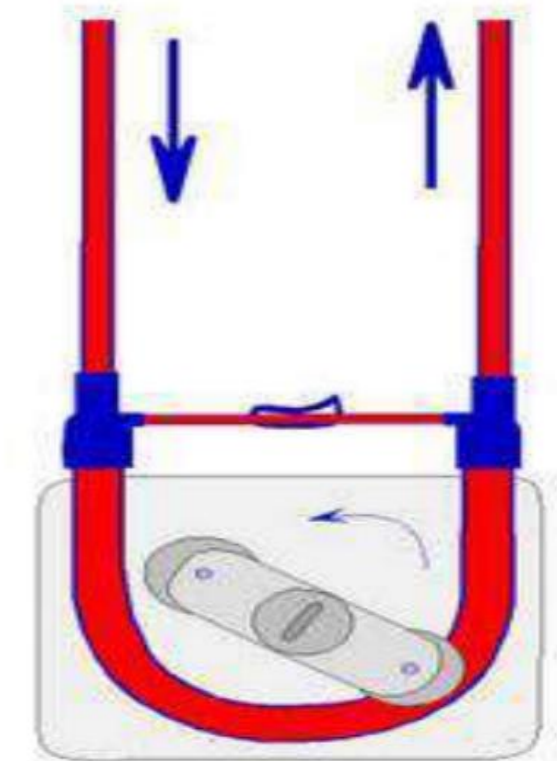
- Transit –time flow meters have an excellent correlation with direct measured blood flow evenly in very low flow ranges.
- They can be clipped on to the outside of the tubing and therefore no immediate contact between the blood and probe exists.



Ultrasonic Flow Sensor



Centrifugal Pump



Roller Pump



THANK YOU