

## LECTURE 20

### FLOW CONTROL VALVES

#### FREQUENTLY ASKED QUESTIONS

##### **1. What is the function of a flow control valve**

Flow control valves are used to regulate the speed of hydraulic cylinders and motors by controlling the flow rate to these actuators.

##### **2. What are the three ways of applying flow control valves**

Meter in, meter out and bleed off are ways of applying flow control valves.

##### **3. What is meant when a flow control valve is said to be pressure compensated**

A pressure compensated flow control valve is one which provides the desired flow rate regardless of changes in system pressure.

##### **4. What is the meter in circuit and where it is used**

In meter in circuit flow control is placed in the pressure line. Pump delivery in excess of metered amount is diverted to tank through pressure relief valve. This is used where load characteristics are constant and positive

##### **5. What is the meter out circuit and where it is used**

In meter out circuit flow control is placed in the return line. This is used in machine tools like drilling in which tools are dragged suddenly at the end of drilling.

##### **6. What are the advantages of meter in circuit**

- Finer speed control is possible
- Suitable for high pressure applications
- Low level of friction – longer service life of components

### **7. What are the disadvantage of meter in circuit**

- Cannot be used for hydromotor
- Pressure drops across due to throttle and hence the pressure of the fluid fed into the actuator will be less than required
- Inefficient because excess flow goes to tank
- Cannot prevent the load from running away as in the case of drilling machine
- Heat generated due to throttling is fed to the actuator.

### **8. What are the advantage of meter out circuit**

- No loss of pressure of the oil at the head end of the cylinder
- The actuator movement is more stable
- Suitable for controlling the speed of both cylinder and motor
- Heat generated during throttling goes to the tank
- Provide positive speed control of cylinder
- Pump works against the maximum pressure
- Positive speed control and stable

### **9. What are the disadvantage of meter out circuit**

- Even at no load the cylinder is subjected to maximum pressure
- Piston rod side is subjected to counter pressure which increases as area ratio increases
- The friction is higher
- If the flow control is installed after the DCV, leakage in DCV will affect the accuracy

### **10. What are the advantage of By pass or bleed off circuit**

- Efficiency is better
- Heat generated due to throttling is fed into the tank

### **11. What are the disadvantage of By pass or bleed off circuit**

- Positive speed control is not possible
- Not suitable for accumulator circuit
- Fluctuation of flow rate in pump affects the speed of the actuator

- Pump works against the load
- Can be used for fixed displacement pump and motor
- The motor continues to rotate even when the pump delivery is cut off from the fluid motor
- Not efficient with variable displacement pump.

## 12. What is a modular valve and what are its benefits

Modular valve is a stack of control valve one on the other to perform a complete valve pack. This arrangement forms a compact system, thereby reducing assembly cost and eliminates much of the complex interconnection of pipe work. Modular valve saves space and easy to troubleshoot.

## 13. What is hydraulic fuse

A hydraulic fuse prevents hydraulic pressure from exceeding an allowable value in order to protect circuit components from damage. It is analogous to an electric fuse.

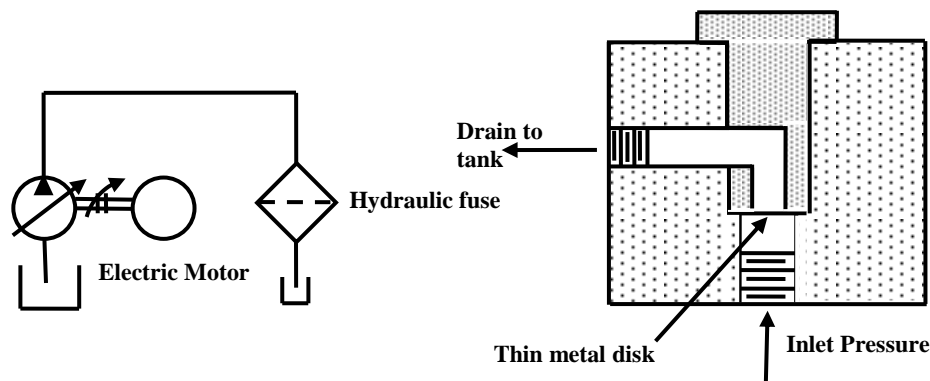


Figure E8 : Hydraulic fuse

## 14. What is the need for temperature compensation in flow control valve

As the viscosity of oil varies with temperature, the oil becomes less viscous when temperature increases. As the less viscous fluid flows more rapidly through an orifice, the increase in temperature causes an increase in flow for a valve setting, so temperature compensation is needed to offset the effect of such temperature variations.

**15. What is the difference between hydraulic fuse and Pressure relief valve**

Hydraulic fuse	Pressure relief valve
Hydraulic fuse is a safety device. When the line pressure exceeds the design capacity of thin metal sheet, it ruptures and connects it to drain	Pressure relief valve is also safety valve. which crack opens when the fluid line pressure exceeds the set pressure. Once the pressure drops below set pressure, Valve resets
It protects the hydraulic system.	It is used to regulate the pressure and protects the expensive parts of pump against the over pressure which may be due to stoppage, or blocking.
It is analogous to electrical fuse. which need to be replaced once thin metal plate ruptures	It is analogous to circuit breaker, which can be reset. like circuit breaker, relief valves are available with different maximum set capacities.
Rupture is due to plastic deformation of the thin metal sheet.	Opening of the valve is due to set pressure which can be adjusted by spring force.