

LECTURE 10 AND 11

HYDRAULIC MOTORS

FREQUENTLY ASKED QUESTIONS

1. Differentiate between hydraulic pump and hydraulic motor

Pump converts mechanical energy provided by prime mover to fluid energy. Hydraulic motor uses fluid energy and converts it to mechanical movement of the actuators, either rotary or linear.

2. List the advantages of hydraulic motor over electric motor

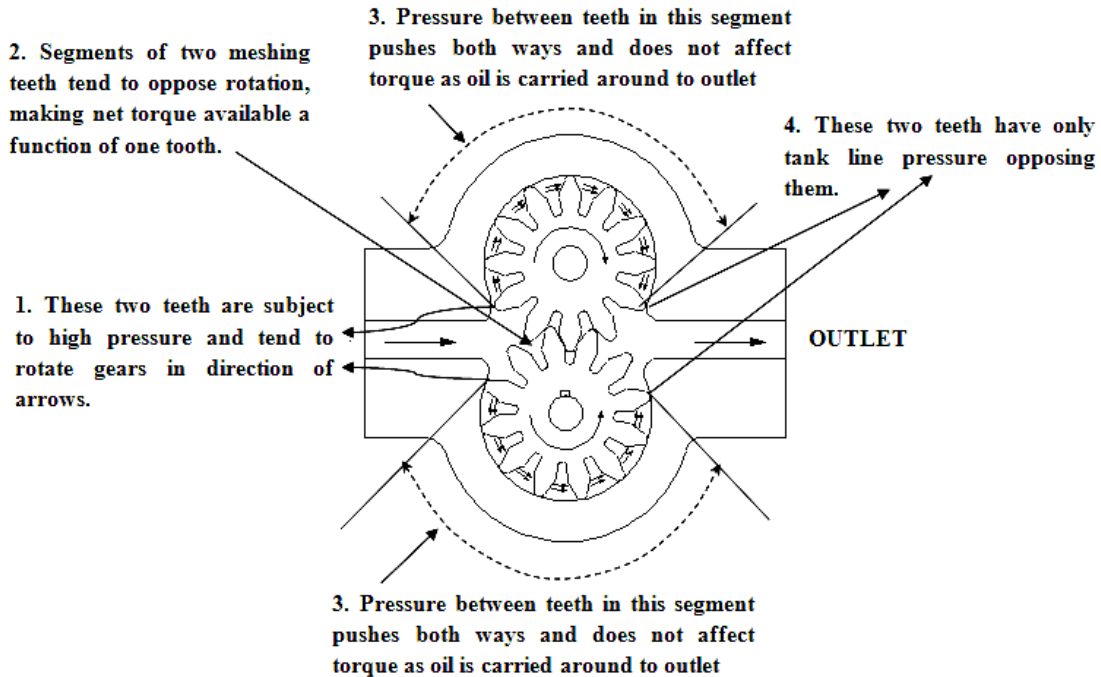
- Hydraulic motors are indeed smaller at identical power and especially torque. Their speed and position can be regulated very well, though not as precisely as for electric motors. Price also was a bit lower because of the inverter.
- When machine stalls due to some snag, direction of the hydraulic motor can be reversed easily and safe using pressure relief valve. Electric motor would trip or burn out
- Where electric motors, which can deliver only rotational power and must be sized to suit the load application, hydraulic motors are much smaller in size even when the application involves heavy loads.
- In a heavy electromechanical system a big electric motor needs to be directly located on the motion axis which may not be always feasible. It would also require a continuous supply of electricity usually from an external source.

3. List four important application of hydraulic motor

- Electric motor coil winding
- Oil pipeline inspection equipment
- Undersea camera manipulation
- Jumbo jet maintenance jacks
- Milling and sawing applications
- Dynamite blast hole pump drive
- Automatic clamping
- Textile washing agitators
- Orange peeling machines
- Fan drives
- Diamond wheel dresser
- Drill and tap machine tool
- Chicken processing machinery
- Conveyor drives
- Due to the high torque at low speeds, loaders and other construction equipment use heavy hydraulic motors to drive the wheels for moving the machines around

- Cooling fans of equipment that already have hydraulic systems. For example a front end loader or excavator.
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4. Explain with neat sketch the working of Gear motor



5. Write the classification of Piston motor

Piston motors are classified into following types

According to the piston of the cylinder block and the drive shaft the piston motors are classified as

- a) Axial piston motors
- b) Radial piston motors

According to the basis of displacement piston motors are classified as

- Fixed displacement piston motors
- Variable displacement piston motors

6. Define volumetric efficiency, mechanical efficiency and overall efficiency of hydraulic motor

$$\eta_v = \frac{\text{Theoretical flow rate motor should be supplied with}}{\text{actual flow rate supplied to motor}} = \frac{Q_T}{Q_A}$$

$$\eta_m = \frac{\text{actual torque delivered by the motor}}{\text{Torque motor should theoretically deliver}} = \frac{T_A}{T_T}$$

$$\eta_o = \frac{\text{Actual power delivered by motor (mechanical)}}{\text{Actual power delivered to the motor (Hydraulic)}}$$

7. Why is the actual flow rate required by the hydraulic motor is higher than the theoretical flow rate

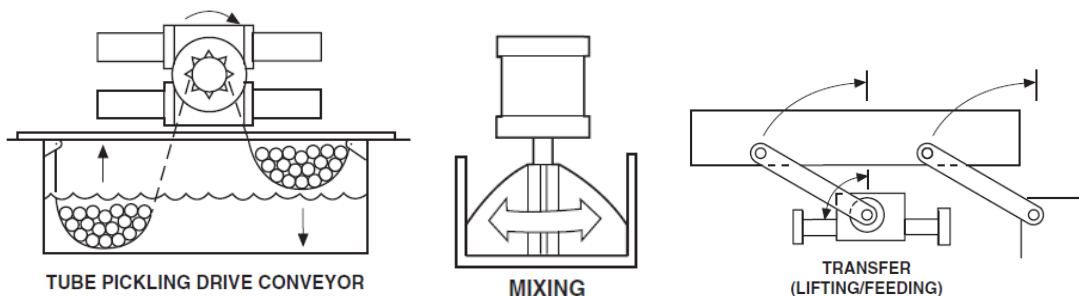
Actual flow rate required by the hydraulic motor is more than theoretical flow rate because of the fluid frictional losses, losses in pipes, losses in fittings, leakage loss etc.

8. Why is the actual torque output delivered by the hydraulic motor is less than the calculated theoretical torque

Actual output delivered by the hydraulic motor is less than theoretical torque because of the mechanical frictional losses like bearing losses etc.

9. List the few applications of semi –rotary actuator

- Semi actuators are used for lifting, tilting in jigs and fixtures
- Partial Opening and closing of door in machine tools
- Indexing, swinging and bending in sheet metal applications



10. Where are external gear motor used

External gear motors are used for high speed (4000 RPM) and low torque application. Usually their capacity is limited to 5-10 kW

- Used in Damper Actuators,
- hydraulic fan drive systems for mobile vehicles
- Material Handling
- Earthmoving machines
- Truck and Bus

11. List the advantages of external gear motor

- High drive speeds
- Compact dimensions and low weight in relation to the power rating
- Cost-effective