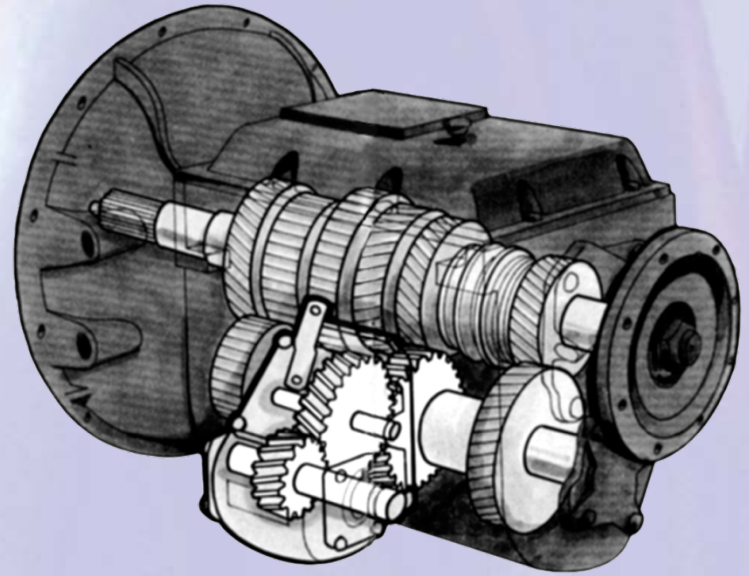


P.T.O. Operation

**How P.T.O.s work, gears,
gear pitch and gear ratio.**

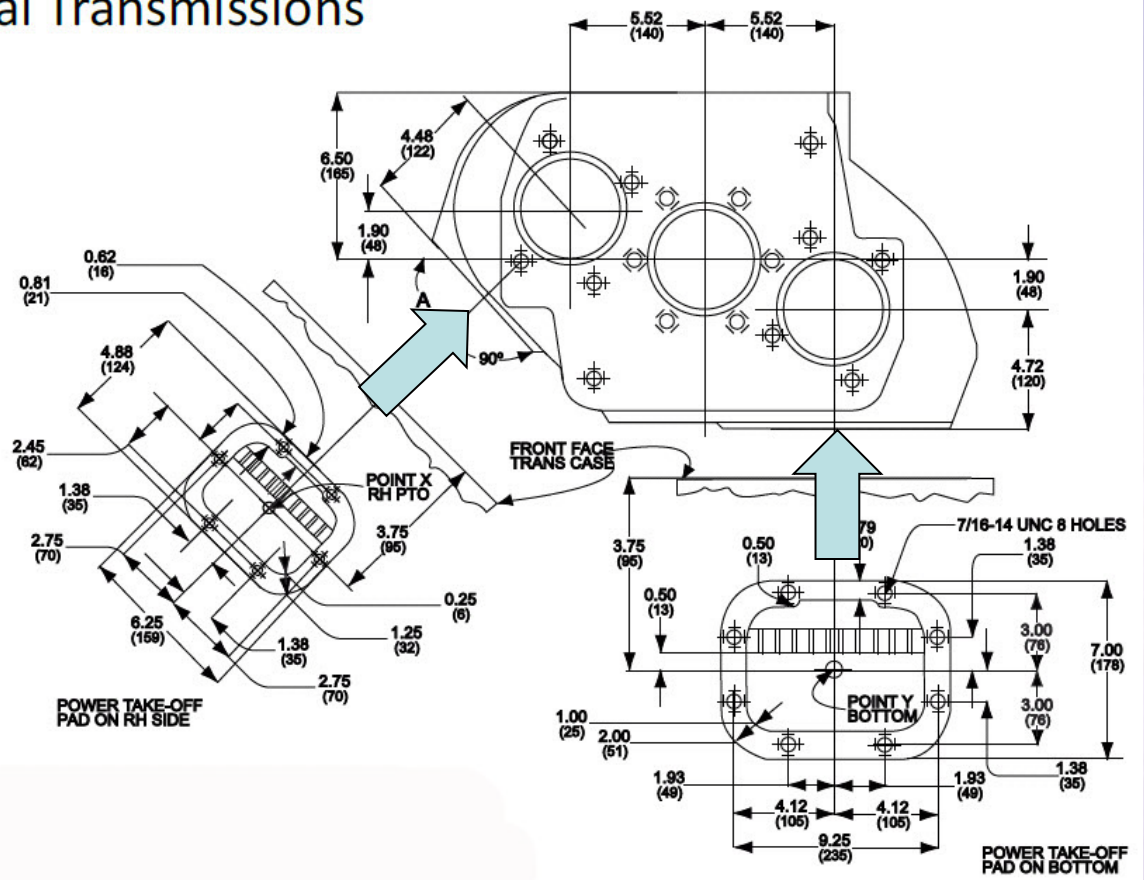
P.T.O. Operation

The typical P.T.O. is designed to pick up engine power, through rotation, and transfer it to another piece of equipment.

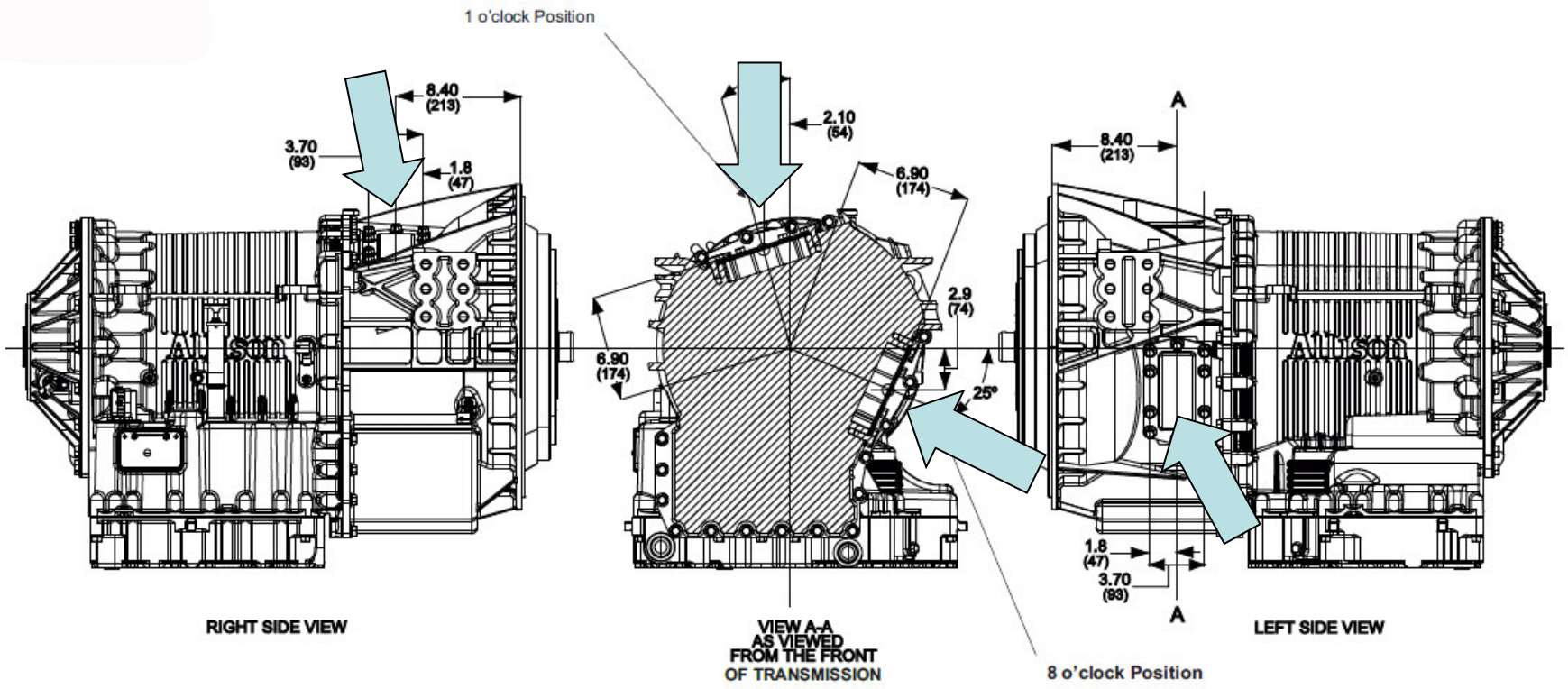


Side Mount P.T.O.

Eaton Manual Transmissions



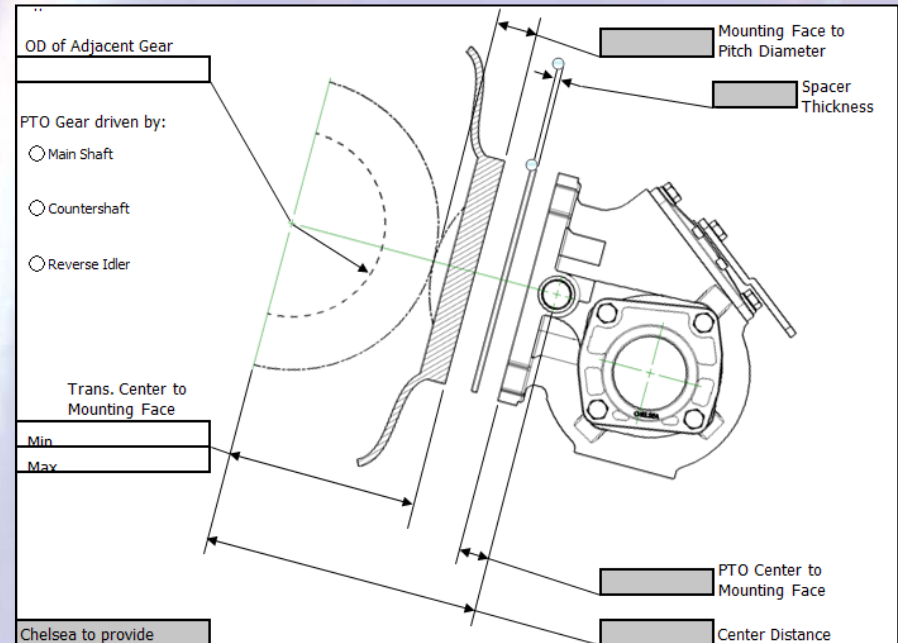
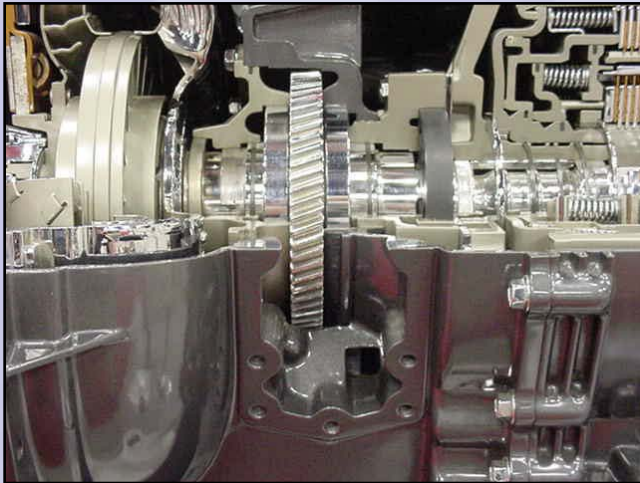
P.T.O. Operation



P.T.O. Operation

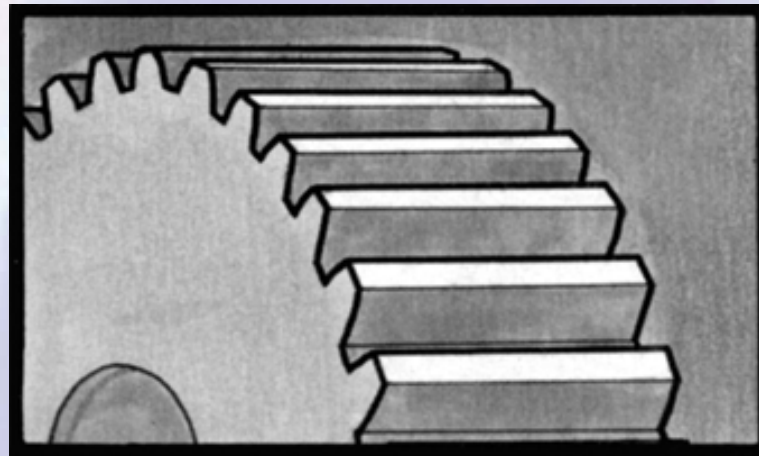
The most important part of a P.T.O. is the gear, or gear set.

- Rotation is picked up by gears meshing or mating with other gears, and in order for the P.T.O. to work, the gears must mesh properly with the transmission's P.T.O. drive gear
- It is very important, therefore, to know the design and specifications of the gear teeth in the transmission



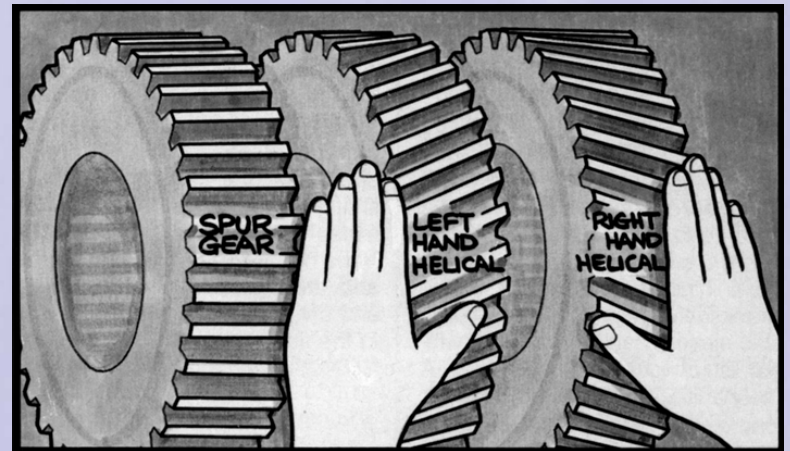
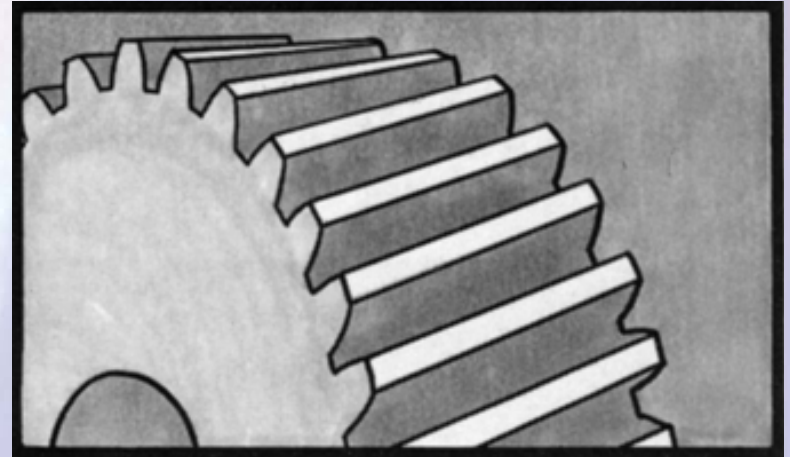
Glossary of Power Take-Off Terms

- **Spur Gear** – A gear whose teeth are cut straight across the face of the gear



Glossary of Power Take-Off Terms

- **Helical Gear** – A gear whose teeth are cut on an angle diagonally across the gear either with a right or left-hand slant. In order for helical gears to mate, one must slant to the right. . . the other to the left
- Helical gears may have their teeth with a right-handed or left-handed slant

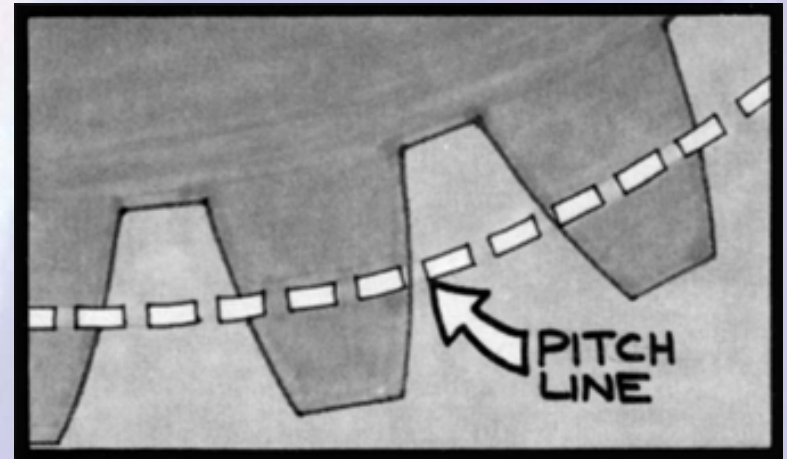


Obviously, a spur gear will not mesh properly with a helical gear.

- Helical gears not only must mesh with each other, but one must be right-handed and the other must be left-handed
- Helical gears also must have the same tooth construction in terms of pitch, pressure angle and helix angle
- Helix angle is the degree of the angle cut across the gear

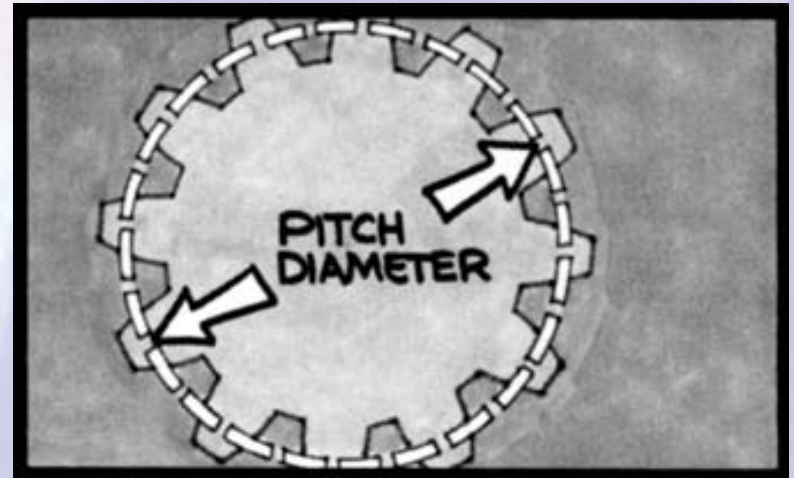
Glossary of Power Take-Off Terms

- **Pitch Line** – The point on the gear tooth midway between the base of the tooth and the tip of the tooth
- **Pitch Line Velocity** – The speed of rotation in feet per minute of a gear measured at the pitch line



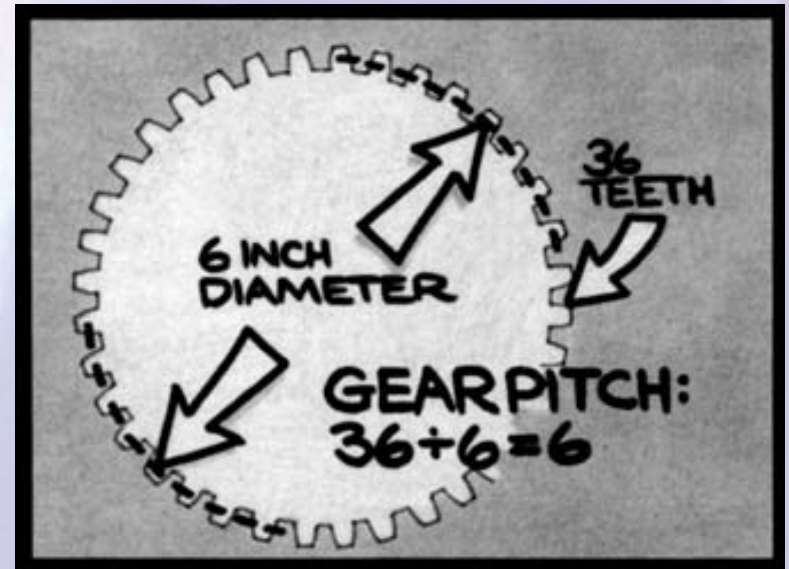
Glossary of Power Take-Off Terms

- **Pitch Diameter** – The distance across the center of the gear measured from the pitch line of one tooth to the pitch line of the tooth directly opposite that tooth



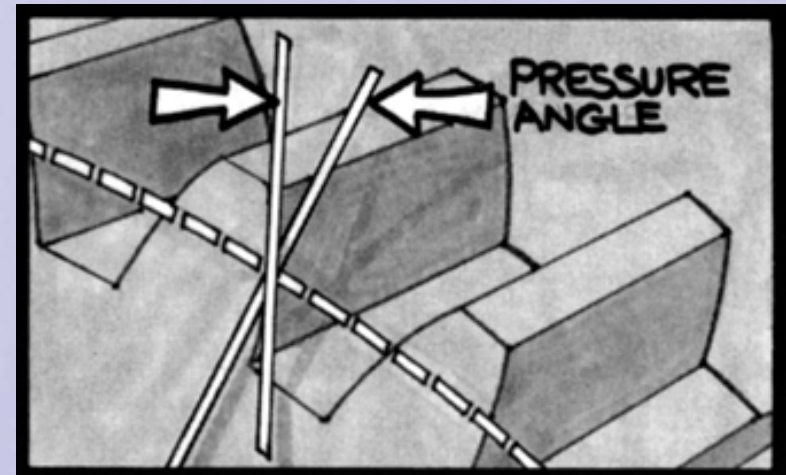
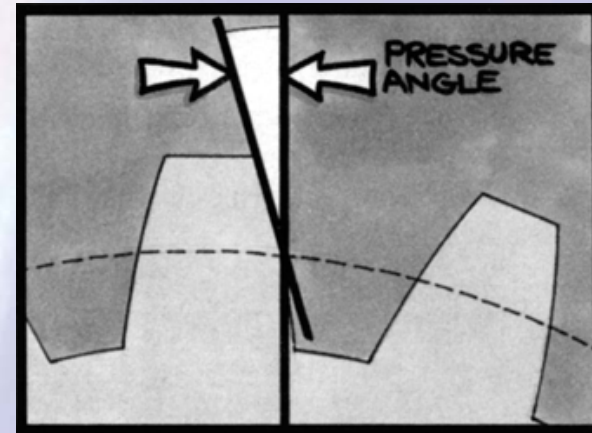
Glossary of Power Take-Off Terms

- **Pitch (Gear)** – The measure of the size of the gear teeth determined by the number of teeth in a given area measured at the pitch line. P.T.O. gear pitch is normally classified as 5, 6 or 7-pitch



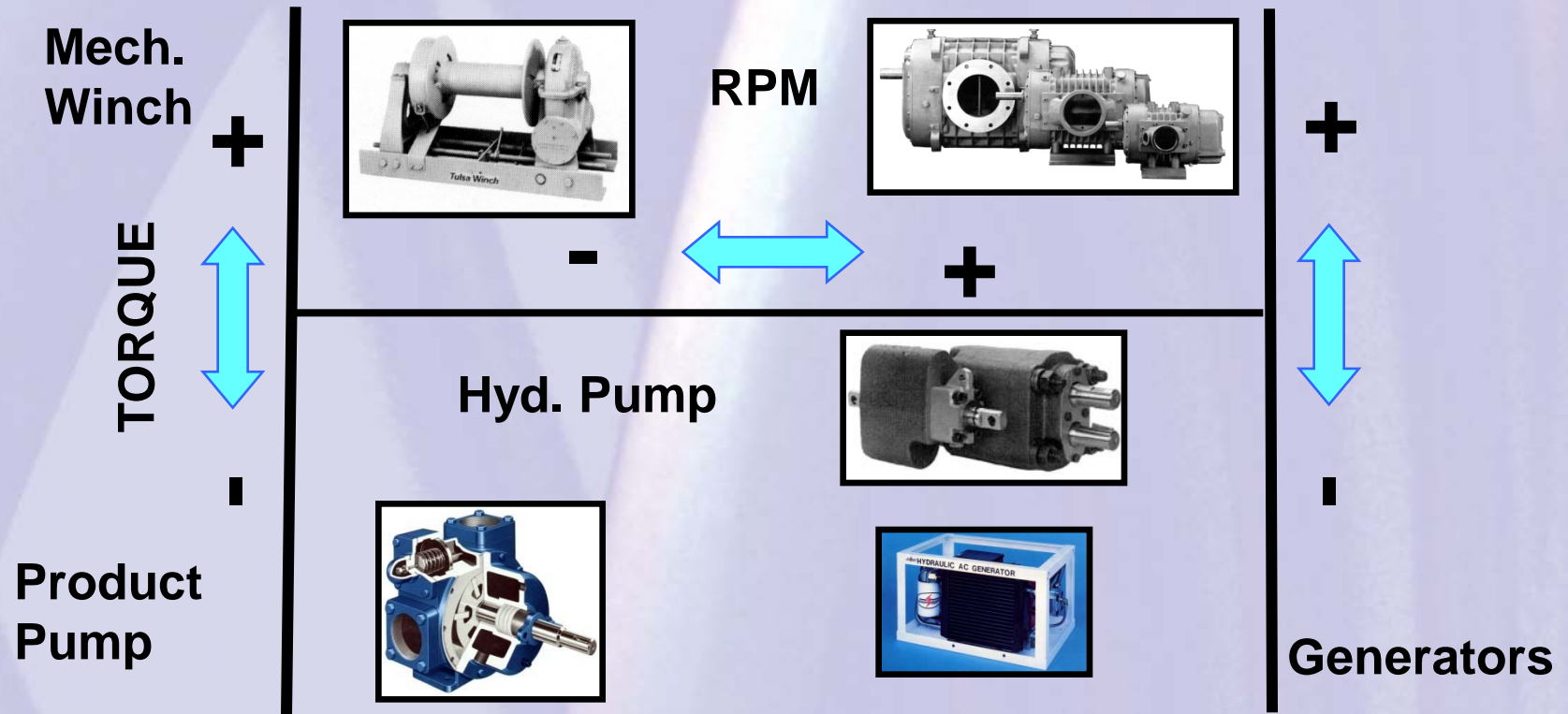
Glossary of Power Take-Off Terms

- **Pressure Angle** – The angle formed, measured in degrees, by a line drawn perpendicular to the pitch line, and a line drawn from the same point on the pitch line tangent to the tooth profile



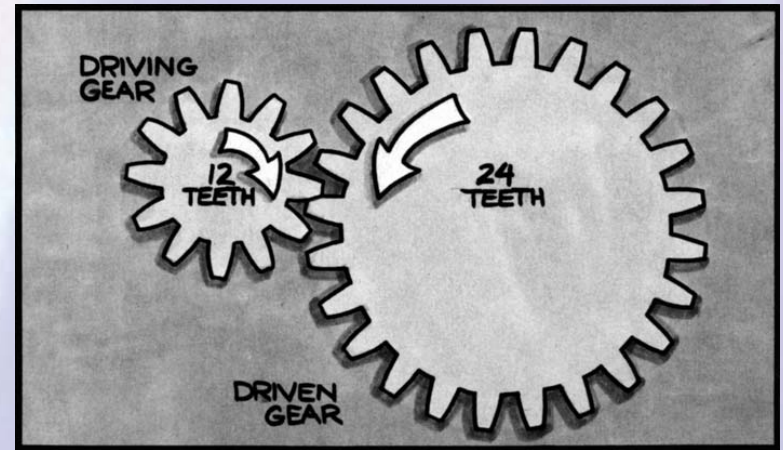
P.T.O. Operation

- **Gear ratio** is another important part of P.T.O. operation. The P.T.O. gear ratio can actually modify the operating speed of the engine to the requirements of the P.T.O.-driven device
- The proper P.T.O. model has the necessary torque capacity and operating speed that most clearly meets the needs of the application



P.T.O. Operation

The gear ratio is determined by dividing the number of teeth in the driven gear by the number of teeth in the driving gear
($24 \div 12$ for a gear ratio of 2 to 1).



Although the gear ratio in the example given is 2 to 1, the change in torque is 1 to 2. This is arrived at by dividing the number of teeth in the driven gear: $12 \div 24 = 0.5$ (1 to 2).

Assume the engine horsepower is 50 and the speed of the small gear is 1000 revolutions per minute (R.P.M.).

The formula for determining torque is:

$$T = \frac{\text{Horsepower} \times 5252}{\text{Speed (R.P.M.)}}$$

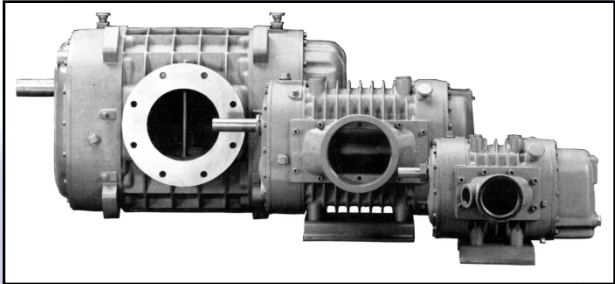
$$\text{(SM)} \quad \frac{50 \times 5252}{1000} = 262.6 \text{ lbs. ft. Torque}$$

$$\text{(LG)} \quad \frac{50 \times 5252}{500} = 525.2 \text{ lbs. ft. Torque}$$

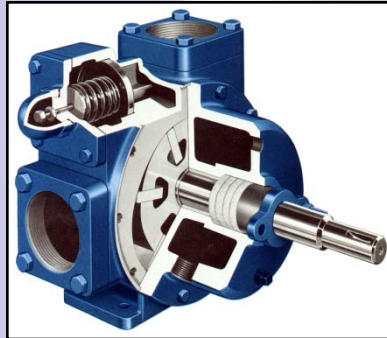
NOTE:

If however, the situation was reversed with the larger gear driving the smaller gear, the smaller gear would rotate twice as fast as the larger gear, but the torque would rotate twice as fast as the larger gear, but the torque would only be half as great.

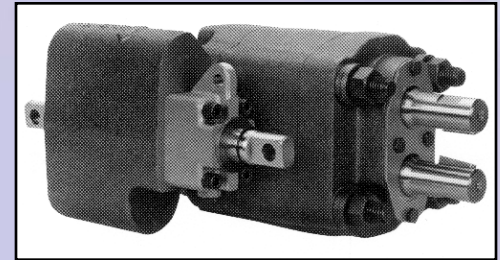
Types of Driven Equipment



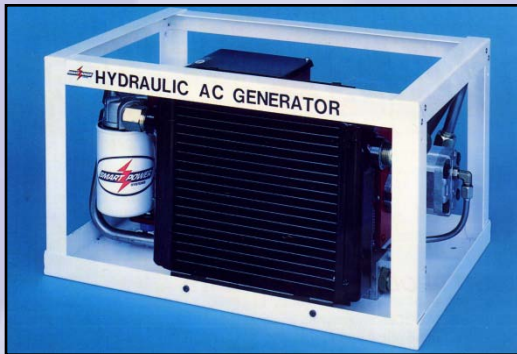
Blower/Vacuum



Product Pump-Air/Liquid



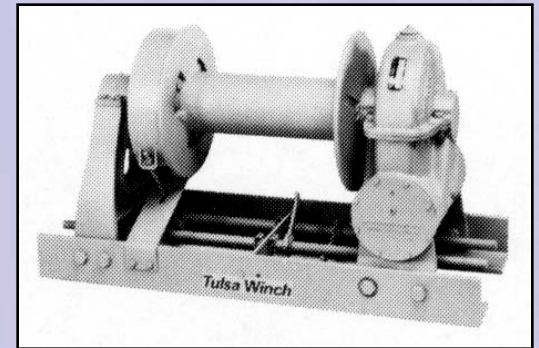
Gear Pump



Hydraulic Generator

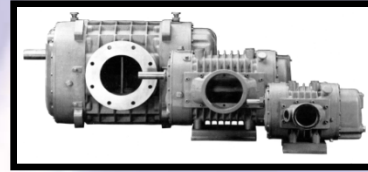


Bent Axis Piston Pump-Volvo



Hydraulic Winch

Mech.
Winch



Blowers

+

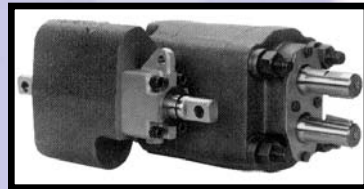
RPM

+

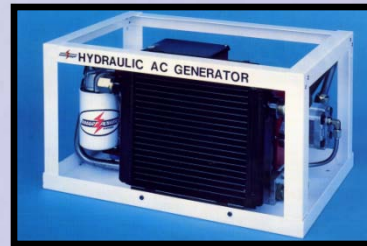
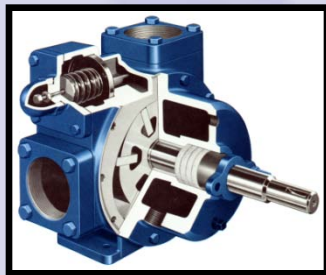
TORQUE



TORQUE



Product
Pump



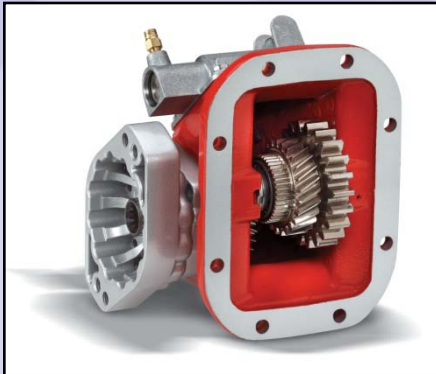
Generators

■

■

Applications

The Dump Truck is the Most Common



Dump Trailers



Aerial/Bucket/Man Lift











Sewer Cleaner Trucks



Water/Product Pump Truck





Snow Plow-Dump Trucks





Bottom Mount & 2 Rear Mount P.T.O.s

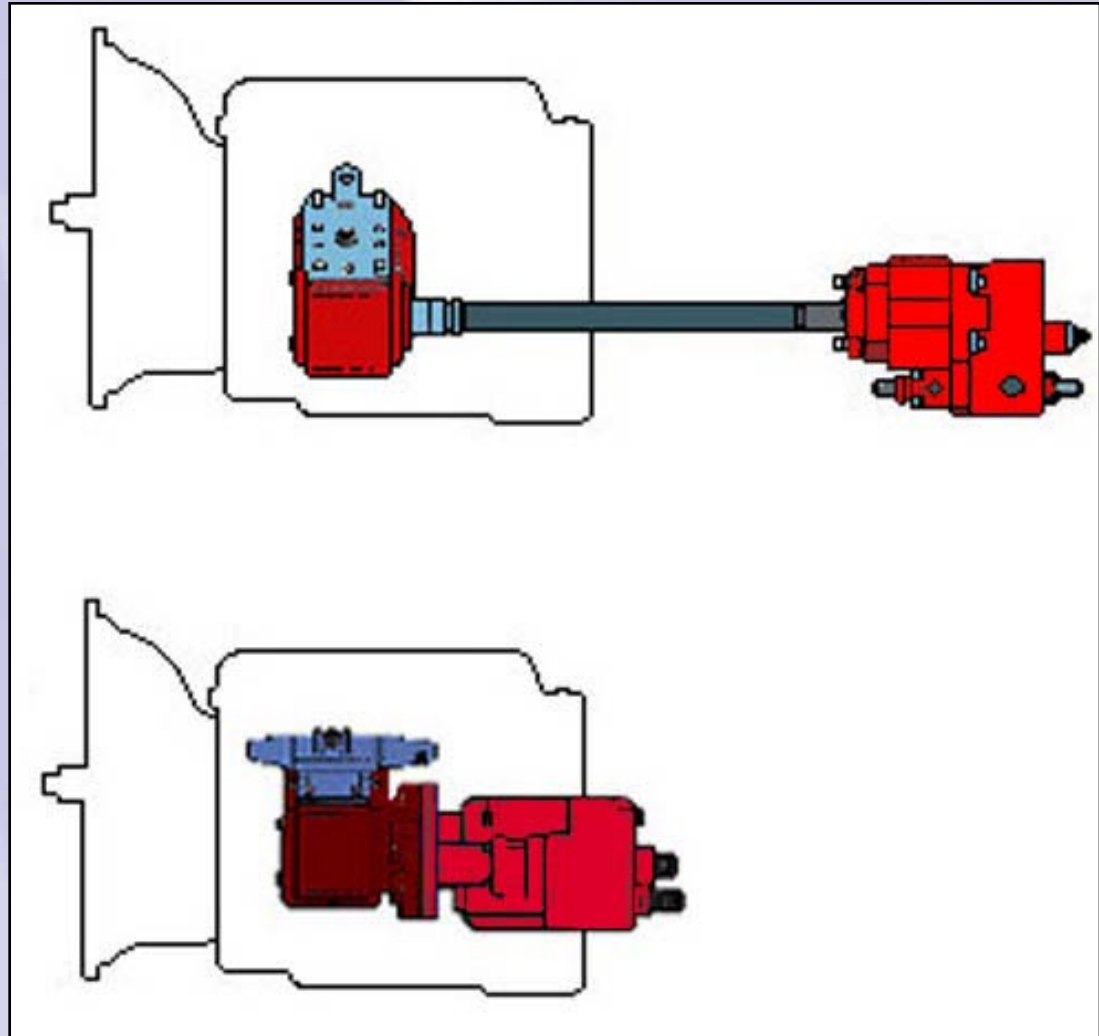


5 P.T.O.s Mounted on One Chassis



Attaching the Pump to the P.T.O.

Remote Mount



Direct Mount

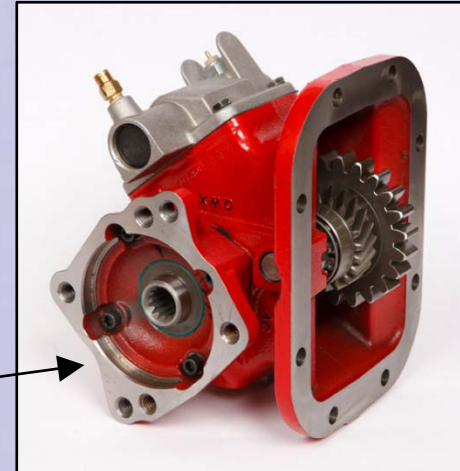
Driveshaft/Remote Mounts



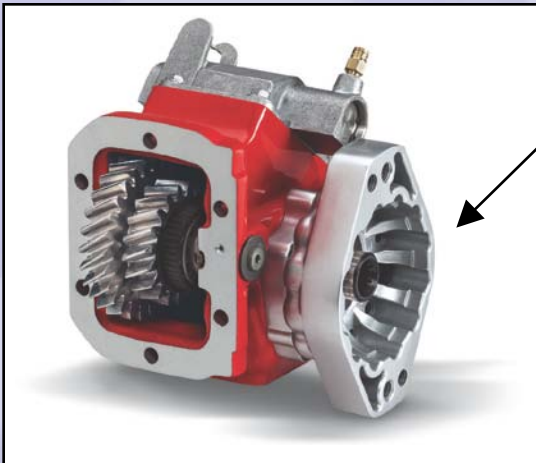
Direct Mount SAE "B" Flanges



S.A.E. "B" 2 & 4 Bolt Pump



S.A.E. "B" 2 & 4 Bolt Fixed Flange



S.A.E. "B" 2-Bolt Rotatable



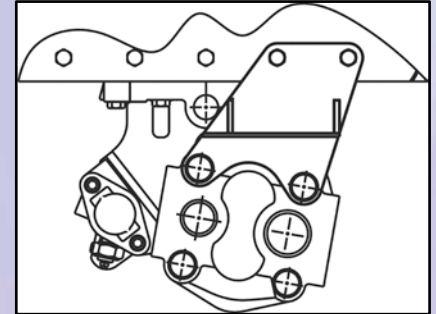
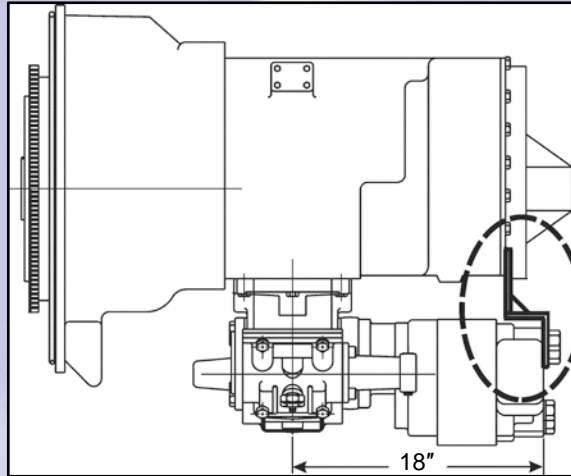
S.A.E. "B" 4-Bolt Rotatable

Direct Mount DIN Flange



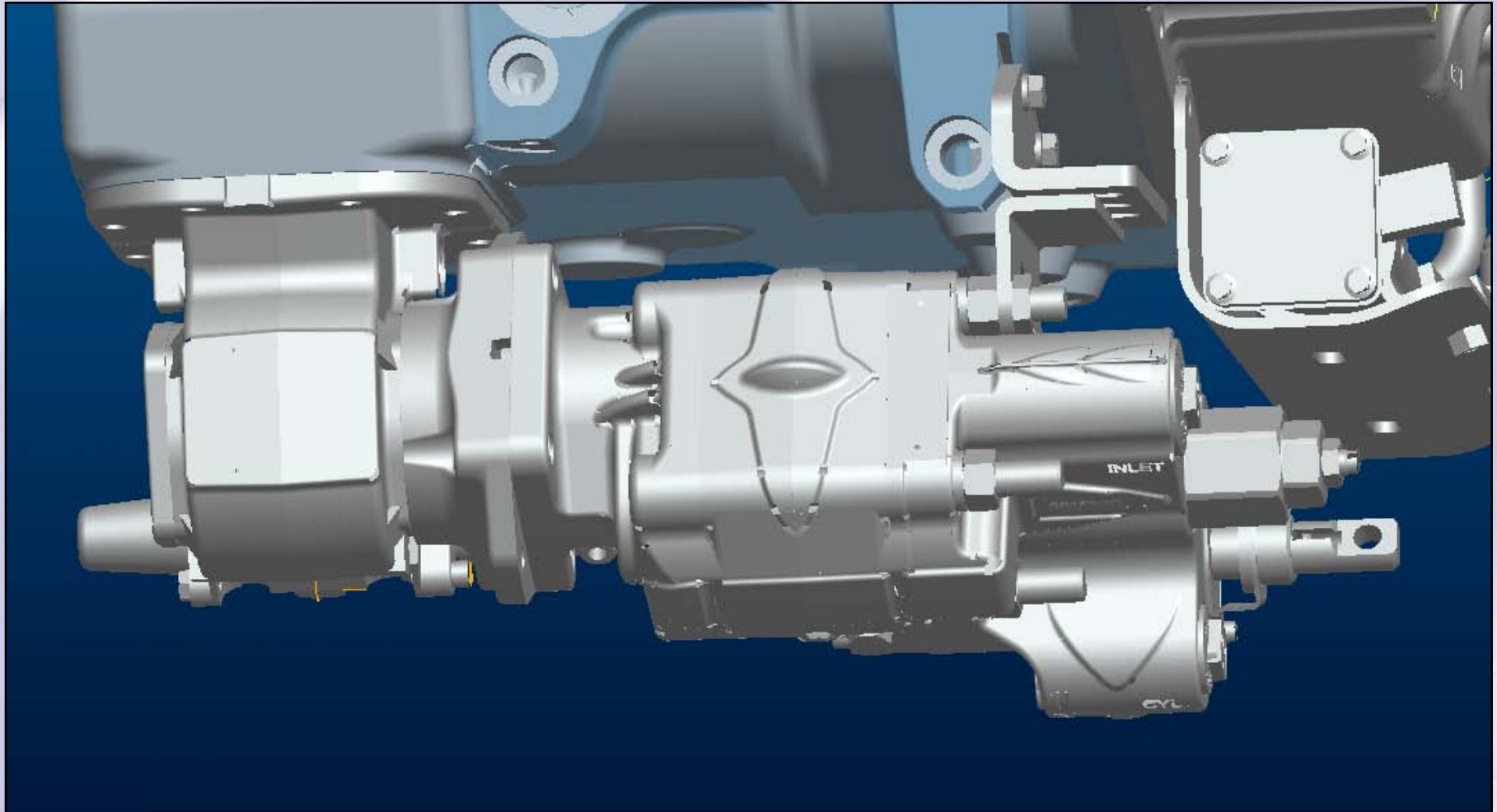
Supporting the Pump

- Direct Mount
- Support Bracket for Pump and Hoses
- 40 lbs. or 18 inch Rule



Bottom Mount 880 with Bracket





Assembly Arrangements

