

**OPERATING  
AND  
MAINTENANCE  
INSTRUCTIONS  
FOR  
MODEL 1800 – 2600**

<b>Amarillo Gear Company</b> <b>P.O. Box 1789</b> <b>Amarillo, Texas 79105-1789</b> <b>Phone: (806) 622-1273</b>  <b>Fax: (806) 622-3258</b> <b>www.amarillogear.com</b>		
	<b>Revision: C</b> <i>Cody Teel</i>	<b>Date: March 18, 2005</b>
	<b>Page: 1 of 5</b>	<b>FORM: 189</b>

# **OPERATING AND MAINTENACE INSTRUCTIONS AMARILLO RIGHT ANGLE GEAR DRIVES (MODEL 1800 – MODEL 2600)**

## **INSTALLATION**

Unless otherwise specified, all units are shipped with the proper type and amount of lubricant. However, check to see if the oil is at the proper level. Add lube oil if necessary.

Inspect and clean the top of the pump discharge base and the bottom of the gear drive. Make sure burrs or foreign material which might cause misalignment are removed.

Using mineral spirits or a suitable solvent, remove the rust preventive compound from the shaft extension and clean thoroughly. Install the coupling half of the flange. Hammering or mechanically forcing the coupling onto the shaft is not permissible, as it can damage the bearings or disturb the setting of the gears. Interference fits are permissible, if the coupling can be heated for installation and fitted without hammering or mechanically forcing it onto the shaft. Check run-out of the aligning surfaces on both coupling halves before installing the connecting members.

Align the driver with the gear drive to obtain parallel and angular alignment. Misalignment should be as close to zero as possible for smoothest operation and maximum life. Misalignment should be no greater than that specified by the coupling or driveshaft manufacturer. Offset of universal type drive shafts should also be within the limits specified by the manufacturer. When aligning universal drive shafts, make sure the knuckles are in phase, the flange faces are parallel in the horizontal and vertical planes and the slip joint is free. Use only the specified tools and procedures when aligning the driver and the gear drive. Recheck alignment and re-torque driveshaft fasteners at regular intervals after start of operation. Correct the alignment if drifting or settling has occurred.

Excessive noise and vibration in a new gear drive is almost always an indication of poor installation, as all drives have been tested at the factory prior to shipping. Failure to correct an installation problem can result in damage to the pump and gear drive. The factory warranty does not apply unless the gear drive is properly installed. Proper installation includes alignment of power unit, right angle drive and pump. It is also necessary to provide an adequate foundation for the pump / engine and a positive method of preventing the power unit from shifting to assure alignment will be maintained.

On engine drive systems, it is common for one or more resonant speeds to exist between zero rpm and the operating speed. Continued operation at a resonant speed will result in torsional vibration which can be damaging to all components of the system. The most common indication of torsional vibration is as unusual rumbling or clattering noise from the gear drive at a sharply defined speed. The noise will disappear when the speed is increased or decreased. This noise is not indicative of a defect but results when the vibratory torque exceeds the driving torque and causes the gear teeth to separate and clash together very rapidly. Transition through a resonant speed range to operating speed is not normally damaging but continued operation close to a resonant speed should be avoided. To avoid operation at a resonant speed it may be necessary to change the elastic characteristics of the rotating components, install a flexible coupling, or change the speed of the engine with respect to the pump (change gear ratio). Contact Amarillo Gear for more information on resonant speeds and torsional vibration.

## **LUBRICATION**

This section covers the main lubrication system of the gear drive. For gear drives equipped with optional pre-lube system and other lube system accessories, refer to the appendix for additional instructions.

The main lubrication system is equipped with a positive displacement pump and pressure relief valve. The relief valve pressure is set at the factory and should not be adjusted in the field to regulate the system oil pressure. The system is designed to maintain lube oil pressure at 40-50 psig when the unit is at operating temperature. If coolant is used, its pressure should be less than the oil pressure, whenever possible.

Use only rust and oxidation inhibited (R&O) gear oil in accordance with the latest American Gear Manufacturers Association (AGMA) lubrication standards. For general operating conditions, the recommended AGMA lubricant number is given in TABLE 1. In general, the mineral oils listed are adequate for ambient temperatures between 20°F (-7°C) and 120°F (49°C). Recommended mineral oils are shown in TABLE 2 (Recommended Mineral Oils). If the gear drive will be started when the ambient temperature is below 20°F (-7°C), use a lube oil heater or one of the recommended synthetic lubricants shown in TABLE 3 (Recommended Synthetic Lubricants). If the ambient temperature is above 120°F (49°C), use one of the recommended synthetic lubricants shown in TABLE 3. Gear oils containing extreme pressure (EP) additives are not recommended.

**CAUTION: Never use EP additives if a sprag type non-reverse is used.**

**TABLE 1 - OIL CAPACITY / RECOMMENDED AGMA LUBRICANT NUMBER**

Model	Oil Capacity	Factory Oil Fill	Operating Oil Temperature			
			Less than 160°F (71°C)	Greater than 160°F (71°C) & Less than 180°F (82°C)	Greater than 180°F (82°C) (3 month change interval)	Greater than 180°F (82°C) (6 month change interval)
1800	26 Gallons (98 Liters)	5	4	5	5	5S
2200	38 Gallons (144 Liters)	5	4	5	5	5S
2600	61 Gallons (231 Liters)	5	4	5	5	5S

## **CHANGE INTERVAL**

Change oil every 2500 hours of operation or every six months, whichever comes first. The change interval should be decreased if the gear drive is subjected to conditions that tend to decrease oil quality, such as water contamination or high operating temperatures. Drives that are operated intermittently or in climates with hot days and cool nights will accumulate moisture more rapidly than drives operating at constant temperature. Frequency of oil change will depend on the rate of water condensation and the rate of oil oxidization. Operating temperatures above 180°F (82°C) will cause mineral oils to oxidize more rapidly and require more frequent oil changes. For high operating temperatures, change mineral oils every 1000 operating hours or every 3 months, whichever comes first. To extend the change interval to 2500 hours or six months, use one of the recommended synthetic oils shown in TABLE 3 (Recommended Synthetic Lubricants).

## **OIL CHANGE PROCEDURE**

With the oil at or near operating temperature, completely drain oil by removing the drain plugs in the base flange of the gear drive and the heat exchanger. Clean oil level sight gauges if necessary. Refill oil at the filler plug located directly below the name plate with the correct lubricant as shown in TABLE 1. Verify oil level is at the midpoint of the upper oil level sight gauge or higher. The approximate oil capacity of the gear drive is given in TABLE 1. For a gear drive without a pre-lube system, run the engine for 3-4 minute at idle to fill the heat exchanger (See CAUTION below). For a gear drive with a pre-lube system, run the pre-lube pump for one to two minutes. After filling the heat exchanger, recheck the oil level and add if necessary.

**CAUTION: If the pin and ratchet non-reverse clutch is used, make sure the vertical speed does not fall below the limit specified below in: “PIN & RATCHET NON-REVERSE CLUTCH INSTRUCTIONS”.**

## **OIL FILTER**

The filter element should be replaced every time the oil is changed. For gear drives equipped with a CUNO Model 1B1 filter, use a CUNO U30Q8 filter element. Verify the oil filter model number on the oil filter name plate. If duplex filters are used, see APPENDIX for additional instructions.

## **COOLING**

The heat exchanger has been sized to maintain the oil temperature between 160°F - 180° F when operated under normal operating conditions and water temperature. It usually requires 1-3 hours for the oil temperature to stabilize after start-up. It is suggested to use 15 gpm as the initial coolant flow rate. The coolant flow rate should be adjusted to maintain the oil temperature within the previously discussed temperature range. The coolant pressure should be less than the lube oil pressure whenever possible. **The maximum allowable coolant pressure is 150 psig.**

## **PIN & RATCHET NON – REVERSE CLUTCH INSTRUCTIONS**

Pins and pin holes in the non-reverse clutch must be clean and free of oil so that the pins will fall freely. Drives used in fire pump applications must be provided with an anti-reverse mechanism. The non-reverse mechanism is not to be disabled for these applications. The gear drive may be damaged by accidental shock engagement of the non-reverse clutch. This can be caused by the engine backfiring with the clutch engaged, or by the pump starting to back-spin before a pin engages the ratchet. Check the gear drive carefully after any shock engagement of the non-reverse clutch. The non-reverse clutch is not guaranteed against damage from accidental shock engagements.

The non-reverse pins will pick up off the ratchets at approximately 200 rpm output shaft speed. Below this speed, the pins will fall freely against the ratchets which will cause a loud rattling noise and is considered normal. Prolonged operation below 200 rpm will cause excessive wear on the ramps of the non-reverse plate and should be avoided. During the break-in period, small metal particles may wear off the ramps. This is considered normal wear and is not a cause for alarm. If the gear drive operates with excessive vibration, the vibration forces can cause the non-reverse pins to fall against the non-reverse ratchet plate even when the pump speed is above 200 rpm. Should this occur, the unit should shut down immediately and the cause of the vibration found and corrected before further operation.

**TABLE 2 – Recommended Mineral Oils**

<b>AGMA LUBRICANT NUMBER</b>	<b>4</b>	<b>5</b>
Atlantic Richfield Co. (ARCO)	Duro 150	Duro 220
British Petroleum	Energol GR150	Energol GR220
Chevron Oil Co.	AW Machine Oil 150	AW Machine Oil 220
Cities Services Oil Co.	Pacemaker 150	Pacemaker 220
Conoco	Dectol 150 R&O	Dectol 220 R&O
Exxon Co.	Teresstic 150	Terrestic 220
Farmland Industries	0047	0048
Gulf Oil Corporation	Harmony 150D	Harmony 220
Mobil Oil Co.	DTE Oil Extra Heavy	DTE Oil BB
Pennzoil	Pennzbell TO 150	Pennzbell TO 220
Phillips Petroleum Co.	Magnus 150	Magnus 220
Shell Oil Co.	Morlina 150	Morlina 220
Sun Oil Co.	Sunvis 7150	Sunvis 9220
Texaco	Regal 150 R&O	Regal 220 R&O

**TABLE 3 - Recommended Synthetic Lubricants**

<b>AGMA LUBRICANT NUMBER</b>	<b>5S</b>
<b>ISO Grade</b>	<b>220</b>
Chevron Oil Co.	Clarity 220 Synthetic
Conoco	Syncon 220 R&O Oil
Mobil Oil Co.	SHC 630

**Note:** This list of oil brand names, shown in Table 2 and Table 3 is for the purpose of identifying types and is not construed as exclusive.