

# Maintenance Of Beam-Type Pumping Units

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All the advancements in metallurgy, improvements in manufacturing technique, and refinements in design that go into the building of the modern pumping unit are without value if that equipment is not operated correctly. Upon the operating personnel of the oil industry falls the responsibility for correct operation of pumping equipment.

## *Installation*

Proper foundation for the pumping unit is most important. Although there are circumstances under which substitutes may be acceptable, a reinforced concrete block is still recommended for a trouble-free setting. Although all modern beam-type pumping units are "skidded," that is, all parts mounted on a steel base, this base must be properly aligned with the well, and level. To insure complete bearing of the base on the concrete block, and to insure permanence of initial alignment, there is no substitute for grouting. Grout should be mixed relatively wet, and care should be taken to see that it is under all of the steel base, not just under the edges of the skids.

## *Erection*

Since there is wide variance in the amount of assembly work necessary in erecting units, no attempt will be made to discuss this. However, certain precautions as to alignment are common to all units. After all parts are erected, and with bolts not tight, a check should be made to determine whether the beam is properly aligned. This is done by measuring the distance between each pitman and the face of the crank, or weight, nearest that pitman. If this "gap" is the same

for both pitmans, then the beam is aligned properly, and a plumb bob, suspended from the horsehead, should be squarely over the centerline of the well.

#### *Lubrication*

Following recommendations of manufacturer exactly. The gear box, or speed reducer, should be filled with a good grade of the specified oil, to the proper level. Do not overfill. Use only a lubricant that will pour at minimum temperature in the area involved. The use of lubricants with high pour points is dangerous, as all reducers use an automatic system, a combination of splash and wiper-system, which does not function properly if oil is excessively stiff and heavy. Detergent type oils are not recommended in the reducer.

Since most pumping units are shipped with bearings dry, care should be taken to see that every bearing, in addition to the reducer, is filled with proper lubricant before starting unit.

Most manufacturers recommend that oil in the reducer be changed every six months. Of great importance is a check, once every three months, to see if water is present in the reducer. If possible, this should be done after the unit has been shut down a few hours. Check for water is made by removing drain plug at bottom of reducer. Some operators equip each reducer with a valve, instead of the plug, to simplify checking for water. Since there are no products of combustion, as in an engine, the oil in a reducer does not "wear out" rapidly, but the presence of even a small amount of water will cause emulsification and oil no longer gives proper lubrication. Check oil level in reducer once each month. All other bearings should be checked twice each month, unless leakage is noted, in which event closer attention should be given the bearings until the leakage can be stopped.

Under no conditions should substitutions be made in connection with the lubricants used. If oil is specified, do not use grease.

#### *Installation and Care of V-Belts*

If properly installed and cared for, modern V-belts are trouble-free. Sheaves should be aligned with a straight-edge. Belts should go on easily, without prying or forcing. As the belts are tightened, it should be noted whether or not all belts are the same length. If one belt is still loose when the others are tight, replace that belt with one to match the others. Do not continue to tighten the belts in an effort to get all stretched to the same length. Tighten the belts until a few pounds pressure on any belt, midway

between the sheaves, will depress that belt about one inch. Another good method is to leave the belts loose enough to slip slightly, then tighten them just enough to stop the slippage. Belts that are too loose will slip, or turn over in the groove. Belts that are too tight will cause damage to clutch and reducer, and shorten the life of the belts. Do not use any type of belt dressing on V-belts.

#### *Installation and Removal of Crank Pins*

Most manufacturers employ a tapered crank pin, with tapered hole in crank. Changing pins should be done according to directions furnished with unit, taking care to clean the new pin hole thoroughly before installing pin.

A few manufacturers offer the hydraulic removal system for pins, which utilizes the high-pressure Alemit gun to assist the operator. It is recommended that this system be combined with light hammer blows to obtain best results.

#### *Counterbalancing*

Proper counterbalancing of the pumping unit is of utmost importance, since improper balance imposes excessive loads on unit, engine, and rod string, and is poor economy in that the prime mover expends more energy than would be necessary with proper balance.

In general, the method of determining whether or not a pumping unit is in balance does not depend upon the type of prime mover, for crank-type beam pumping units. If the crank-type unit is allowed to "coast" to a stop, observation will show whether it is under-balanced or over-balanced. If it is properly balanced, the cranks will tend to stop at any point, then slowly return to "top-dead-center" position. Properly balanced beam-weight type unit would stop at any position, and would not return to "top-dead-center."

Other methods are in general use, such as listening to engine exhaust, or "whine" of electric motor, use of tachometer, or use of ammeter, but the above method is accurate, yet does not require special equipment.

#### *Air Balance Units*

Air balance units are very similar, in design and construction, to conventional crank-type units, except compressed air is used as a counterbalancing means instead of crank weights or beam weights. Lubrication and maintenance problems are the same, except the air balance unit has an air system which requires that certain procedure be followed in initial starting, and introduces the air compressor and clutch as additional items to be maintained.

Initial starting of the unit must be preceded by build-up of air pressure sufficient to offset weight of rods.

Procedure of changing stroke is similar to that of conventional unit, but it should be remembered that changing length of stroke also changes amount of travel of piston in air cylinder, which requires the operator to raise or lower the oil level in the oil reservoir accordingly.

#### *Check Points*

After initial starting of a pumping unit, the following points should be checked during the first week of operation:

1. Check tightness of all foundation bolts.
2. Check tightness of counterweight bolts.
3. Check counterbalance and change as required.
4. Check tightness of crank pin nuts.
5. Check tightness of bolts in structure.
6. Check alignment of beam, and of unit base.
7. Check alignment of sheaves, and tightness of V-belts.
8. Check lubrication of all structure bearings.
9. Check reducer oil; examine a sample to see if metal cutting are present.
10. Check engine mounting to be sure bolts are tight, and no vibration is present.
11. Check wireline hanger for alignment and wear. Lubricate at least twice each year.

The above points should be checked every three to six months. A few minutes spent in periodic check of these points may prevent a costly failure or undue wear on equipment.

Cleanliness of equipment is important. Accumulations of oil and dirt prevent the operator from being able to determine whether or not a seal is leaking, clog the breather on the reducer, and constitute a safety hazard.

Every unit should have a V-belt cover, or guard. The modern belt cover protects the belts and sheaves from oil, dust, moisture, and sun. The life of the V-belts is increased considerably. In addition, the belt cover acts as a safety guard, and in most states is required by law.

The modern pumping unit is a precision-made machine and should be operated exactly as recommended by the manufacturer. Any unusual noise, vibration, or heating should be reported at once. Proper attention to lubrication, counterbalance, and alignment will repay the operator many times over in long life and trouble-free operation of the equipment.