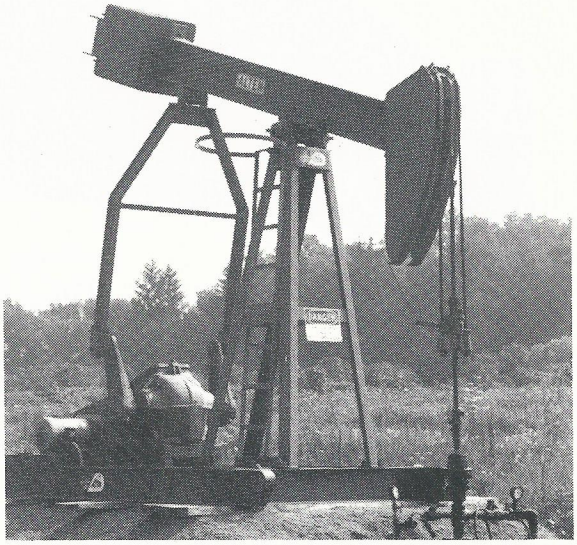
PUMPING UNITS FROM ALTEN ENGINEERING

Alten Model 114-143CF-64,
T-Base, Crank Balanced Unit



Alten Model 57-95-48,
Wide Base, Beam Balanced Unit

QUALITY PUMPING UNITS, SINCE 1919

ALTEN
ENGINEERING DIVISION

A DIVISION OF THE WESTERMAN COMPANIES
245 N. Broad St., PO Box 125
Bremen, OH 43107

Alten Model 228-213CF-86, T-Base, Crank Balanced Unit

Alten has been manufacturing pumping units since 1919, when the first Alten pumping unit was manufactured with open gearing and a cast samson post, walking beam, and horsehead. Prior to World War II, Alten was building smaller units and using Brad Foote helical gear reducers. During World War II, Alten began to furnish castings for the Brad Foote reducer, and soon started to build its own gear reducers, making the Alten pumping unit a complete in-house product.

In 1953, Alten purchased the International Derrick and Equipment Company (IDECO) line of pumping units. This gave them their start into larger pumping units with herringbone gearing and broadened their line to include sizes from 4,000 inch lbs. of torque (D-4) up through 456,000 inch lbs. of torque (456). These units were sold through oilfield distributors throughout the United States and Canada.

When the oil industry slowed down dramatically in 1966, Alten turned their attention to the industrial speed reducer market. This was done with great success, and today Alten industrial speed reducers are in service in rubber mills, mixer drives, material handling systems, pulverizing systems, and dry docking facilities worldwide. Many of these speed reducers have been in service for over 40 years. The industrial reducers are the same herringbone geared reducers as those used on the Alten pumping unit.

The Westerman Companies and Alten reached an agreement in 1977 in which Alten would again manufacture pumping units for Westerman to market. This agreement led to Westerman purchasing certain assets of Alten in September, 1983, and establishing the Alten Engineering Division of the Westerman Companies. Since then, Westerman has added new vertical and horizontal omni mills and numerous other state-of-the-art CNC machines and equipment. This marriage of Westerman's financial, organizational, and market strength affords the entire industry the best in pumping unit quality, design, and service across the entire United States and Canada.

A row of Alten 16-43F-30P, Wide Base, Beam Balanced Units

Installation of Unit

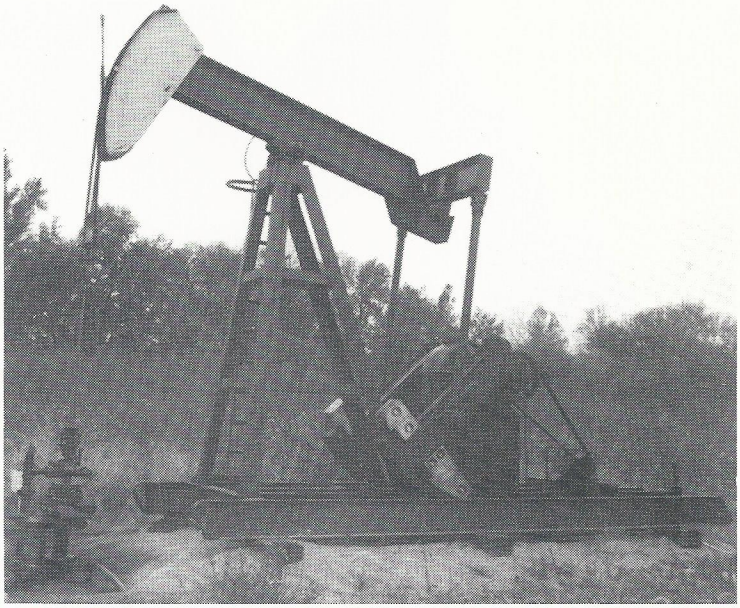
Before Placing Unit in Operation the Following Precautions Should Be Taken:

1) Make certain unit is level.
2) Fill gear reducer with oil to oil level indicated on gauge.
3) Lubricate all bearings.
4) Tighten all bolts. This should include foundation bolts and wrist pin nuts.
5) Adjust brake.
6) Check clearance of cranks and weights with foundation and v-belt guard.
7) Adjust v-belts to proper tightness.
8) Adjust counterbalance weights to estimated counterbalance.

Locate frame level, firmly supported on top of timbers or concrete. Center frame with well spaced away from the well distance shown on the positioning drawing (shipped with the unit). Attach the ladder, if equipped, to the samson post and install samson post to frame, also connecting the ladder to the frame. When tightening the "U" bolts (used in attaching various assemblies) both ends of the "U" bolt should be drawn tight at the same time. Do not tighten one side fully tight before tightening the other. Attach the saddle bearing to the samson post, then walking beam to saddle bearing. The equalizer bearing can be attached to the walking beam at this time.

The installation of the equalizer beam, if equipped, and equalizer bearing on the walking beam is very simple, but must be done properly to avoid uneven stresses and twisting of the walking beam. The bottom surface of the equalizer bearing is convex in order to allow the equalizer, pitmans and walking beam to properly align themselves, allowing good load distribution and operation of components at the stress levels for which they were designed.

The actual assembly of the equalizer and equalizer bearing on the walking beam may be accomplished at any time during the assembly of the unit and should be left up to the rig builder. However, it is most important that the U-bolts connecting the equalizer bearing to the beam be merely "snugged up" until the unit is completely assembled.



Alten Model 57-95F-48P
Wide Base, Beam Balanced Unit

Attach wire line to horsehead after stringing it through the polished rod. Loop cable around the wedge, place wedge in horsehead or polished rod. Make sure it is firmly in place. On larger units, a plate is unbolted from the horsehead and a wire line is looped around the horsehead top, then the plate should be bolted back in place. Attach the horsehead on to the walking beam. Align the horsehead with the well center by using a plum bob hanging from top of the horsehead (allow for half of wire line). Adjust the saddle and horsehead adjusting bolts to center the unit with the well. Center the polished rod hanger on wire line so that equal load applies to wire lines. When the unit is properly aligned with the well, the frame should again be checked to make sure it is level and the pitmans should be checked with a level to make certain they are vertical. For long, trouble-free service, it is most important that the unit be properly aligned with the well and is level on the foundation. Attach the bell crank, horizontal brake rod and brake handle (or brake cable, if applicable). Adjust the brake so it is not dragging on brake drum and functions properly. Attach the prime mover to the slide rails, and "V" belts to the sheaves. Using the rail adjuster, adjust the slide rails so belts are tight.

Proper belt tension and sheave alignment is necessary for long belt life. A string stretched tightly across the outside finished faces of the sheaves should lightly contact all surfaces to assure sheave alignment.

After the engine or motor is set on the frame, the belts should be drawn sufficiently tight so that when struck with the hand, they will have a live, springy vibration. They must not be too tight. If too loose, they will slip when the engine is engaged. When the unit is operating they should sag slightly on the slack side and be tight on the drive side. Should slippage occur, the belt tension should be increased until the slippage is eliminated.

After setting the brake, attach polished rod gate to the well polished rod and tighten clamps securely around the polished rod. Then add the estimated counterbalance weight (keeping the weights toward the back of the beam) and lock them in place. On crank balanced units, add the estimated counterweight to the cranks.

After the unit is completely assembled, the U-bolts should be slightly loosened in order to remove any strain from the mating parts and to allow them to properly align. Rotate the unit once or twice to make certain all members are free of any strain. Then the U-bolts should be tightened. In tightening the U-bolts, move from one side of the beam to the other, tightening only a little at a time. This will keep an equal load on both sides of the beam and prevent it from twisting.

Maintenance and Lubrication

With the unit now completely assembled and the estimated counterbalance in place, it is extremely important to make a final adjustment to the counterbalance to assure smooth, long lasting operation and to avoid premature wear of any component. We recommend that a polished rod dynometer be used to record accurate well load measurements followed by finite adjustment of the counterbalance to attain an evenly loaded cycle of operation for each revolution of the unit. If a dynometer is unavailable, a good alternative would be to use an ammeter to compare the amperage required for both the up and down stroke. The peak reading taken from the ammeter should be equal on both the up and down strokes approximating a unit in balance. Of course, the ammeter method is only applicable to electrically powered units. For gas powered units, a vacuum gauge can be used with the same methodology as the ammeter.

Lubrication of your Alten Speed Reducer

Lubricating oils for use with Alten Speed Reducers should be high grade, first quality, well refined petroleum oils. Oil should be changed to the proper viscosity if temperatures in your area vary greatly between summer and winter. The first filling of oil should be drained at the end of two weeks of operation, and the Reducer thoroughly rinsed with a light flushing oil. The original oil may be filtered to remove foreign matter or abrasive material and reused, adding necessary new make-up oil. After this initial treatment, the lubricant should be changed after every 2,500 hours of operation, or every six months, whichever occurs first. If, however, the operating conditions are severe, such as rapid rise and fall in temperature of the gear case with accompanying condensation on the inside walls, resulting in the formation of sludge; or where operation is in moist or dusty atmospheres; or used in the presence of chemical fumes, it may be necessary to change the oil at more frequent intervals.

Use a high quality EP gear lubricant, automotive or industrial.

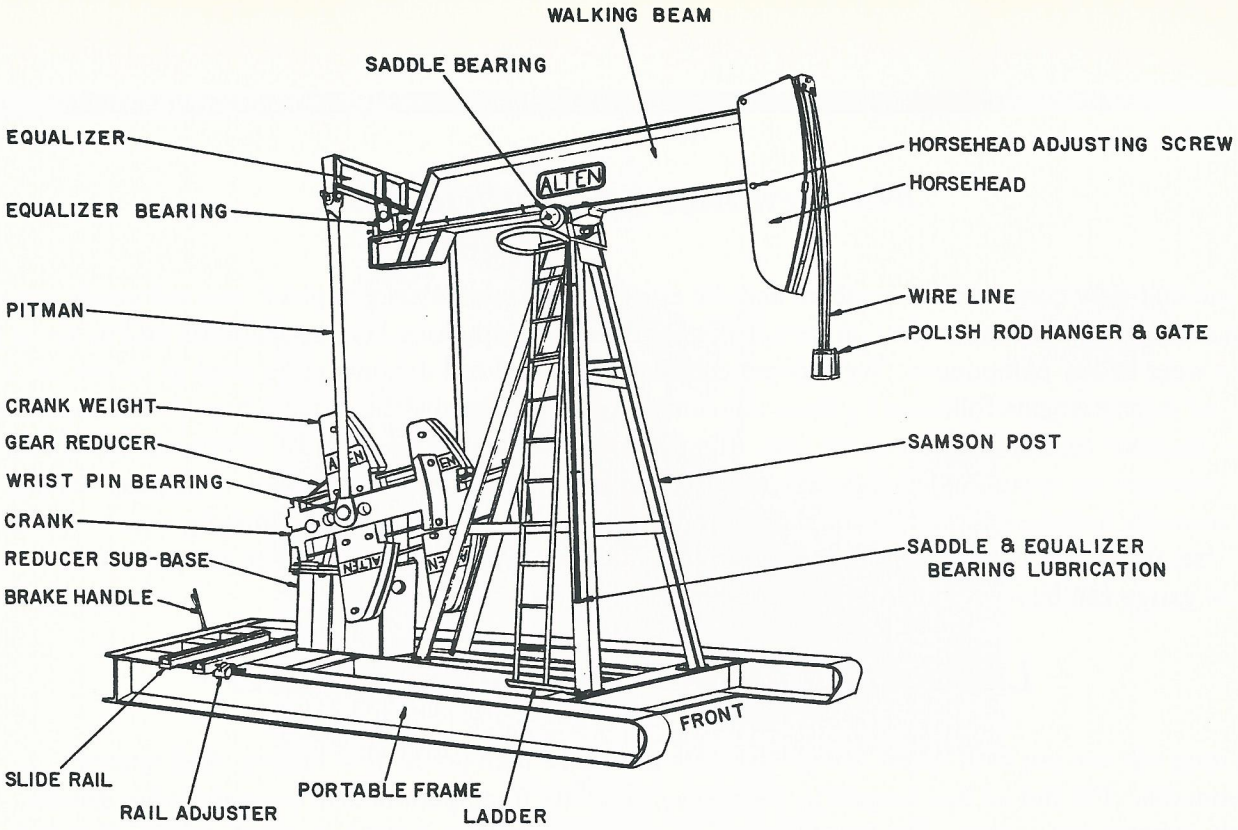
Operating Temperature	***SAE Viscosity***	***AGMA***
-30 deg. F to 110 deg. F	80W	4 EP
0 deg. F to 140 deg. F	90W	5 EP
-30 deg. F to 140 deg. F	80W-90 and other multigrades	

Lubrication of Other Parts

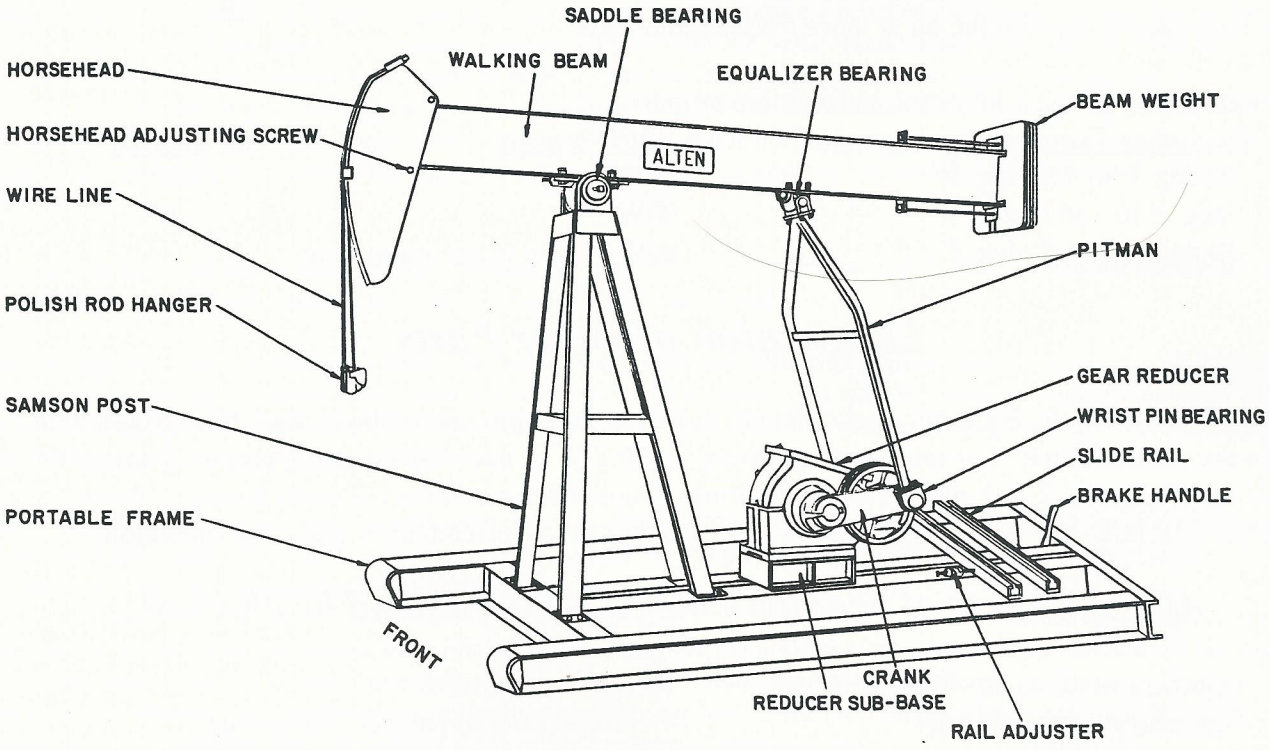
For lubrication of saddle, equalizer, and wrist pin bearings, use a premium lithium soap-base grease with extreme pressure additive. For temperatures down to -30 deg. F, use a NLGI No. 1 grease. During hot weather, an NGLI No. 2 or 3 may be used. Bearings should be greased once a week during 24 hour operation. The interval may be increased up to once a month for infrequent or part-time operation.

After 24 hours of operation the following should be checked...

1) Tightness of all bolts.
2) Tightness of wrist pin nuts.
3) Reducer oil level.
4) Adjust counterbalance, if required.



CRANK BALANCED UNIT



BEAM BALANCED UNIT

Useful Formulas

Strokes per Minute

$$SPM = \frac{RPM}{R} \times \frac{d}{D}$$

Example:
R = 29.975 Ratio for D320 Gear Reducer
d = 12" Pitch Diameter of Prime Mover Sheave
D = 44" Pitch Diameter of Gear Reducer Sheave
RPM= 1170 Revolutions Per Minute of Prime Mover

$$SPM = \frac{1170}{29.975} \times \frac{12}{44} = 10.6$$

Prime Mover Sheave Diameter

$$d = \frac{SPM \times R \times D}{RPM}$$

Example:
R = 29.975 Ratio for D320 Gear Reducer
D = 44" Pitch Diameter of Gear Reducer Sheave
RPM = 1170 Revolutions Per Minute
SPM = 12 Strokes Per Minute

$$d = \frac{12 \times 29.975 \times 44}{1170} = 13053 \text{ inches}$$

Belt Velocity

$$V = \frac{\Pi \times d \, RPM}{12}$$

Limit between 2000 and 5000 Feet Per Minute.
Belt velocity less than 2000 FPM results in poor belt life.
Belt velocity greater than 5000 FPM requires dynamically balanced sheaves.

Example:
d = 14.5" Pitch Diameter of Prime Mover
RPM = 1170 Revolutions Per Minute of Prime Mover

$$V = \frac{3.1416 \times 14.5 \times 1170}{12} = 4441 \text{ FPM}$$

Belt Length

$$BL = 2 \times CD + 1.57 (D + d)$$

Example:
d = 14.5" Pitch Diameter of Prime Mover Sheave
D = 44 Pitch Diameter of Gear Reducer Sheave
CD = 72 Center Distance of Shafts

$$BL = 2 \times 75 + 1.57 (44 + 14.5) = 241.8$$

Use C240 Belts Depending on Sheaves selected.

Horsepower of Prime Mover

For High Slip Electric Motors and Slow Speed Engines

$$HP = \frac{BPD \times Depth}{56000}$$

For Normal Slip Electric Motors and Multi-Cylinder Enginer

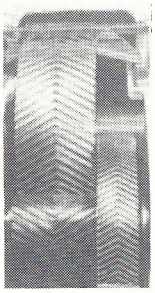
$$HP = \frac{BPD \times Depth}{45000}$$

Example:
BPD = 217 @ 100% Pump Efficiency
Depth = 5600 Pump Setting
Assume High Slip (NEMA D) Motor

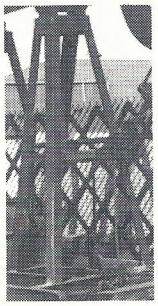
$$HP = \frac{217 \times 5600}{56000} = 21.7 \text{ (use 25 HP Motor)}$$

Some Alten features include:

Alten Gear Reducer - The Alten D-57 Gear Reducer has a heavy, solid cast iron housing; heavy, heat-treated ductile iron herringbone gears; and heat-treated, alloy steel herringbone pinions and an automotive-type drum brake. This gear box has an A.P.I. peak torque rating of 57,000 in. lbs.



Herringbone Gearing - All sizes of Alten pumping units 25,000 in.-lb. and greater utilize herringbone gearing. The gears operate in an oil bath and larger models utilize a positive wiper system that furnishes oil to all bearings. Herringbone gearing eliminates side thrust and unnecessary bearing loads, and offers very low tooth deflection due to archlike construction and the large number of teeth in contact. This results in a maximum load carrying capacity with smooth and quiet operation.



Samson Post - A four-legged design, rigidly braced to carry maximum loads in addition to loads induced by minor installation errors. Front legs are wide spread for stability.

Horsehead - Designed to roll back out of the way. A horizontal adjustment feature allows the horsehead to be lined up over the well after the unit is set.

Alten Engineering/A Division of The Westerman Companies

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