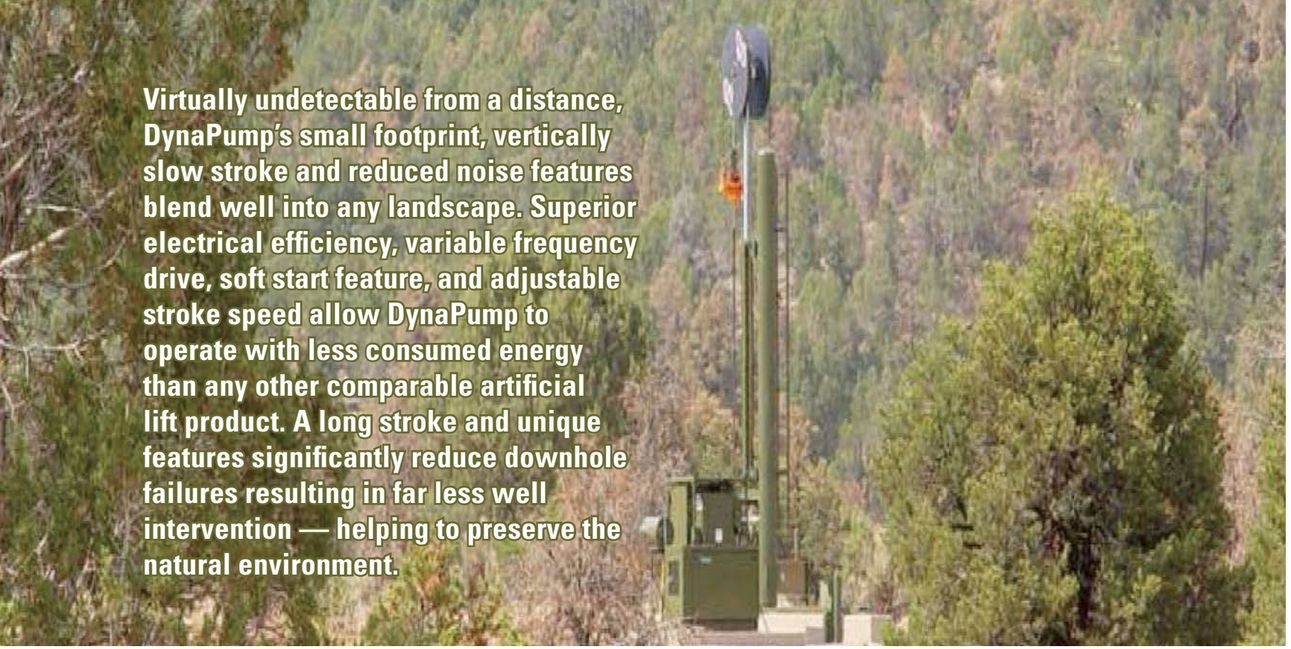

Virtually undetectable from a distance, DynaPump's small footprint, vertically slow stroke and reduced noise features blend well into any landscape. Superior electrical efficiency, variable frequency drive, soft start feature, and adjustable stroke speed allow DynaPump to operate with less consumed energy than any other comparable artificial lift product. A long stroke and unique features significantly reduce downhole failures resulting in far less well intervention — helping to preserve the natural environment.

ADJUSTABLE AUTOMATIC FLOW CONTROL

The built-in electronic controller on the DynaPump includes functions, which act as a pump-off controller, but without intermittently shutting down the unit. As part of its standard instrumentation, the DynaPump obtains a dynamometer card on each stroke. One of the adjustable load set points can detect when the well is in a pumped-off condition. When a pump-off condition is detected, the unit automatically adjusts to a slower speed. It will periodically return to it's original pumping speed to check whether or not there is sufficient fluid to support the higher pumping speed.

LIGHT/PORTABLE

The DynaPump is lighter, and more portable than conventional beam units. For example, a Model 5 is capable of 750 BFPD from 3,000 ft. deep. A C-456-305-120 beam unit is required to produce the equivalent volume. The Model 5 wellhead unit has an assembled weight of 5000 pounds and the power unit a weight of 600 pounds. The C-456 has a bare weight of 18,440 pounds (without counter-balance), and with maximum counterbalance weighs 43,420 pounds.

LOWER TRANSPORTATION COST

The lower weight and compact size of the units can result in lower transportation costs, particularly if several units are shipped simultaneously. Savings of 25% were estimated by the operator for an application in Utah based on using a DynaPump Model 5 rather than a C-456 beam unit.

LOWER INSTALLATION COST

The low weight, compact size and ability to ship DynaPump wellhead units fully assembled result in reduced installation costs. The small footprint of the wellhead unit and lack of massive rotating counterbalance weights results in less massive foundations. The light weight requires smaller lifting equipment, reducing costs. Since the wellhead unit is shipped fully assembled, only one lift is required for placement. A second lift to unload the power unit completes the operation. This reduces the time required for field installation, further reducing costs. In one example, a reduction of greater than 40% was estimated by the operator for foundation and crane work compared to a beam unit.

LOW INSTALLED POWER

When designed to take optimum advantage of the high polished rod load capabilities of DynaPump units (i.e., large diameter pump, and long stroke), DynaPump installations have significantly reduced installed horsepower requirements compared to conventional pumping units.

LOWER POWER CONSUMPTION

An electrical power consumption survey of 8 DynaPump wells and more than 50 beam pumped wells showed that mean power consumption of the DynaPump's was more than 30% less than conventional units.

VALUE
The DynaPump Value Proposition

PRICE ADVANTAGE

The DynaPump can offer significant capital cost savings over normal beam pumping units. Because DynaPump is manufactured using about 1/10th the raw steel of a conventional Beam Unit, the cost of a DynaPump unit is generally 24-36% percent less than a new conventional unit.

HORIZONTAL HEAVY OIL WELLS

New high capacity pumping units were needed for horizontal heavy oil wells being drilled in California to a true vertical depth of approximately 1000 feet. These wells were to be part of a steam thermal recovery operation, and thus would have highly variable fluid production rates during their lifetimes. To meet expected maximum fluid rates in excess of 2000 BFPD would have required purchase of model 912 conventional units. DynaPump Model 7 units were purchased at a capital savings of 35%.

COAL BED METHANE WELLS

A coal bed methane drilling campaign in the Rocky Mountain region required conventional model 456 pumping units. The same lift capacity is being provided by a Model 5 DynaPump. Capital savings were between 24% and 36% depending upon whether the comparison is made versus a new brand name conventional unit or cheapest available conventional unit.

LONGER STROKE

The DynaPump offers a longer stroke length than is available from competing pumping units. The DynaPump Models 7, 9, 11 and 13 offer maximum stroke lengths of 240, 288, 336 and 360 inches, respectively. The maximum stroke length from a beam unit is 240 inches (available in various units with torque ratings of 912,000 inch-pounds and higher). The benefits of a slower, longer stroke operation are generally known. For a given pump size and fluid production rate, the lower number of strokes per minute means fewer rod direction reversals which reduces the rate of fatigue in the rod string, thus increasing rod life. Also, the stretch of the sucker rods as a percentage of stroke length is less. For example, a beam unit pumping 800 BFPD from 6000 ft. using an 1824 pumping unit with a 240 inch stroke has a calculated loss of bottom hole stroke of 35 inches (15%). For a DynaPump Model 11 with a 336 inch stroke the same loss represents only a 10% decrease (for simplicity, this assumes the same acceleration loads). Therefore more of the total linear surface movement of the rod string is used to provide effective plunger movement down hole.

The cost of a DynaPump unit is generally 24-36% percent less than a new conventional unit.

HIGH ELECTRICAL POWER FACTOR

DynaPump units have inherently high power factors due to their design. In power surveys conducted on 14 conventional units and 8 DynaPump units pumping horizontal heavy oil wells, the mean power factor for the conventional units was 48% while it was 86% for the DynaPump units.

POSITIVE EFFECT ON ELECTRICAL GRID DEMANDS

The lower power requirements and higher power factors of the DynaPump units reduces the total load on the electrical grid. For a three-phase power system, the power factor is equal to watts/1.73EI, where E is voltage and I is current. Using the mean power factors from the surveys discussed in the preceding paragraph, it is seen that the current requirement to deliver a given amount of power to the conventional units would be approximately 1.8 times the current required to deliver the same power to DynaPump's. Transmission line losses are proportional to the current squared. Thus, line losses to supply power to the beam units would be 3.2 times as great, assuming the same size conductor.

LOWER INFRASTRUCTURE COSTS

Where DynaPumps are used in new well drilling programs there is the opportunity to reduce infrastructure costs through their more efficient energy usage. In a coal bed methane example, the use of a Model 5 DynaPump rather than a C-456 reduced the required transformer size from 75 KVA to 22.5 KVA. Where new power lines must be installed, commensurate savings in conductor size are possible.

GREATER ROD PUMPING CAPACITY

The DynaPump's combination of long stroke length and high polished rod load capacity gives its larger units the capability to achieve pump capacities which exceed other rod pumping systems and which compete with the lower range of ESP systems. For example at a pumping depth of 6000 ft., an A-2560 beam unit has a maximum capacity of approximately 1450 BFPD versus a DynaPump Model 13 with a maximum capacity of 1900 BFPD. 1-1/4 inch sucker rods are now available to allow better utilization of the DynaPump's higher polished rod load capacity.

DynaPump Units, Placerita, California

VARIABLE SPEED

The DynaPump use of an integrated variable frequency drive for its prime mover plus its automated control system allows the operator to easily change pump speeds without the need for a crew call-out to change belt sheaves. Pumping speed can be set using the PDA interface at the well site, from the office in those fields which have automation systems, or through DynaPump software using a cell phone or radio connection and modem in the DynaPump power unit.

The unit also has independently controllable acceleration and deceleration rates for both the up and down strokes (two acceleration rates and two deceleration rates). These rates are set in the inverter, and are independent of the upstroke and down stroke speed settings. These accelerations are not fixed by unit geometry and speed as is the case with beam units. This permits "soft" stroke reversals, which reduce peak rod loads and lessen the differential between the peak and minimum polished rod load. This helps prolong rod life.

DynaPump's low power requirements and higher power factors reduce the total load on the electrical grid.

CONTROL

Communications for Control & Feedback

DIFFERENTIAL SPEED UP/DOWN

The DynaPump use of an integrated variable frequency drive for its prime mover plus its automated control system also allows the operator to specify different speeds for the up-stroke and down-stroke. When pumping very viscous oils, this permits the use of a slower down stroke to eliminate or minimize "rod float" which occurs when the viscous drag on the rod string slows its rate of fall to a velocity less than that imposed by a fixed geometry.

FLOW CONTROL RATIO 5:1

The DynaPump has a very significant turn-down ratio available through its surface control unit electronics without a crew call-out for sheave changes or a rig call-out for changing down hole pumps. This turn-down ratio is achieved without having the well intermittently shut-in as with conventional pump-off controllers. Stroke speed turn-down ratio is 2.5:1 (hydraulic pump motor rpm adjustable from 900 to 2250). Stroke length is also variable by controller adjustment. Although the amount of stroke length turn-down varies slightly between units, the Model 11 has a stroke length turn-down ratio of 2:1. Thus, the combined turn-down ratio for a Model 11 is 5:1.

CONTROL AND FEEDBACK

The DynaPump is electronically controlled from a panel within its power unit module. This makes it very easy to provide communications for control and feedback. Data can be downloaded on site through a serial port to a laptop computer or PDA, or accessed remotely where a communications link is available. Remote access may use DynaPump software, Case Services automation software, or XSPOC automation software. These communication links provide information on unit performance, including dynamometer cards, and allow adjustment of unit operating parameters such as speed, stroke length, and set points for detection of pump-off conditions.

DIAGNOSTIC FEEDBACK

The control panel also provides diagnostic feedback on the operation of the unit itself. This feedback takes two forms: Warnings of impending problems or need for maintenance, items which do not result in an automatic shutdown of the unit; and Alarms which report the reason the unit has experienced an automatic shutdown.

In addition to providing service personnel with the immediate cause of a unit shutdown, the unit will display the last five alarms to have occurred. This can assist with troubleshooting. The DynaPump software also provides comment windows which pop up with suggested troubleshooting data when the cursor is placed over a given alarm description.

DynaPump pumping speed can be set remotely via a PDA interface.