One Company, Unlimited Solutions

Since 1841, National Oilwell Varco™ has been dedicated to ensuring customers receive the highest quality oilfield products and services. National Oilwell Varco is a worldwide leader in the design, manufacture and sale of equipment and components used in oil and gas drilling and production operations, the provision of oilfield services, and supply chain integration services to the upstream oil and gas industry. NOV™ also provides supply chain services through its network of more than 200 distribution service centers located near major drilling and production activity worldwide.

We continue to build upon our unlimited, customer-focused solutions and are proud to deliver our Artificial Lift Systems through the NOV Mono division.

The NOV Mono division is a true partner and worldwide source for complete Artificial Lift equipment and packaged solutions. Our Artificial Lift professionals collaborate with you to properly evaluate well conditions and provide customized artificial lift solutions that will optimize your production.

- Professional Well Evaluation
- Surface and Subsurface Equipment
- Controllers and Production Automation
- All Production Accessories and Expendables
- Global Supply Chain thru NOV Wilson
Hydraulic Rod Pumping Systems

NOV Mono Rod Pumping Systems are high performance production systems that are ideal for many oil and gas applications. These systems use patented technologies that will optimize your oilfield production, reduce production costs and allow you to maximize the profitability of each well. They also offer many advantages over traditional pumping units and have successfully replaced many in the oilfield. These advantages include lower set up cost and quick installation, quick and easy adjustments to stroke length and stroke speed, as well as, reduced environmental impact with its low profile and small footprint.

Our complete hydraulic rod pump system includes surface level hydraulic pumping mast which mounts directly to the wellhead, an EPA certified power skid (natural gas or electric), downhole sucker rod components, and self-optimizing controller.

These systems are quickly and easily installed to maximize production uptime:
Corlift™ High Performance Hydraulic Rod Pumping System

The NOV Mono Corlift is a cost-competitive, industry proven hydraulic rod pumping system that is ideal for many oil and gas applications. Lower set up costs and minimal ground disturbance make these low profile units ideal for pumping in areas where conventional pump jacks are not economical. This system consists of a mast with a single hydraulic ram which is mounted directly to the wellhead and powered by a 5.7L power skid. The power skid is field proven, EPA certified and delivers the quality you expect from NOV Mono. With lifting capabilities up to 30,000 lbs. and variable stroke length up to 144 inches; the Corlift system is ideal for producing wells with varied conditions.

Features and Benefits
- Low set up costs
- Minimal install time (requires 3 hours with 1 ton picker truck)
- Easily moved, requiring minimal manpower
- Power Skid available in gas or electric (EPA certified skids are optional)
- Manufactured in ISO 9001 certified facility
- Low profile and small footprint = minimal environmental impact
- Guide wires not required
- Quick and easy adjustments to SPM and stroke length
- Variable stroke speed allows for optimal pump filling
- Can be used with rod and tubing rotators

Common Applications
- Oil and gas production
- Dewatering gas wells
- Coal Bed Methane (CBM)
- Remote locations
### Corlift™ Technical Specifications - Model 20-120 and 30-144

<table>
<thead>
<tr>
<th>Feature</th>
<th>Model 20-120</th>
<th>Model 30-144</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift* (Peak Polish Rod Load)</td>
<td>20,000 lbs</td>
<td>30,000 lbs</td>
</tr>
<tr>
<td>Lift* (Max Continuous Rod Load)</td>
<td>18,000 lbs</td>
<td>28,000 lbs</td>
</tr>
<tr>
<td>Stroke Length</td>
<td>0 - 120 inches</td>
<td>0 - 144 inches</td>
</tr>
<tr>
<td>Strokes per Minute (SPM)</td>
<td>½ to 5 SPM</td>
<td>½ to 5 SPM</td>
</tr>
<tr>
<td>Well Depth (max. depth)</td>
<td>2,500 m (≈8,000 ft)</td>
<td>3,000 m (≈10,000 ft)</td>
</tr>
<tr>
<td>Unit Height and Weight</td>
<td>150 inches; 1,000 lbs</td>
<td>168 inches; 1,600 lbs</td>
</tr>
<tr>
<td>Power Skid Dimensions (LxWxH)</td>
<td>105 x 43 x 51 inches</td>
<td>105 x 43 x 51 inches</td>
</tr>
<tr>
<td>Power Skid Weight</td>
<td>2,500 lbs</td>
<td>2,500 lbs</td>
</tr>
</tbody>
</table>

**Hydraulic Pump Controller**

**5.7L EPA Certified**

**Hydraulic Power Skid**
Morlift™ High Performance Hydraulic Rod Pumping System

The NOV Mono Morlift is a cost-competitive, industry proven hydraulic rod pumping system that answers all of your production needs. The hydraulic pumping system works in conjunction with a state-of-the-art nitrogen accumulator to decrease load fluctuation, reduce stress on the engine and hydraulic components, and prevent unnecessary downtime for maintenance and repairs. It also allows for pumping with lower horsepower which increases fuel efficiency and reduces operating costs. The 5.7L power skid is field proven, EPA certified and delivers the quality you expect from NOV Mono. With lifting capabilities up to 40,000 lbs. and variable stroke length up to 144 inches; the Morlift system can produce wells with extreme depths.

Features and Benefits
- Low set up costs
- Minimal install time (requires 3 hours with 2 ton crane)
- Power Skid available in gas or electric (EPA certified skids are optional)
- Manufactured in ISO 9001 certified facility
- Very small footprint = minimal environmental impact
- Guide wires not required
- Quick and easy adjustments to SPM and stroke length
- Upstroke and downstroke controlled with accumulator skid
- Variable stroke speed allows for optimal pump

Common Applications
- Oil and gas production
- Dewatering gas wells
- Highly deviated wells
- Remote locations
Morlift™ Technical Specifications - Model 40-144

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift (maximum Peak Polish Rod Load)</td>
<td>40,000 lbs</td>
</tr>
<tr>
<td>Stroke Length</td>
<td>0-144 inches</td>
</tr>
<tr>
<td>Strokes per Minute (SPM)</td>
<td>½ to 5 SPM</td>
</tr>
<tr>
<td>Well Depth (maximum depth)</td>
<td>4,000 m (≈ 13,000 ft)</td>
</tr>
<tr>
<td>Unit Height and Weight</td>
<td>216 inches, 3,000 lbs</td>
</tr>
<tr>
<td>Accumulator Skid Dimensions (L x W x H)</td>
<td>114 x 27 x 35 inches</td>
</tr>
<tr>
<td>Accumulator Skid Weight</td>
<td>1,300 lbs</td>
</tr>
<tr>
<td>Power Skid Dimensions (L x W x H)</td>
<td>105 x 43 x 51 inches</td>
</tr>
<tr>
<td>Power Skid Weight</td>
<td>2,500 lbs</td>
</tr>
</tbody>
</table>

5.7L EPA Certified Hydraulic Power Skid

Accumulator Skid

Leveling Plate

2 Hydraulic Rams

2 Nitrogen Rams

Wellhead Booth

 Hydraulic Pump Controller

www.nov.com/ArtificialLift

NOV-Mono-ALS@nov.com
Hydraulic Pump Controller (HPC)
The NOV Mono Hydraulic Pump Controller provides economical pump-off control of hydraulic sucker-rod pumping systems. Using sophisticated modeling and control software and a powerful processor, the HPC computes surface and downhole conditions to best regulate the starting, stopping, or speed adjustment of the pumping unit. Comprehensive monitoring and reporting capabilities provide daily gauging, fault and event logging, a user-configurable data sampler, and more. HPC units are rugged and have been designed to withstand the harsh environments of the oil patch.

Full Color Touch Screen Display
The user-friendly, color, touch-screen display makes the HPC the first controller to use a touch screen interface. The software is Windows CE based and allows for all changes to be made by simply touching your finger to the screen.

Stroke speed and length, as well as acceleration and deceleration of the hydraulic ram can all be changed from the main screen. The data for bridal block load, strokes per minute, and mast position is also shown on the main screen. All well characteristics are displayed in real-time and can be changed via the touch-screen while the rod pumping system is in operation. This translates to easier control and less production downtime. HPC's interface was designed to be very easy to navigate from page to page. Every screen has the following 2 buttons on the bottom for easy access, no matter what page you are on: “Main” to easily navigate back to the home screen, and “System Configuration” which allows the user to customize mast load configuration, position sensor configuration, manual control, and timed pump off controller.

Automatic Optimization
Throughout the life of every well, there are factors that can prevent reaching optimal production levels. By reducing the negative effects of these factors, the production rate for each well can be optimized without losing efficiency and reliability. The HPC has the capability to automatically detect these factors and instantaneously adjust the operation of the pumping unit to maximize system performance.

Maximum Pump Fill
By controlling the speed of the system, the HPC will automatically adjust stroke speed to produce the maximum amount of fluid from the reservoir and keep the system operational instead of shutting down due to low inflow downhole. This feature combined with the Hydraulic Rod Pump surface equipment results in a full system that automatically adapts to various inflow conditions and prevents wear on the downhole equipment by reducing the number of cycles required to pump equal amounts of fluid.
Hardware
- 12V DC/24V DC AC supply input
- State-of-the-art expandable controller
- Weatherproof design
- Rugged NEMA 4X Stainless Steel Enclosure
- Extended Temperature Range
- 7” Color Graphic Touch Panel Display
- External SD Micro Memory Card Storage
- Field replaceable CPU
- Optimized to work with NOV Pumping Units
- Firmware Field Upgradable

Inputs/Outputs
- Four Isolated Analog Inputs
- Two Isolated Analog Outputs
- Ten Discrete Inputs
- Six Discrete Outputs

Sensors
- Pressure Transducer
- Continuous Position Sensor
- Red Beacon Alarm Indicator

Communications
- Standard Ethernet Communications
- Modbus RTU/TCP Protocol
- Profinet
- Wifi Option
- Cellular Modern Option
- Satellite Communication Option

Control
- Pump-off Control
- Timer Control
- Automatic Re-start Capability
- Adaptive Pump Control

Displays
- Simplified Well Configuration
- Full Color Graphic Display of all key functions including:
  - Rod velocity
  - Rod position
  - Rod load
  - Pump velocity
  - Pump position
  - Pump load
  - Pump fill
  - Pump stroke
  - Daily fluid production
  - Daily leakage loss
  - Daily average pump fill
  - Daily average pump speed
  - Pump intake pressure
  - Discharge pressure
  - Tubing pressure
  - Casing pressure
  - Fluid level
  - Fluid flow

Data Collecting/Reporting
- Well production/performance report
- Time-stamped event/fault logging
- Time-stamped user-definable data sampler
- IPR curve graph
- Web-based monitoring/control
- Third-party head-end software interface (Case, Theta)
Downhole Rod Pumps

NOV Mono offers a full line of API 11AX Standard Rod Pumps and Components that can be tailored to fit the specific characteristics of your well. Our rod pumps are available in many different lengths, diameters and materials to fit your well’s conditions.

There are two basic types of Subsurface Pumps, the Tubing Pump and the Insert Pump. The Tubing Pump Barrel is threaded directly onto the bottom of the production tubing, and is installed near the bottom of the well immersed in the oil within the well casing. The plunger is run into the tubing on the sucker rod string. Generally a standing valve puller is run between the bottom of the plunger as well as the separate standing valve. This makes the removal of the standing valve optional when pulling the sucker rods and plunger. The plunger, traveling valve, and standing valve can be serviced simply by pulling the rods, but it requires removal of the tubing to service the pump barrel.

An Insert Pump is run into the well on the rods as a complete unit. A seating assembly on the pump engages a seating nipple on the tubing when the pump is run in, or installed. After the well has pumped up, the additional pressure of oil in the tubing combined with the flow line pressure holds the pump firmly in place. The entire Rod Pump is removable, and therefore may be serviced merely by pulling the sucker rod string.

*See our Rod Pump Catalog for all product offerings.
NOV Mono Rod Pump Components

Barrels  Bushings  Cages  Connectors  Couplings  Guides

Seating Nipples  Nipple Extensions  Plugs  Plungers  Pullers

Valve Rods  Seating Assemblies Friction  Seating Assemblies Mechanical  Pull Tubes  Valves

Images are not to scale

*See our Rod Pump Catalog for all product offerings.
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Downhole Solutions

Drilling Solutions

Engineering and Project Management Solutions

Industrial Solutions

Lifting and Handling Solutions

Production Solutions

Supply Chain Solutions

Tubular and Corrosion Control Solutions

Well Service and Completion Solutions

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