Push Pull Machine

RIG FLOOR SNUBBING UNIT FOR UNDERBALANCED AND SLIDE ASSIST DRILLING OPERATIONS

OVERVIEW
The Push Pull Machine (PPM) is utilized in managed pressure drilling (MPD) and underbalanced drilling operations to control pipe movement in and out of the well in both pipe-heavy and pipe-light conditions, using a dual-slip traveling assembly. It can be installed on most drilling and workover rigs, and is adaptable to fit most rotary table bushing sizes. Requiring less than 1 foot (0.3 meters) in pipe stump height, this rig floor pipe-handling equipment can be utilized for all connections. The PPM utilizes an independent hydraulic power unit spotted at ground level away from the rig floor, and is controlled by a small control console placed anywhere on the rig floor.

The PPM is designed to snub and hoist pipe into the hole during underbalanced conditions, allowing the bottomhole assembly or casing to be tripped safely to and from the rig floor and maintain underbalanced conditions.

With the PPM, operators can improve rate of penetration (ROP) during slide intervals of shallow-water, extended-reach horizontal wells and increase hole depth by as much as 1,000 feet (305 meters) over conventional methods. Casing running time can also be reduced by utilizing the PPM to push casing to total depth.

FEATURES
- Handles tubular diameters from 2-3/8 inches to 8 inches
- Two independent page-light and pipe-heavy slips
- Independent hydraulic power unit
- Small footprint and height
- Quick installation and removal

BENEFITS
- Handles transition from pipe-light to pipe-heavy conditions without reversing slips
- Ideal for safely drilling, tripping and completing live underbalanced wells
- Protects the reservoir by allowing it to flow and remain underbalanced during all operations
- Can improve rate of penetration when drilling shallow extended-reach laterals
- Eliminates the need for downhole drilling isolation valves
- No elevated work basket means personnel are able to perform all work at rig floor
- Small footprint maximizes space on the rig floor
- Utilizes single die for 2-3/8-inch to 7-inch pipe tubular diameters
- 3-1/2-inch to 8-inch pipe slips available for pushing up to 7-inch casing
OPERATION

The PPM unit utilizes a quad slip arrangement whereby two slip assemblies are fixed and two slip assemblies travel each as one unit. Each slip pair is mounted back to back to provide a reaction force for both pipe-light and pipe-heavy conditions. The traveling slips are moved by a hydraulic cylinder. They are brought toward the pipe through a hydraulically driven spiral gear assembly, and are operated independent of each other. Once the slip dies have contacted the pipe, the relative pipe/die movement will self-energize the dies to provide the necessary grip. The traveling portion of the PPM is raised and lowered by using chains driven by the cylinder housing assembly.

The PPM is fixed to the rig floor, using a hold-down bushing that extends through the base plate of the PPM and through the rotary table. It is fastened, with four chains, to the blowout preventer (BOP) or rig substructure.

On the control panel, the slips are opened and closed by using four handles located in a single valve bank. Slip opening and closing pressures are set via relief valves in the PPM control console that are preset and do not usually have to be adjusted during operations. The traveling assembly is also controlled by using a single handle on the control console. Cylinder pressures for both travel assembly directions are displayed.

All handles have a lockout mechanism to prevent unintended movement of the slips or travel assembly.

### Push Pull Machine vs Conventional Snubbing

<table>
<thead>
<tr>
<th>Push Pull Machine</th>
<th>Hydraulic Power Unit</th>
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<tbody>
<tr>
<td>Slip Range, in.</td>
<td>2-3/8 to 7 (3-1/2 to 8 optional)</td>
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<tr>
<td>Dimensions, in. (m) (l x w x h)</td>
<td>70 x 34 x 185 (1.78 x 0.86 x 4.70)</td>
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<tr>
<td>Weight, lb (kg)</td>
<td>12,100 (5488)</td>
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<tr>
<td>Snubbing Force, lb (kN)</td>
<td>50,000 (222.4)</td>
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<tr>
<td>Hoisting Force, lb (kN)</td>
<td>25,000 (111.2)</td>
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<tr>
<td>Stroke, in. (m)</td>
<td>120 (3.05)</td>
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<tr>
<td>Flow Rate, gpm (lpm)</td>
<td>51 (232)</td>
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Notes:
- These ratings are guidelines only. Refer to the equipment data book for individual equipment specifications.

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com

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