The ULTIMATE in Hole Cleaning

Whether drilling on land or offshore, the advancement of technology and the ability to drill wells at a higher rate of penetration can create issues. One of several tools Arrival Oil Tools’ has created is the patented Cuttings Bed Mobilizer. Designed and built to combat the problem of cuttings lying on the low side of the well bore. The CBM’s are positioned throughout the entire horizontal section, this insures that the entire lateral has minimal cuttings and no intermittent hole cleaning.

By adequate cuttings removal, operators can expect the following:

- More weight to the bit as tool joints aren’t forced to push cuttings when sliding.
- Higher ROP and lower rotary torque.
- Increased tripping speeds and less or no overpull on trips.
- Reduced risk of stuck pipe or packing off.

The Cuttings Bed Mobilizers unique features that enable it to enhance hole cleaning:

- The CBM’s overall length is relatively short and easy to handle on the rig floor.
- Embedded within the CBM’s is an impeller which picks cuttings up off the bottom of the hole and transports them to the high side where the high velocity circulation is occurring.
- Just in front of the impeller, a flow accelerator is embedded which provides turbulence and higher fluid velocities which assist the impeller in moving the cuttings off the low side of the hole.
- Four blades on the CBM insure concentric motion at the flow accelerator and impeller and also assist in hole cleaning.
- The uphole blades on the CBM have both a left and right hand wrap which enhances hole cleaning when the drill string is being pulled off bottom or during a wiper trip.
- Clusterite is installed on the leading and trailing edges of all blades to enhance hole cleaning and also to reduce the effects of borehole spiraling.

At Arrival, we believe that unique technologies like the CBM’s can positively affect the overall time required to drill a well and make the drilling process significantly easier.
### Cuttings Bed Mobilizer™ Technical Specifications

<table>
<thead>
<tr>
<th>Standard Pipe Size</th>
<th>Make Up Torque</th>
<th>Standard Connection</th>
<th>Drill Pipe Size</th>
<th>Make-Up Torque</th>
<th>Make-Up Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1/2&quot; A</td>
<td>10,900 - 12,000 FT-LBS</td>
<td>3-1/2 A</td>
<td>116.0&quot; (2,946 mm)</td>
<td>19,500 FT-LBS</td>
<td>2,646 daNm</td>
</tr>
<tr>
<td>4&quot; A</td>
<td>23,600 - 26,000 FT-LBS</td>
<td>4-1/2 API FH NC 46</td>
<td>116.0&quot; (2,946 mm)</td>
<td>20,900 FT-LBS</td>
<td>2,847 - 3,037 daNm</td>
</tr>
<tr>
<td>5-1/2&quot; A</td>
<td>30,200 - 33,200 FT-LBS</td>
<td>5-1/2 API FH NC 50</td>
<td>116.0&quot; (2,946 mm)</td>
<td>25,250 - 27,750 FT-LBS</td>
<td>3,424 - 3,763 daNm</td>
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<tr>
<td>4&quot; MT40</td>
<td>20,900 FT-LBS</td>
<td>4&quot;</td>
<td>116.0&quot; (2,946 mm)</td>
<td>24,475 - 25,634 daNm</td>
<td>3,000 - 3,500 daNm</td>
</tr>
<tr>
<td>4&quot; DS40</td>
<td>21,000 - 22,400 FT-LBS</td>
<td>4&quot;</td>
<td>116.0&quot; (2,946 mm)</td>
<td>25,000 - 25,500 daNm</td>
<td>2,800 - 2,900 daNm</td>
</tr>
</tbody>
</table>

Cuttings and fluid move uniformly in annulus with CBMs in the drill string.

High speed pipe rotation will cause the fluid to spiral as it is forced up the hole. The cuttings bed can be agitated by a tool like the Cuttings Bed Mobilizer which lifts the cuttings off the low side of the hole and moves it up into the flow path.

### Cuttings Return Vary with Rotary Speed

Several operators have experimented with rotary speeds of up to 220 rpm, but little benefit has been seen over 180 rpm.

How fast can you rotate the pipe in your horizontal well? The Cuttings Mobilizer can move the cuttings into the flow path at lower rpm.

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*Make-up torque values are listed for reference only.*