Sucker Rods Intended for Progressing Cavity Pump Application
Conventional Sucker Rods

Sucker Rod
• Standard API design
• Designed for reciprocating application
• Time proven over 45 years to provide a dependable link between surface and pump
• Connection is engineered to have a much higher tensile strength than the rod body
Drive Rods®

Developed specifically for use in PCP applications

1” Drive Rod

1” Sucker Rod
Drive Rods®

Produced in sizes:

- 1” with 7/8” pin
- 1 1/4” with 1” pin
- 1 1/4” with 1 1/8” pin
- 1 1/2” with 1 1/8” pin
Drive Rods®

- Reduced connection size decreases flow/pressure losses
• Reduced connection size decreases flow/pressure losses

• Examples:
  • 1” Drive Rod in 2 7/8” tubing has 37% more flow area than a 1” Sucker Rod
  • 1 1/4” Drive Rod in 3 1/2” tubing has 27% more flow area than a 1 1/8” Sucker Rod
**Drive Rods®**

- Reduced connection size decreases flow/pressure losses
- Lower pump discharge pressure, rod string torque, and drive head input power
Reduce rod tubing wear by allowing more rod body to contact the tubing wall

Upset transition is much smaller leading to improved fatigue life
Sample Simulations

Example:
- Well Type: Deviated
- Pump Depth: 750 m
- Fluid rate: 15 m³/day
- Tubing: 88.9 mm
- Viscosity: 3,000 cp
- Pump speed: 142 rpm
- Pump model: 15-1800

<table>
<thead>
<tr>
<th></th>
<th>Sucker Rod</th>
<th>Drive Rod</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rod Loading</td>
<td>85%</td>
<td>73%</td>
</tr>
<tr>
<td>Pump Loading</td>
<td>83%</td>
<td>71%</td>
</tr>
<tr>
<td>Flow Losses</td>
<td>1126 psi</td>
<td>816 psi</td>
</tr>
</tbody>
</table>
Sample Simulations

Example:

- Well Type: Deviated
- Pump Depth: 750 m
- Fluid rate: 15 m³/day
- Tubing: 88.9 mm
- Pump model: 15-1800
- Average DLS: 2.13°/30m
- Max DLS: 4.66°/30m

<table>
<thead>
<tr>
<th></th>
<th>Sucker Rod</th>
<th>Drive Rod</th>
<th>Guided Rod</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Side Load (lb/ft)</td>
<td>573</td>
<td>484</td>
<td>160</td>
</tr>
</tbody>
</table>
Drive Rods®

Drive Rod modified thread provides much higher torque capacity

1” Drive Rod

1” Sucker Rod
**High Strength Couplings**

- Designed for PC application in conjunction with Drive Rods
- Made from higher strength base material than API Class T couplings

<table>
<thead>
<tr>
<th>Material</th>
<th>Yield Strength, PSI</th>
<th>Hardness, HRA</th>
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</thead>
<tbody>
<tr>
<td>API Class T</td>
<td>AISI 8630</td>
<td>80,000 min</td>
</tr>
<tr>
<td>AOT High Strength</td>
<td>AISI 4130</td>
<td>105,000 min</td>
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</table>

- Wider contact face = greater friction = higher torque capacity
Drive Rods®

1” API Connection

7/8” Drive Rod Connection
Drive Rods®

1” API Connection

1” Drive Rod Connection
## Torque Ratings

<table>
<thead>
<tr>
<th>Grade</th>
<th>Torque Capacity of Drive Rods (ft-lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1&quot;</td>
</tr>
<tr>
<td>Grade D</td>
<td>1,100</td>
</tr>
<tr>
<td>High Strength</td>
<td>1,200</td>
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</tbody>
</table>
Key Points to Prevent Failure
Drive Rod® Installation

Key Points

1. Cleanliness is vital
2. Rod shoulders & Coupling Faces must be free of all grease
Drive Rod® Installation

Key Points

1. Cleanliness is vital
2. Rod shoulders & Coupling Faces must be free of all grease
3. Connections must be tight
4. When checking displacement, both sides of the connection must be measured.
Summary

Improved Overall Well Performance
- Reduced flow/pressure losses
- Decreased rod/tubing wear
- Improved fatigue life

Increased connection strength
- Connections are stronger than rod body
- Drive Rod connections provide a higher safety factor than API connections

Drive Rods should be used in all PCP applications
Questions?