Variable Speed Drives
Beam Pumping

By: Andy Cordova
• VSD  Variable Speed Drive
• VFD  Variable Frequency Drive
• ASD  Adjustable Speed Drive
Fluid Pound - as experienced in a pumping oil well, is caused by the pump not completely filling with fluid on the upstroke. As the downstroke begins, the entire fluid and rod string load moves down through a void until the plunger hits the fluid level in the pump barrel. The traveling valve opens, suddenly transferring the load to the tubing, causing a sharp decrease in load, which transmits a shock wave through the pumping system. It is this shock wave that damages the parts of the pumping system.
Applications – Why Use a VSD

• Match pumping displacement to reservoir
• Reduce rod loads
• Reduce rod stress
• Reduce rod float
• Increase production
• Decrease maintenance costs
• Decrease electrical costs

NOTE: Verify Pumping Unit has correct wipers
What Wells to use a VSD on

- Heavy crude & rod fall problems
- Steam flood with erratic inflow
- Large volume producers where if shut down takes days to return to oil production
- Low BHP where shutting down will cause back pressure on inflow
- Sanding/pump sticking problems
- Reduce costs for sheave changes
Typical Installation
VSD Enclosure
Control Logic

Change Speed-Pump Fillage
Motor-VSD Controlled
• Company A
  – 20 high-failure wells
    • 52 failures in 12 months before install (2.60 FF)
    • $1.2 mm repair cost ($24 m/failure)
  – In operation 10 months
    • 12 failures to date (annualized FF of 0.68, 74% redux)
    • 5% production increase 6 mos. After
Field Results

- **Company B**
  - 15 high-failure/low BHP/fiber glass rod wells
    - 38 failures in 12 months before install (2.53 FF)
    - $873 m failure cost ($23 m/failure)
  - **In operation 8 months**
    - 6 failures to date (annualized FF of 0.60, 76% redux)
    - 8% production increase 2 mos. after
# Summary

<table>
<thead>
<tr>
<th>RPC</th>
<th>Peak Load</th>
<th>Min Load</th>
<th>Net SPM</th>
<th>Pump Stroke</th>
<th>Rod Loading</th>
<th>Gearbox</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPC</td>
<td>16156</td>
<td>2870</td>
<td>3.89</td>
<td>285”</td>
<td>93%</td>
<td>53.4%</td>
<td>693 BPD</td>
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<tr>
<td>VSD RPC</td>
<td>15698</td>
<td>2725</td>
<td>4</td>
<td>280.7”</td>
<td>90.2%</td>
<td>49.2%</td>
<td>670 BPD</td>
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<tr>
<td>VSD RPC Optimized</td>
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<td>3378</td>
<td>4.01</td>
<td>285.1”</td>
<td>78.5%</td>
<td>43.4%</td>
<td>716 BPD</td>
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</tbody>
</table>

**RESULTS:**
- Lowered Loading
- Increased Production
RESULTS:
Increased Revenue $500/day
Payout less than 30 days
Actual 40HP AFE operation Line Side

Energy Recovered
Questions