SMART SENSE
INTELLIGENT PUMP CONTROL AND MONITORING SYSTEM

You've come to expect precision, long-life and maximum energy efficiency from CIRCOR’s Allweiler, IMO, Houttuin and Warren pumps. With our Smart Sense system you can comfortably achieve this expected performance as our control system incorporates various real-time readings to optimally adjust pump operations.

Our patented cavitation monitoring and wear detection features set the benchmark for the screw pump industry.

CONTROL AND MONITORING FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cavitation Monitoring</td>
<td>Cavitation measurements across the pump’s rotating screws feed the control system which adjusts operating parameters accordingly: - Preventing cavitational pump wear - Protecting film support (three screw pumps) - Optimizing pumping with air/liquid mixtures (two screw &amp; progressive cavity pumps)</td>
</tr>
<tr>
<td>Wear Detection</td>
<td>Active measurement of housing and rotating screw wear enables predictive maintenance scheduling</td>
</tr>
<tr>
<td>Pressure Monitoring</td>
<td>Inlet and outlet pressure readings adjust pump controls to ensure compliance with process requirements</td>
</tr>
<tr>
<td>Temperature Monitoring</td>
<td>Fluid and pump component temperature readings log process conditions and, when applicable, automate controls for cooling or heating pump support systems</td>
</tr>
<tr>
<td>Vibration Monitoring</td>
<td>Horizontal and vertical vibration reading track micro pump movements as process conditions evolve</td>
</tr>
<tr>
<td>Seal and Lubrication System Monitoring</td>
<td>Temperature, pressure and leak detection monitoring identify undesired performance before failures occur</td>
</tr>
<tr>
<td>Remote Communications</td>
<td>Remote operations, monitoring and/or alarms enable centralized equipment, management with limited on-site equipment management</td>
</tr>
<tr>
<td>Smart Monitoring</td>
<td>Monitoring software reads, logs and displays pump operating and performance characteristics. - Includes programmable alerts, alarms and reports - Electronic log book of operating parameters and maintenance - Incorporated in CIRCOR’s proprietary controls systems - Feed for customer’s existing equipment control systems - Automatic spare parts purchasing and inventory control</td>
</tr>
<tr>
<td>Control System</td>
<td>Proprietary control system optimally operates the pumps according to desired process conditions and real-time conditions as noted above. Optional local or central control system operations.</td>
</tr>
</tbody>
</table>

www.circorpt.com
PERFORMANCE BENEFITS ACHIEVED WITH SMART SENSE

Precise Flow Control, Optimization and Measurement:
- Reduced energy consumption and cost as pump speed adapts to changing fluid and process conditions
- Predictable pump and process performance as pump automatically adjusts to deliver prescribed volumes
- Faster, more complete loading and unloading operations as pumps adjust to account for a decreasing suction head and increasing volumes of air in the fluid

Condition Based Monitoring System:
- Minimal unplanned maintenance down time as pump performance is recorded and monitored
- Reduced maintenance cost as predictive parts replacement reduces more costly equipment repairs
- Real time system diagnosis and optimization as process conditions fluctuate

Remote Operations and Maintenance Monitoring:
- Elimination of control system redundancies via encorpration of a plant-level control system
- Reduced cost for on-site supervision and monitoring as the task is centralized
- Increased safety as hands-on equipment monitoring and operations is eliminated

SMART SENSE OVERVIEW

POWER ROTOR BORE CUTAWAY

IDLER ROTOR BORE CUTEWAY

CIRCOR
1710 Airport Road
Monroe, NC 28110-5020
Tel: +1.704.289.6511
Tel: +1.877.853.7867
CIRCOR Product & Services