Industry Leading Coke Drum Unheading and Center-Feed Technology

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Traditional Coke Drum Unheading

- Traditional coke drum unheading is:
  - Unreliable
  - Expensive to maintain/repair
  - Time consuming
  - Inherently unsafe
Traditional coke drum unheading has been responsible for:
- Unplanned downtime
- Near misses
- Disabling injuries
- Fatalities
The DeltaValve Solution

Fully Automated Coke Drum Unheading
The DeltaValve Solution
Totally Enclosed, Safe, Simple, Reliable Unheading

- Coke drum
- Transition spool with side entry
- DeltaValve unheading valve
- Fixed chute
- Switch deck
- Discharge chute
DeltaValve Coke-Drum Unheading
Totally Enclosed, Safe, Simple, Reliable
DeltaValve Coke Drum Unheading
Bottom Unheading Valve Installation
DeltaValve Coke Drum Unheading

Increased Throughput

- Unheading or reheading time of 2 - 4 minutes
- For maximum throughput, the unheading valve is configured to allow: Draining of coke and water through the port
DeltaValve Coke Drum Unheading

Low Maintenance Costs

- Quick assembly and disassembly with coke drum
- Minimal part requirements for complete seat and seal replacement
- Re-buildable on switch deck during shutdowns
DeltaValve Coke Drum Unheading

Latest Technological Advances - GV825 Bottom Unheading Valve

- Ultra low steam consumption
- Body is fully isolated from solids
- Valve body remains fully pressurized during stroke
- No cooling box/water
- Hydraulic or electric actuation options
DeltaValve Coke Drum Unheading

Latest Technological Advances – Ultra Low Steam Consumption

Original Seating

New Seating
DeltaValve Coke Drum Unheading

Latest Technological Advances – Electric Actuation
## DeltaValve Coke Drum Unheading

### Latest Technological Advances – Electric Actuation

- **Unheading valve actuator comparisons**

<table>
<thead>
<tr>
<th>Types of Operators</th>
<th>Planetary Roller Screw</th>
<th>Hydraulics</th>
<th>Acme screw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load capacity</td>
<td>Very high</td>
<td>Very high</td>
<td>Very high</td>
</tr>
<tr>
<td>Lifetime</td>
<td>Very high</td>
<td>Very long</td>
<td>Short/</td>
</tr>
<tr>
<td>Speed</td>
<td>Very high</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Acceleration</td>
<td>Very high</td>
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<td>Low</td>
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<tr>
<td>Stiffness</td>
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</tr>
<tr>
<td>Shock resistance</td>
<td>High</td>
<td>Very High</td>
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<tr>
<td>Efficiency</td>
<td>&gt;80%</td>
<td>Moderate &lt;50%</td>
<td>Very low (&lt;40%)</td>
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<tr>
<td>Maintenance</td>
<td>Very low</td>
<td>Very High</td>
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</tr>
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<td>Installation</td>
<td>Very easy</td>
<td>Complex</td>
<td>Very Easy</td>
</tr>
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<td>Position control</td>
<td>Very easy</td>
<td>Complex</td>
<td>Moderate</td>
</tr>
<tr>
<td>Position accuracy</td>
<td>Very high</td>
<td>Moderate</td>
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</tr>
<tr>
<td>Environmental concerns</td>
<td>Low</td>
<td>High</td>
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</tr>
</tbody>
</table>
Unheading Valve Comparison

Hydraulic Actuation

Competitor unheading valve

DeltaValve unheading valve
DeltaValve Center Feed Technology

Why the Need for Retractable Center Feed?

- **Common concerns with side-feed entry:**
  - Opposing coke drum wall opposite side-feed entry experiences extreme thermal stresses
  - Resid flow patterns tend to migrate up the drum wall rather than up the center, causing thermal stresses to the coke drum during feed and quench possibly causing coke drum “banana effect”
  - “Banana effect” on coke drums can also result in damaged drum skirts and process safety risks
  - Potential increase in “hot spots” and top head blowouts when using side-feed
DeltaValve Center Feed Technology

Center Feed Injection: Bottom Feed vs. Side Feed

Traditional Bottom Feed  Current Side Feed  Retractable Center Feed Injection

Data courtesy of Stress Engineering Services
The simulations represent the beginning of the coking process when VRC vapor is injected into an empty drum.

The analysis and path lines show that the flow impinges upon the drum wall. The impingement causes the flow to disperse partially around the circumference of the drum; the flow then rises vertically upwards along the walls of the drum.

Data courtesy of Stress Engineering Services.
DeltaValve Center Feed Technology

Center Feed Injection: Bottom Feed vs. Side Feed - Results

- Unsteady flow analysis
  - The simulations represent the beginning of the coking process when VRC is injected into an empty drum

Velocity (m/s)
Red color denotes velocity of 2 m/s and the white areas next to red denotes regions of velocity higher than 2 m/s

Data courtesy of Stress Engineering Services
DeltaValve Center Feed Technology

Retractable Center Feed Injection
DeltaValve Center Feed Technology

Retractable Center Feed Injection
DeltaValve Center Feed Technology

Retractable Center Feed Injection
DeltaValve Center Feed Technology

Retractable Center Feed Injection

- Nozzle configuration produces a centered feed stream
- Better thermal distribution during feed may result in
  - Maximized coke-drum life and minimized down-time and repairs
  - Minimized pressure spikes during quench cycle
  - Improved top head safety by minimizing blowouts and geysers
  - Reduced local hot-spots
  - With nozzle retracted, no flush water required to keep feed line clear during cutting
- Prototype unit working since October 2011 without any production loss
- 4 units installed and operating
- 3 units in production
- Numerous orders pending
Questions/Comments