Upgrading Existing Delayed Cokers with Ruhrpumpen Remote Coke Cutting Technology

Valencia, Spain, 2018-10-03

Dr. Wolfgang Paul
Our Mission: Become a worldwide company

1950  Founded in Witten / Germany
Specialist for:  API Process pumps
API Pipeline pumps for Crude Oil,
Products, Water

1963  Part of THYSSEN AG
THYSSEN RUHRPUMPEN

1997  Part of Cooperation EG, Monterrey,
Mexico

Location: RuhRPumpen Witten, Germany

2000  Start with Hydraulic Decoking System

2001  First Order: Petroleras Ameriven
/04  ConocoPhillips, PdVSA, Chevron Texaco

Since that time orders for revamps, new
Units and Components
Witten, Germany
Area: 48,000 m²
Testing: 8,850 HP

Tulsa, USA
Area: 28,000 m²
Testing: 2,000 HP

Monterrey, Mexico
Area: 14,370 m²
Testing: 7,500 HP

Changzhou, China
Area: 7,500 m²
Testing: 6,000 HP

Chennai, India
Area: 7,500 m²
Testing: 6,000 HP

Orland, California
Area: 2,500 m²

Rio de Janeiro, Brazil
Area: 7,500 m²
Testing: 6,000 HP

Buenos Aires, Argentina
Area: 7,500 m²
Testing: 1,500 HP

Suez, Egypt
Area: 2,280 m²
Testing: 2,680 HP
Target and goal of a revamp project

**Reliability**
- Increase for the next 20 years

**Safety**
- Increase to the actual technical standard in the industry for operators and equipment

**Maintenance**
- Reduction of maintenance activities
- Reduction of downtime

**Environment**
- Improve of environmental issues
  - Noise, oily air, steam

**Spare Parts**
- Availability for all components
BP-Gelsenkirchen, Germany

Goal / Target
Increase of safety
Modernization of cutting system

Scope
- Cutting system, elec operated
- Bottom deheading, semi-auto
- Top deheading, semi-auto

Order: 2003-06
Start up: 2004-05
RP elec Coke Cutting System

BP-Gelsenkirchen, Germany (2004)

Goal / Target
Increase of safety
Modernization of cutting system
Remote Coke Cutting 2006

Scope
- Cutting system, elec operated
- Bottom deheading, semi-auto
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Order: 2003-06
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Modernization of cutting system

Scope
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Order: 2003-06
Start up: 2004-05
BP - ERE - Lingen
Germany

Goal
Increase of safety

Scope:
Cutting system,
Top deheading, ZJ electric driven
Bottom deheading, semi-automatic

Order: 2003-12
Start up: 2004-10

RUHRPUMPEN Specialist for Pump Technology
First Deheading valve in Europe

BP - ERE - Lingen
Germany (2004)

Goal
Increase of safety

Scope:
- Cutting system, hydraulic
- Top deheading, zj-electric
- Bottom deheading, semi-automatic

Order: 2003-12
Start up: 2004-10
RP – semi automatic bottom deheading

BP-ERE – Lingen B
Germany (2004)

**Goal**
Increase of safety

**Scope:**
Cutting system,
Top deheading, zj-electric
Bottom deheading, semi-automatic

Order: 2003-12
Start up: 2004-10
BP Germany
Coker A

Delivered and Installed by RP

Top Valve
- ZJ 30"
- Adapter drum
- Adapter Top

Derrick
- Guide device

Weight
- Valve 8,000 kg
- Adapter 1x500 kg
CBI for Frontier-Oil

Frontier, Kansas, USA

Licensor/EPC: CBI - Lummus

Scope:
– Cutting system, electric
– 1 pump, 2 drums

– Order: 2007
– Start up: 2008

– 1st remote coke cutting system in NA
CBI for Frontier-Oil

Frontier, Kansas, USA

Licensor: CBI - Lummus

Scope:
- Cutting system,
- 1 pumps, 2 drums

- Order: 2007
- Start up: 2008

- remote cutting system
Hunt, AL, USA

Licensor: CBI - Lummus

Scope:
- Cutting system,
- 2 drums, revamped coker
- Electrical cutting system
- Order: 2009
- Start up: 2010
- remote coke cutting system
Shell-Argentina

Client: Shell CAPSA, Buenos Aires
EPC: CH2

Scope
- revamp of cutting system hoists and DSD, elec.
- remote cutting system for 2 drums

Revamp
- delivery in 2010
- start up 6 month later
Coker in Romania

- OMV
- Rompetrol
- Lukoil
Bottom

- up to 2015
- open chute
- Manual operation
- Without safety system
Switch deck

Chute System
- Ruhrpumpen

Safety Clamping Device

Version A
- Reinforced hydraulic cy

Version B

Auxiliaries
- HPU
- Operator Shelter
- MCC
- PLC Cabinet
Top valve assembly

- Adapter
- Top valve
- Guide device
Structure

- Calculation of existing coker, similar design
- Structure is able to carry additionally more than 10 t
Petrom-OMV-realisation

Top valve assembly

- Adapter
- Top valve
- Guide device
MIRO-Karlsruhe

MIRO- (ex ESSO)
Germany

Drum: 2 x 7,30 x 32 m
**MIRO- (ex ESSO)**

**Germany**

- 1. automatic coke cutting (by ESSO)
- Drum: 2 x 7,30 x 32 m

**Ruhrpumpen**

<table>
<thead>
<tr>
<th>Year</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>Tools, auto</td>
</tr>
<tr>
<td>2010</td>
<td>Drill Stem Drive</td>
</tr>
<tr>
<td>2012</td>
<td>Crosshead, Free Fall</td>
</tr>
<tr>
<td></td>
<td>Arrestor,</td>
</tr>
<tr>
<td></td>
<td>HP-Water Hoses</td>
</tr>
<tr>
<td>2017</td>
<td>Top&amp;Bottom Valves</td>
</tr>
<tr>
<td></td>
<td>(other)</td>
</tr>
<tr>
<td>2017</td>
<td>Enclosure (RP)</td>
</tr>
</tbody>
</table>
OMV-Burghausen
Germany

Drum: 2 x 6,82 x 29,92 m
OMV-Burghausen
Germany

“Coker 2020+ “

2017 Free Fall Arrestor System
Drill Stem Drives (Seal)

2020 Hoists, electric
Hoses instead of pipe

202x Top and Bottomvalves
RP – DSD, Crosshead and FFA

Ruhrpumpen
2006    Auto Tools
2007    Jet Pump+dcv
2018    CH+FFA, DSD

RUHRPUMPEN Specialist for Pump Technology
Ruhrpumpen Philosophy for upgrades and revamps

1. Strong mechanical lifting system
   - Hydraulic / electric driven Hoists and DSDs
   - Crosshead with Free Fall Arrestors
   - Basic Instrumentation in the derrick
     - Rope load, position encoders and switches
   - Reliable and simple Tool

2. Control System
   - Signal channelling from Cutting System through PLC to OP Panel
   - Operator Panel with signal and status visualization
   - PLC-program with Automatic Cutting System Program

3. Drum Vibration Monitoring System and Camera System for remote / auto
   - Vibration Probes at drum
   - Camera Systems for Cutting Deck and Chute observation

4. Manual override function
   For Installation and Maintenance
Control system

- Local Operator panel
- Cutting deck
  - Operation of Cutting System
    - Interactive P&ID
    - Safety glass
    - Fire resistant material

High safety on cutting deck (modernization 2004)
Operator Panel, Shelter on Cutting Deck
- Operation of Cutting System from safe shelter
- Panelview
  Indication during drill/cutting
  - coke fall out
  - Jet to wall
- Condition monitoring
- all data of Cutting System
- Maintenance provision
- Status indication by lamps
- View to cutting deck / hoists
- Designed for remote operation
Control and process visualisation
Control and process visualisation

<table>
<thead>
<tr>
<th>Position Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute</td>
</tr>
<tr>
<td>Relative</td>
</tr>
</tbody>
</table>

### Absolute

<table>
<thead>
<tr>
<th>Position</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>ZT-4621</td>
<td>NNN.NN m</td>
</tr>
<tr>
<td></td>
<td>NNN.NN m</td>
</tr>
<tr>
<td></td>
<td>NNN.NN m</td>
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</tbody>
</table>

### Relative

<table>
<thead>
<tr>
<th>Position</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>High Pos. Derrick</td>
<td>ZSH-4621</td>
</tr>
<tr>
<td>Park Position</td>
<td>XS-4621</td>
</tr>
<tr>
<td>Tool above Top Valve</td>
<td>XS-4622</td>
</tr>
<tr>
<td>High High Pos. In Drum</td>
<td>ZSH-4621/4622</td>
</tr>
<tr>
<td>Dome Cleaning Max Pos.</td>
<td>XS-4623</td>
</tr>
<tr>
<td>High Working Pos. In Drum</td>
<td>ZSH-4622</td>
</tr>
<tr>
<td>Low Low Pos. In Drum</td>
<td>ZSL-4622</td>
</tr>
<tr>
<td>Low Low Pos. In Drum</td>
<td>ZSSL-4621/4622</td>
</tr>
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</table>

### Weight of Drill

<table>
<thead>
<tr>
<th>Drill Orientation</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>CW</td>
</tr>
<tr>
<td>Drill Speed</td>
<td>NNNNNN rpm</td>
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<tr>
<td>Slack rope</td>
<td>XS-4624</td>
</tr>
</tbody>
</table>

### Drum R-001A

- **Drum Status**: Decoking
- **LZ-002A**
- **LZ-003A**
Remote Control system

Frontier, Ka
Operator cubicle
First remote system in NA

Remote operation
- Deheading Valves
- Coke Cutting

Auxiliaries
- HVAC
- Camera System
Remote Operator Shelter

Remote Cutting System

Frontier, Kansas,
USA 2008
Remote Operator Shelter

Hunt, AL, USA

Licensor: CBI - Lummus

Scope:
- Cutting system,
- 2 drums, revamped coker
- Electrical cutting system

- Order: 2009
- Start up: 2010
- remote cutting system
Remote Operator Panel - typical

Operator Panel in Control building
<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Company</th>
<th>Location</th>
<th>System Type</th>
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<tbody>
<tr>
<td>Germany</td>
<td>2006</td>
<td>BP</td>
<td>Germany</td>
<td>remote, automatic</td>
</tr>
<tr>
<td>USA</td>
<td>2009</td>
<td>Frontier</td>
<td>USA</td>
<td>remote,</td>
</tr>
<tr>
<td>Argentina</td>
<td>2010</td>
<td>Shell</td>
<td>Argentina</td>
<td>remote,</td>
</tr>
<tr>
<td>USA</td>
<td>2010</td>
<td>Hunt refining</td>
<td>USA</td>
<td>remote,</td>
</tr>
<tr>
<td>Russia</td>
<td>2016</td>
<td>LO Perm</td>
<td>Russia</td>
<td>remote,</td>
</tr>
<tr>
<td>Russia</td>
<td>2016</td>
<td>Tatneft</td>
<td>Russia</td>
<td>remote,</td>
</tr>
<tr>
<td>Russia</td>
<td>2016</td>
<td>Antipinsky</td>
<td>Russia</td>
<td>remote,</td>
</tr>
<tr>
<td>Belgium</td>
<td>2018</td>
<td>ExxonMobil</td>
<td>Belgium</td>
<td>remote, start up 2018</td>
</tr>
<tr>
<td>India</td>
<td>2018</td>
<td>IOCL Haldia</td>
<td>India</td>
<td>remote, start up 2018</td>
</tr>
</tbody>
</table>

After 2010 nearly all Ruhrpumpen Decoking Systems are built as remote system, designed for extension to automatic systems. Actually, there are 3 orders in house for remote system.
Limitations of Remote / Automatic Coke Cutting

• Coke Cutting System
  – Weak points of Cutting System cannot be eliminated
  – Power of Cutting System cannot be improved
  – Safety issues cannot be solved
    – Except Operators are removed from Cutting deck
    – Except Operators are hurt and fatalities are avoided

• Control System
  – Program is as good as information from site are implemented
  – Program is as good as experience from supplier are implemented
  – Program is as good as special operation features are implemented
    – Different Feedstocks can be handled only when procedures are implemented

• Optimization
  – Optimization is an ongoing process
Supplier of Choice

We make it