RUHRPUMPEN
Decoking System

Remote Coke Cutting

Cooking.com®
MORE PRODUCTION - LESS RISK!

New Delhi, India, October 2013
Dr. Wolfgang Paul
– Pump Division
– Decoking Division
– RP-Egypt, Suez
– RP-Argentina
– RP-Brazil
– RP-India
<table>
<thead>
<tr>
<th>Year</th>
<th>Company Name</th>
<th>Drums</th>
<th>Scope</th>
<th>Type</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Petrolera Ameriven, Venezuela</td>
<td>4 x 29'</td>
<td>HDS, Hydraulic Decoking System</td>
<td>hyd</td>
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<tr>
<td>2002</td>
<td>BP-Gelsenkirchen, Germany</td>
<td>4 x 26'</td>
<td>Cutting system, semi automated top dh, semi automated bottom dh</td>
<td>elec / autom</td>
<td>revamp</td>
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<tr>
<td>2003</td>
<td>BP – Lingen, Germany</td>
<td>2 x 17'</td>
<td>Cutting system, 36” top deheading valves, semi-automated bottom dh</td>
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<tr>
<td>2004</td>
<td>Jinling, China</td>
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<td>Jet Pump and DC-Valve</td>
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<tr>
<td>2005</td>
<td>CNRL, Canada</td>
<td>4 x 30'</td>
<td>HDS,</td>
<td>elec/hyd</td>
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<tr>
<td>2005</td>
<td>ENERCON, Chile</td>
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<td>2005</td>
<td>BP-Lingen, Germany</td>
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<td>Cutting system, 30” top deheading valves, semi-automated bottom dh</td>
<td>elec</td>
<td>revamp</td>
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<tr>
<td>2006</td>
<td>BP Castellon, Spain</td>
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<td>HDS, 30’ top deheading valves,</td>
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<td>2006</td>
<td>Sinclair Oil, USA</td>
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<td>Suncor, Canada</td>
<td>6 x 32'</td>
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<td>2007</td>
<td>Frontier, CB&amp;I, USA</td>
<td>2 x 26'</td>
<td>HDS,</td>
<td>elec / remote</td>
<td>revamp / new</td>
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<td>2007</td>
<td>OMV, Germany</td>
<td>2 x 26'</td>
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<td>elec</td>
<td>revamp</td>
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<td>2007</td>
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<td>2007</td>
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<td>3 x 18'</td>
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<td>revamp</td>
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<td>2007</td>
<td>Petro Canada, Montreal, Can</td>
<td>2 x 28'</td>
<td>HDS,</td>
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<td>new</td>
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</table>
### Ruhrpumpen – References, systems

<table>
<thead>
<tr>
<th>Year</th>
<th>Company</th>
<th>Drums</th>
<th>Scope</th>
<th>Type</th>
<th>Project</th>
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<tbody>
<tr>
<td>2008</td>
<td>Petro Canada, Fort Hills, Can</td>
<td>4+2x32’</td>
<td>HDS,</td>
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<td>2008</td>
<td>Hunt Ref., USA</td>
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<td>C-Chem, Japan</td>
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<td>elec</td>
<td>extension, new</td>
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<td>2008</td>
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<td>4 x 30’</td>
<td>HDS,</td>
<td>elec</td>
<td>new,</td>
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<td>Statoil, Norway</td>
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<td>revamp</td>
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<td>SHELL CAPSA, Argentina</td>
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<td>HDS</td>
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<td>MRPL, India</td>
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<td>HDS</td>
<td>hyd</td>
<td>new,</td>
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<td>Lukoil, Volgograd, Russia</td>
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<td>HDS</td>
<td>elec</td>
<td>new,</td>
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<td>IOCL, Paradip, India</td>
<td>4 x 32’</td>
<td>HDS</td>
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<td>2011</td>
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<td>HDS</td>
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<td>Lukoil, Perm</td>
<td>4 x 25’</td>
<td>HDS</td>
<td>elec, remote, auto</td>
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<td>2013</td>
<td>ERC-GS, Egypt</td>
<td>2 x 31’</td>
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<td>elec, remote</td>
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<td>Tatneft (LOI), Russia</td>
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<td>HDS</td>
<td>elec, remote</td>
<td>new</td>
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<td>Antipinsk, Russia</td>
<td>2 x 23’</td>
<td>HDS</td>
<td>elec, remote</td>
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<td>HDS</td>
<td>elec</td>
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<td>4 x 18’</td>
<td>Jet Pump and DC Valve</td>
<td>elec</td>
<td>revamp</td>
</tr>
</tbody>
</table>
Petroleras Ameriven

Hamaca
Venezuela

Licencor: FW
Contractor: Fluor
Inelectra

Order: 2001-04
Start up: 2004-10
BP-Gelsenkirchen, Germany

Licencor: FW

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

Order: 2003-06
Start up: 2004-05
Frontier, Kansas, USA

Licensor: Lummus
EPC: CBI

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

- Order: 2007
- Start up: 2008

- remote cutting system
HMEL, India

Licensor: Lummus
Contractor: EIL, India
PMC EIL

Scope:
– Cutting system, 2 pumps, 4 drums
– Order: 2008-10
– Start up: 2012-02
MRPL, India

Licensor: Lummus technology

Contractor: PLL, India

Scope:
– Cutting system, 2 pumps, 4 drums

– Order: 2009-10
– Start up: 2012-xx
DCU
Licensor: Foster Wheeler
PMC: JACOBS, India

Drums
- 4 drums, D = 9.80 m
- height, FF = 45.00 m

Pumps
- 2 x ADC 6x10
- Flow 318 m³/h
- Head 3585 m
Testbed of Decoking Jet Pump

Jet Pump

Performance test
(RP-test field)
Full speed

Functional test:
(50 Hz)
Jet Pump
Motor
Lube oil system
Decoking Control valve
Cutting Tool

Capacity 272 m³/h
Head 2850 m
Speed 2900 rpm
Temperature 70 °C
Medium Water
Decoking Jet Pump

**Jet Pump India**

- Jet Pump unit
- LOU
- Decoking Control valve

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Capacity</td>
<td>295 m³/h</td>
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<tr>
<td></td>
<td>1300 gpm</td>
</tr>
<tr>
<td>Head</td>
<td>3158 m</td>
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<tr>
<td></td>
<td>4492 psi</td>
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<tr>
<td>Speed</td>
<td>3923 rpm</td>
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<tr>
<td>Temperature</td>
<td>65 °C</td>
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<tr>
<td>Medium</td>
<td>Water with coke fines</td>
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</table>
Cutting system: Hoist and DSD

**Electrical system**
- Features
  - 1 VFD set for hoists
    - 1 running, 1 stand by
  - 1 VFD set for DSDs
    - 1 running, 1 stand by
  - VFDs, 1 set per coker,
    - Installed in safe area, or
    - Cutting deck
  - Redundant installation

**Hydraulic system**
- Features
  - Hydraulic power unit
  - 1 hyd. hoist/DSD per drum
  - 1 Operator panel per drum pair
  - Control electric/electronic
  - Integrated in PLC system
  - Measurement of force, tension

**Pneumatic system**
- Not recommended
  - Un- sufficient power,
  - Oil polluted air
  - High noise level
  - Remote / automatic control
    - Not reliable
Weight of Coke
History

Hoist pull force related to drum size and jet pump power

- Hoist Pull Force (Standard) %
- Hoist Pull Force (RP) %
- Jet Pump Power %
- coke per drum %

<table>
<thead>
<tr>
<th>Year</th>
<th>Hoist Pull Force (Standard)</th>
<th>Hoist Pull Force (RP)</th>
<th>Jet Pump Power</th>
<th>coke per drum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>100</td>
<td>120</td>
<td>140</td>
<td>80</td>
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<td>1980</td>
<td>110</td>
<td>130</td>
<td>150</td>
<td>90</td>
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<td>1985</td>
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<td>2010</td>
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<td>190</td>
<td>210</td>
<td>150</td>
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<tr>
<td>2015</td>
<td>180</td>
<td>200</td>
<td>220</td>
<td>160</td>
</tr>
</tbody>
</table>
Hoist and Rope

• Hoist with integral cartridge gear
  – drum with grooves
  – Pull force 5 t
  – slack rope indicator
  • locks the hoist

• Rope
  – measurement of tension in the rope
  – indication at the operator panel
  – avoiding of overload
Drill Stem Drive

- Drill Stem Drive
  - Electric motor
  - High load bearing
  - Grease lubrication
  - Cartridge packing
  - Swivel
  - Standard version (down to -20°C)

- Variable Frequency Converter VFC
  - At Cutting deck, or
  - At safe area
Basic design
- Slim tool, OD 13"
- Low lift force
- Low torque

- Switching devices
  - Manual / Automated
  - At the top of the tool

- Valves
  - Ballshape valves
  - No seals
  - Pressure operated

- Nozzles, cutting
  - 0°
  - 10° up both cutting nozzles

- Nozzles, drilling
  - 1 strong centre nozzle
  - 3 periphery nozzles
Control system, Manuel Operation

- **Main Control panel, safe area**
  - PLC,
  - Condition Monitoring System

- **Pump Control panel, pump area**
  - Start, stop of pump unit,
  - Remote/Local operation of Lube oil system
  - Remote/Local operation of DC valve

- **Operator panel, operator deck**
  - Installed in Operator shelter, Class I Div.II,
  - Centre panel and 2 drum panel for each pair of drums
Control system

Main Control Panel,

Pump area

- Operation of pump unit,
- Lube oil unit
- Panelview
- Condition monitoring
- Maintenance provision
- Status indication by Imps

25.03.2004
Operator Shelter with Panel

- Local Operator panel
  - Operation of
    - Decoking valve
    - Isolation valve
    - Hoist
    - Drill stem drive
  - Interactive P&ID
Control and process visualisation

OVERVIEW

RUHRPUMPEN Specialist for Pump Technology
Why remote and automatic coke cutting?  
**Advantage, Benefits**

1. **Safety**
   - Increased Safety
   - “No Men in the structure during Coke Cutting”

2. **Operation / Process**
   - Increased Stable process
     - More Data and information to the operator remote
     - More Data and information to Control Room remote/automatic

3. **More through put => more money**
   - Stable process, more through put
   - Reduced failure rate, reduced downtime, reduced maintenance
   - Minimizing of “human factor” with automatic coke cutting
Remote Coke Cutting system

Requirements for Remote Coke Cutting

• Coke Cutting System
  – Lifting System with enough Power for remote coke cutting
    • Hydraulic or electric driven Hoists and Drill Stem Drives
    • 5000 kg pull force lifting system

• Control System
  – Signal channelling from Cutting System thru PLC
  – Operator Panel with all Signals through PLC

• Drum Vibration Monitoring System
  • Vibration Probes at drum for remote coke cutting

• Automatic Coke Cutting Tool
  • Automatic switching from Drilling to Cutting while Jet Pump in Bypass
Basic design

Operation remote
Hunt Refining

Hunt, AL, USA

Licensor: Lummus
EPC: Commonwealth Eng.

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

- Order: 2009
- Start up: 2010

- remote cutting system
Hunt Refining

Hunt, AL, USA

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

– Order: 2009
– Start up: 2010

– remote cutting system
Hunt Refining

Hunt, AL, USA

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

– Order: 2009
– Start up: 2010

– remote cutting system
# References, running for several years

<table>
<thead>
<tr>
<th>Country, Location</th>
<th>Year</th>
<th>Company</th>
<th>System Type</th>
</tr>
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<tbody>
<tr>
<td>Germany, Germany</td>
<td>2006</td>
<td>BP</td>
<td>remote, automatic</td>
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<tr>
<td>USA, USA</td>
<td>2009</td>
<td>Frontier</td>
<td>remote, manual</td>
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<td>Argentina, Argentina</td>
<td>2010</td>
<td>Shell</td>
<td>remote, manual</td>
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<tr>
<td>USA, USA</td>
<td>2010</td>
<td>Hunt refining</td>
<td>remote, manual</td>
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</tbody>
</table>

RP has actual 2 orders for remote coke cutting system
3 orders for remote / automatic system
THANKS FOR YOUR ATTENTION