Opportunities and Limitations on Remote and Automatic Coke Cutting

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Dr. Wolfgang Paul
Ruhrpumpen - Organisation

Pump Division
Decoking Division
- RP-Argentina
- RP-Brazil
- RP-India
- RP-China
- RP-Egypt
Coke Cutting System

Opportunities for Remote / Automatic Decoking

- Safe and smooth operation
- Short Cutting Time
- Reduced failure rate
- NO STUCK TOOL
Requirements for Rem/Auto Coke Cutting

- **Coke Cutting System**
  - Lifting System with enough Power for Automatic Coke cutting
    - Hydraulic or electric driven Hoists and Drill Stem Drives
    - 5000 kg pull force lifting system

- **Control System**
  - Signal channelling from Cutting System to PLC
  - Operator Panel with Signal visualization through PLC remote CC
  - PLC-program with Automatic Cutting System Program autom. CC

- **Drum Vibration Monitoring System and Camera System**
  - Vibration Probes at drum
  - Camera Systems for Cutting Deck and Chute observation

- **Manual override**
  - Installation and Maintenance
Decoking Jet Pump

Jet Pump India
- Jet Pump unit
- LOU
- Decoking Control valve

Capacity 295 m³/h
1300 gpm

Head 3158 m
4492 psi

Speed 3923 rpm

Temperature 65 °C

Medium Water with coke fines
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
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

![Graph showing the relationship between coke weight and drum diameter.](image)
Cutting System Performance

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 %
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
Hoist, Block and Rope

Hoist, electrical driven, cartridge gear
- Electric driven, 45 kW
- Triple Brake system
- Pull force 5,000 kg
- slack rope device
- API Baseplate
- Safety cage

Rope
- 16/18 mm
- measurement of rope tension
- 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
Crosshead with FFA and DSD

Ruhrpumpen Drill Stem Drive
- grease lubricated
- modular design
- packing cartridge
- one main bearings
- hydraulic / electric

Tolerances of installation

Main beams
- outside-outside: 1640 mm
- acting width: 1400 mm

Tolerances
- guide beams/rails: +3/-3 mm
- main beams: +5/-15 mm
- +50/-25 mm special
- weight: 850 kg
- Reduced shock load: Vert. main beams

RUHRPUMPEN Specialist for Pump Technology
Automatic Cutting Tool

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
Drum Monitoring System

Drum Monitoring
Signals are channelled to PLC System,
Operation Information/Signals for Cutting System

Vibration
Noise
Operator Shelter with Panel

- Local Operator panel
  - Operation of
    - Decoking valve
    - Isolation valve
    - Hoist
    - Drill stem drive
  - Interactive P&ID
Basic design

Operation remote
Remote Operator Shelter

Remote Cutting System

Frontier, Kansas, USA 2008
Remote - Automatic Decoking

Instrumentation  drum-shute vibro-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
### References, running for several years

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

RP has actual 2 orders for remote coke cutting system
3 orders for remote / automatic system
BP-Gelsenkirchen, Germany

Licensor: FW

Scope
- Cutting system, automatic
- 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
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, AL, USA

Scope:
– Cutting system,
– 2 drums, revamped coker
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– Order:  2009
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Hunt, AL, USA

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– Start up: 2010
– remote cutting system
Remote and Automatic Coke Cutting

Results of Remote and Automatic Coke Cutting

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
THANKS FOR YOUR ATTENTION