Welcome to TRIPLAN Technology GmbH.

Closed Coke Slurry System

An Advanced Coke Handling Process

- Environment-Friendly
- Economical
- Safe

 TRIPLAN Technology GmbH
 Essostrasse 16
 76189 Karlsruhe
 Germany
 Ralf Gast / Bernd Lankers
Summary

TRIPLAN is offering a unique system for coke handling in a Delayed Coker Unit (DCU).

Unique in a way that the system;
- eliminates hazardous emissions
- provides the utmost safety to operators
- requires less water
- requires less operators
- reduces maintenance cost
- requires less space
- provides flexibility in plot plan

compared with traditional DCU design.

During our presentation we will highlight these unique features of the system, the benefits, and the many years of experience with extremely good results in an operating unit in Germany.
TRIPLAN AG – at a glance

- 50 Years in Service
- 750,000/a Engineering Hours
- 450 Employees
- Patented Technology Petrol-Coke-Handling
- Engineering Services
- Technology
- Software Solutions
- Chemical Industry Engineering
- Pharma & Life-Science Engineering
- Refinery & Petro-Chemical Engineering
TRIPLAN AG

- German Engineering company listed on Frankfurt Stock Exchange
- Specialized in Process Improvement & Optimization.
- India subsidiary since 2014.
- TRIPLAN Technology GmbH, Karlsruhe. Patented Technology for state of the art coke handling for Delayed Coking Unit

> CLOSED COKE SLURRY SYSTEM
Closed Coke Slurry System

Advantages at a glance

- Environmentally sound, fully closed, no steam plum, no dust, no volatile organic components

- Automated, fully controlled operation through Instrumentation with DCS architecture

- Reliable, robust, unique & proprietary design features for crusher and pumps; consequent use of abrasive & corrosive resistant materials

Engineering Service
- Feasibility Study / PDP
- Basic Engineering
- Basic Engineering / FEED Studie
- Detail Engineering
- Construction Management
- Commissioning
- Training

Equipment Service
- Crusher
- Pumps
- Transition Piece
- DCS
- Quality Assurance Expediting
- Service and Spare Parts
Delayed Coker Unit

How they are presented

Source: IOCL
Delayed Coker Unit

How they are presented
Conventional Coke Handling
Conventional Pit/Pad System

Source: Google Maps
Disadvantages

... of Conventional Open Pit/Pad System

High Emission
- Coke Fines & 20% VOC to the Atmosphere with Exhaust Steam from Open Pit

Separate Coke Crushing Step
- Coke Fines to the Atmosphere

Poor Dewatering
- Unhomogeneous in Different Coke Pile Regions
- Post-Drainage within Load Area / Railcars / Trucks Required

High Water Loss due to the Exhaust Steam from Open Pit
- High Quantity of Make-Up Water

Maze Clogging
- Repeatedly Manual Sludge Disposal

Low Efficiency of Water Clarification System
- Fines in the Cutting Water

Poor Reliability and High Maintenance Cost
- e.g. Bridge Crane & Pumps
Closed Coke Slurry System

• Open System
• No In-Line Crusher
• Crane or Front-End Loader for Coke Transport
• Sludge Settling in Maze

TRIPLAN`s Proprietary Closed Coke Slurry System – CCSS

• Closed System
• Continuous Process between Cutting & Unloading
Process & Operating Features of CCS System

01 In-Line Crushing during Cutting Operation
02 Water Feeding for Coke Transport and Further Cooling
03 Forwarding Coke Slurry into the Dewatering Bin
04 Water Diffusing through the Voids of the Coarse Material into the Drain Water Basin
05 Forwarding Drain Water into the Water Settling Tank for Separation of Remaining Coke Fines (<0.5%)
06 Flushing Water for Cleaning Equipment and Piping
07 Coke Product from Dewatering Bin
08 Quenching Water for Decoking
09 Cutting water
10 Make-up water for Compensating Water Losses
11 Discharging Collected Sludge into the Slurry Basin
Advantages

... of Closed Coke Slurry System

Environment-Friendly
- No Effluents
- Minimum Steam Exhaust

Safe
- Safe & Healthy Environment for Fellow Worker
- Minimization of Occupational Accidents & Fire Hazard within the DCU

Efficient & Economical
- Effective Water Clarification
- Extensively Automation / Low Manpower
- No Emission of Coke Fines & VOC to the Atmosphere
- Less Footprint
- Omission of Open Pit/Pad with walls up to 17 Meter
- Low Water Consumption
- Low Operation & Maintenance Cost
Special Design of Selected Components

- Transition Piece & Crusher
- Dewatering Bins
- Slurry & Drain Water Pump
Double Roll Crusher

Dedicated Crushing Principle ...

- Holding the full coke drum inventory positively back – No avalanche outlet
- Handling any type of Coke from Premium Calcinate Grade to Shot Coke
- In-line grinding from 40"/1,000 mm to 4"/100 mm in one single step
Double Roll Crusher

Critical Equipment

- 80 Tons of Special Material
- Unique Design & Construction Features
- 50 mm / 2” Wall Casing Thickness
- German Craftsmanship, under 100 % TRIPLAN Supervision
- High Torque Direct Drive Each Roll
- Crushing Ratio till 10:1; 40” --> 4”
- Safe & Remote Operation
Slurry & Drain Water Pump

Triplan Technology GmbH

Slurry Pump

Critical Equipment

- No fines generation at low speed 600 RPM
- Design, construction and materials selection enable long cycle life
- Cavitation protection by impeller design
Transition Piece

Critical Equipment

- Compensation of axial and radial expansions caused by temperature differences in Coke Drum
- Closed system
- Cladded surface which has contact with abrasive medium - Coke/Water mixing
Dewatering Bin

Dedicated Dewatering Principle ...

- Hydrostatic Pressure enhances Drain Water Velocity
- Coarse Material of Coke serves as Filter for Trapping and Retaining Coke Fines
- Maximum Fines Retention (Sludge Retention Rate in Dewatering Bin >99.5%)
Dewatering Bin

Critical Equipment

- Closed Drum with Vent
- Drum Wall and Cone Section Fitted with Special Screens
- Uniform and Fast Dewatering
- Non-Clogging Type Screens
- Permanent Water Removal due to Static Draft
Dewatering Bin
Dewatering Bin

It can be placed anywhere where you need dry coke. ... thus kilometers away from your DCU location.
Features of CCSS

Smaller footprint

Conventional System
Features of CCSS

Reduced Height of DCU Superstructure

Note:
Structure height for NEW DCU can be lower

O.o.m up to 10 meters
Against conventional PIT design
### What can be expected from the Closed Coke Slurry System?

#### Measures to Improve Coke Handling Operation

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Emissions</td>
<td>Closed System to “cover” Processing</td>
</tr>
<tr>
<td>Continuous Operation</td>
<td>In-line Crusher</td>
</tr>
<tr>
<td>Efficient Dewatering</td>
<td>Special Dewatering Bin (Water Content ≤ 10%)</td>
</tr>
<tr>
<td>Low Make-Up Water Consumption</td>
<td>Water Cooling -&gt; Less Exhaust Steam Losses</td>
</tr>
<tr>
<td>Low Manpower Requirement</td>
<td>High Level of Automation</td>
</tr>
<tr>
<td>Effective Water Clarification</td>
<td>Water Filtering and Internal Sludge Recycle</td>
</tr>
<tr>
<td>Higher System Reliability</td>
<td>Unique Design &amp; Construction</td>
</tr>
</tbody>
</table>
Closed Coke Slurry System

... for existing plants

Retrofit e.g. Replacement for Open PIT/PAD

- Suitable for Multi-Drum Coker
- Footprint fits into any existing Coker Unit, maximum layout flexibility
- System Flexibility - Slurry Transport via pipeline (up to several kilometers) for Petcoke supply to remote customer (power stations / gasification plants / calciner plants)
- Basin construction in Concrete (above-/underground) or Steel (aboveground)
Thank you for your attention

More on Wikipedia:
https://de.wikipedia.org/wiki/Closed-Coke-Slurry-Verfahren

TRIPLAN Technology GmbH
Essostrasse 16
76189 Karlsruhe
Germany
Phone: +49 721 8308524
Fax: +49 721 8308510
http://www.triplantec.com/en