Closed Coke Slurry System

- An Advanced Coke Handling Process sets the benchmark for modern Delayed Coker Operations
- Most recent unit @ LOTOS, Poland successfully on stream since July 2019
  - Environment-Friendly
  - Economical
  - Safe

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Delayed Coker Unit

How DCU’s are usually presented in Brochures

Source: IOCL
Delayed Coker Unit

How DCU’s are usually presented in Brochures
Conventional Coke Handling

and that is the reality
Conventional Pit/Pad System

and that is the reality

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

Pit or Pad 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

2019 TRIPLAN Technology – Proprietary & Confidential
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

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Special Design & Fabrication of Core Components

- Dewatering Bins
- Transition Piece & Crusher
- 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

Special Equipment

- 80 Tons of Special Material
- Unique Design & Construction Features
- 50 mm / 2” Wall Casing Thickness
- Designed for Green Coke, Anode Grade Coke and Needle Coke
- High Torque Direct Drive Each Roll
- Crushing Ratio till 10:1; 40” --> 4”
- Safe & Remote Operation
Slurry Pump

Special 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

Special 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

Special 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.
LOTOS Group*

* data at the end of 2018;  ** Euro exchange rate: 4.2 PLN/EUR

5,000 employment in LOTOS Group

20,4 thousand boe /day average daily oil and gas production

10.8 mln tonnes production of finished goods

495 Gas station

EUR 240.95 mln ** EBITDA LIFO (increase +2% y/y)

96% recovery of waste generated by itself

ADRIAN SZKUDLARSKI
Management Board Member of LOTOS Asfalt
Project rationale – why heavy residue processing?

- After implementation of 10+ Program we still produce about 2 mln ton/year of heavy products
- HSFO contains on average 26% of middle distillates
- Substantial negative margin of heavy products vs. crude oil
- According to the long term forecasts such situation will remain or become worse
- More and more stringent quality specifications for fuel and bunker oil create a risk of difficulty in placing these products on the market
Increasing refinery complexity step by step

Products structure

- Low value products
- Coke
- Hydrowax
- High value products (fuels & lube oils)

Adrian Szkudlarski - Management Board Member of LOTOS Asfalt
Coking Project major objectives

➢ To achieve flexible technical capabilities allowing for processing of all heavy residues

➢ To maximize the level of utilization of the existing assets (HDS and MHC)

➢ To maximize further production of middle distillates

➢ To increase conversion ratio of feedstock and resulting refinery margin

➢ To minimize Investment cost by right selection of processing configuration
**Indicative schedule**

- **Conceptual studies report approval**
- **Start of II development phase**
- **RFP for DCU EPC**
- **Implementation 48 months**
- **Financing closure**
- **Corporate decisions**
- **Start up**

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### DCU BDEP completion

- **2009**
- **2010**
- **2011**
- **2012**
- **2013**
- **2014**
- **2015**
- **2016**
- **2017**
- **2018**
- **2019**

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Adrian Szkudlarski - Management Board Member of LOTOS Asfalt
Project LOTOS / Gdansk

Facts

- 2 - Drum DCU
- 18 Hours Cycle
- Footprint about 200 m² (25% of open Pit)
- 15 m from unheading to ground
- DCU Licensor CLG
- EPC KT
- Coking.com involvement
- Capex 518 mln EURO
Reasons for LOTOS to opt for the Closed Coke Slurry System

No Emissions
- Closed coke drying system
- no dust emissions
- no odor emissions

Economic
- Water Cooling -> Less Exhaust Steam Losses
- less human resources - high level of automation

Operational
- Reduction of drainage time
- Elimination of shoot coke

Image
- The image-preserved the purity level of installation - crack coke dust

Higher System Reliability
- Unique Design & Construction

Localization
- smaller area compared to standard unit

HSE
- work at the coke - worse place to work

Solutions above BAT
- residual gases from the reactors sucked off before opening with a dedicated compressor
- Closed coke unloading, transport and storage systems

Adrian Szkudlarski - Management Board Member of LOTOS Asfalt
Distance from the nearest residential buildings

437.4 m

Adrian Szkudlarski - Management Board Member of LOTOS Asfalt
Features of CCSS

Reduced Hight of DCU Superstructure

Note:
Structure height for NEW DCU can be lower

Smaller & flexible footprint
Project LOTOS / Gdansk

Triplan Facts

• Long Leads:
  – Crushers: max 18 month
  – Pumps: max 12 month

Adrian Szkudlarski - Management Board Member of LOTOS Asfalt
Training, Conference and Exhibition
9–12 November 2020
Gdańsk, Poland
Prospects and Highlights 2019 / 2020

Prospects (Grassroot)
• Russia; 4 Drum DCU
• Germany; 2 Drum DCU
• China; 2 Drum ( Needle Coke )

Prospects (Upgrader)
• China; 2 Drum ( Needle Coke )
• Taiwan 4 Drum DCU

Highlights
• Lotos Polen Gdansk; Startup in July/August 2019
Thank you for your attention

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

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