

Closed Coke Slurry System

- An Advanced Coke Handling Process sets the benchmark for modern Delayed Coker Operations
- •Most recent unit @ LOTOS, Poland sucessfully 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



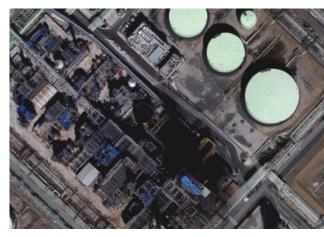




Conventional Pit/Pad System

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

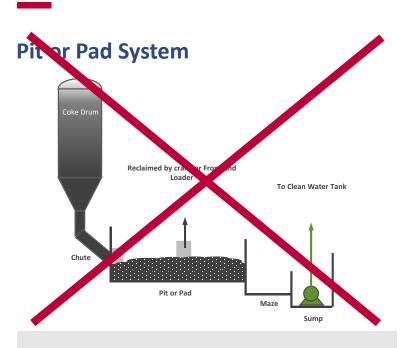
Fines in the Cutting Water

Poor Reliability and High Maintenance Cost

• e.g. Bridge Crane & Pumps

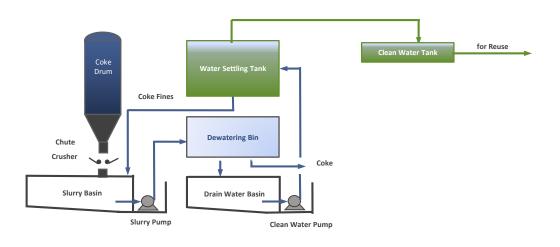


Closed Coke Slurry System



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

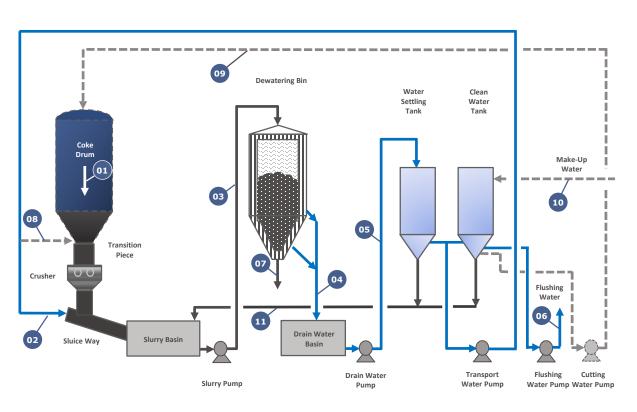
TRIPLAN's Proprietary Closed Coke Slurry System – CCSS



- Closed System
- Continuous Process between Cutting & Unloading



Process & Operating Features of CCS System



- In-Line Crushing during Cutting Operation
- Water Feeding for Coke
 Transport and Further Cooling
- Forwarding Coke Slurry into the Dewatering Bin
- Water Diffusing through the Voids of the Coarse Material into the Drain Water Basin
- Forwarding Drain Water into the Water Settling Tank for Separation of Remaining Coke Fines (<0.5%)

- Flushing Water for Cleaning Equipment and Piping
- Coke Product from Dewatering Bin
- Quenching Water for Decoking
- 09 Cutting water
- Make-up water for Compensating Water Losses
- Discharging Collected
 Sludge into the Slurry Basin



Advantages

... of Closed Coke Slurry System

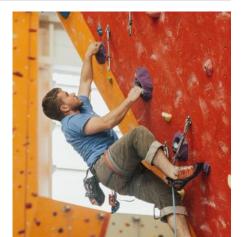


Environment-Friendly

- No Effluents
- Minimum Steam Exhaust

Safe

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



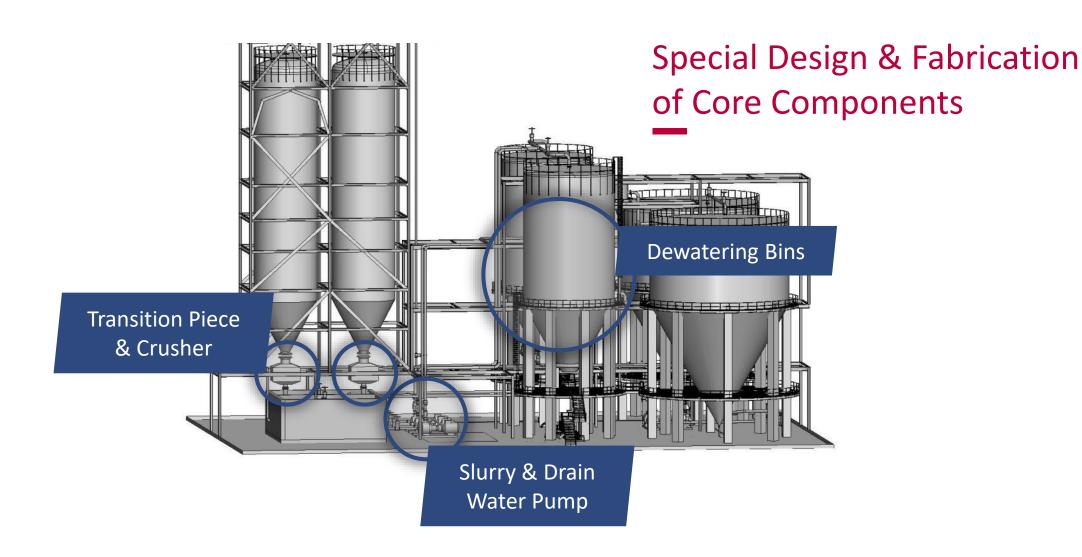


Efficient & Economical

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









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

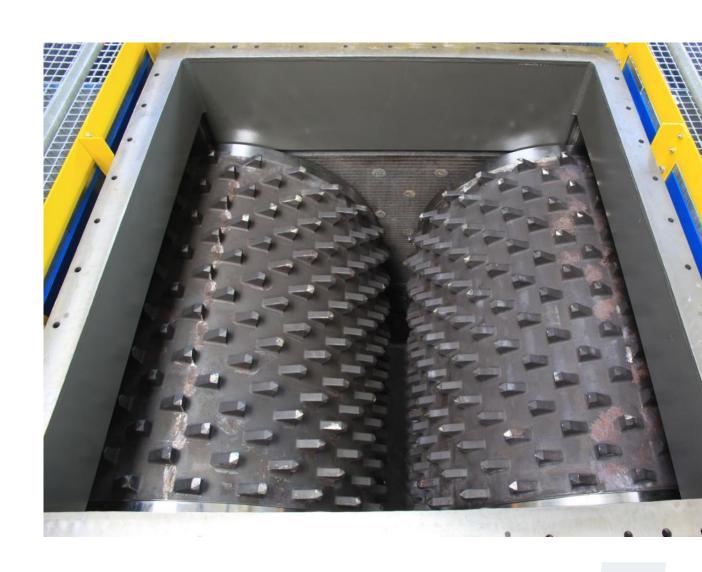
In-line grinding from 40"/1,000 mm to 4"/100 mm in one single step





Double Roll Crusher

- 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

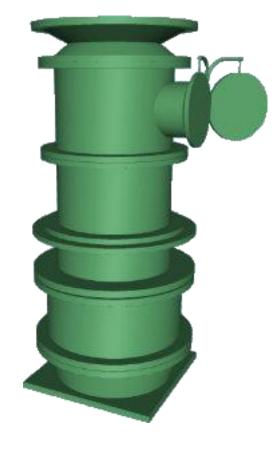
- No fines generation at low speed 600 RPM
- Design, construction and materials selection enable long cycle life
- Cavitation protection by impeller design

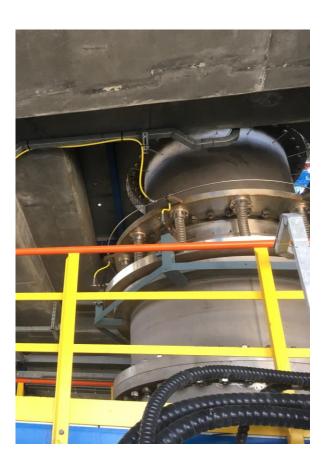




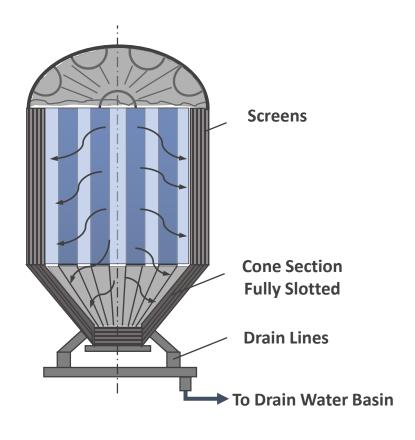
Transition Piece

- 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









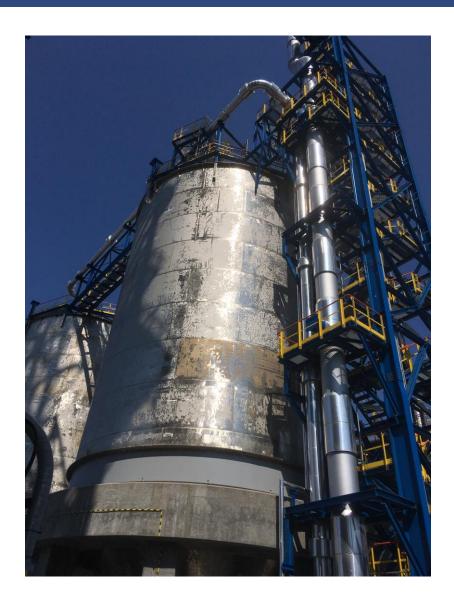
Dedicated Dewatering Principle ...

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 %)





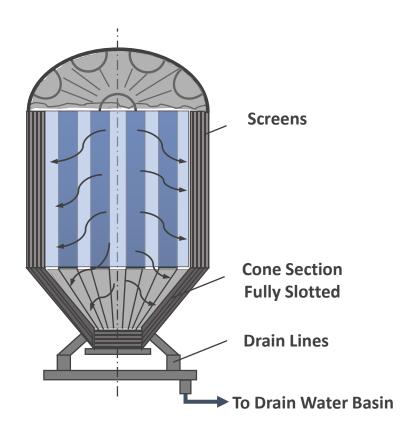
- Closed Drum with Vent
- Drum Wall and Cone Section Fitted with Special Screens
- Uniform and Fast Dewatering
- Non-Clogging Type Screens
- Permanent Water Removal due to Static Draft











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



LOTOS Group*



20,4 tousand boe /day

average daily oil ang gas production

EUR 240,95 mln ** producti

EBITDA LIFO (increase +2% y/y)

96%

recovery of waste generated by itself

10.8 mln tones production of finished goods

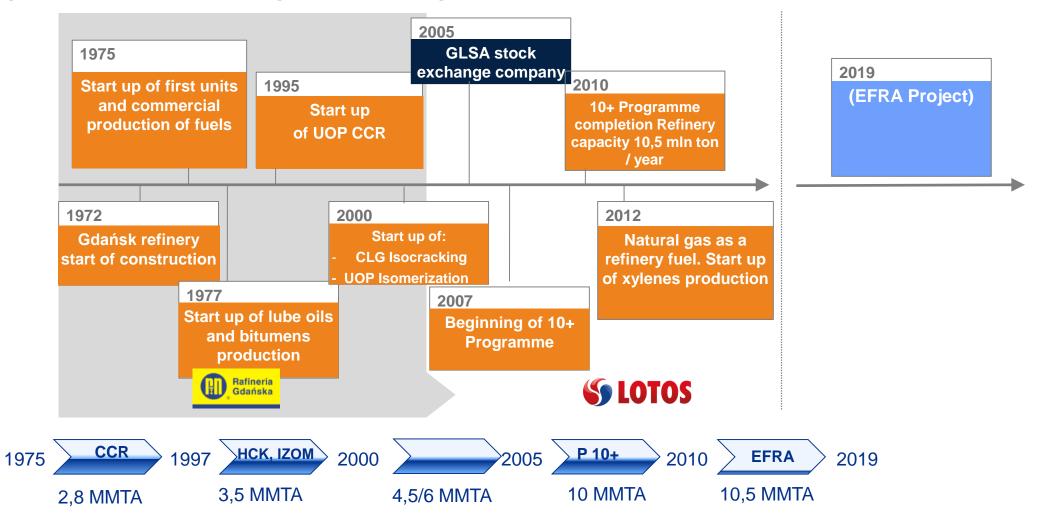
495

Gas station





Grupa LOTOS continuous process of improvements







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 producs on the market





Increasing refinery complexity step by step

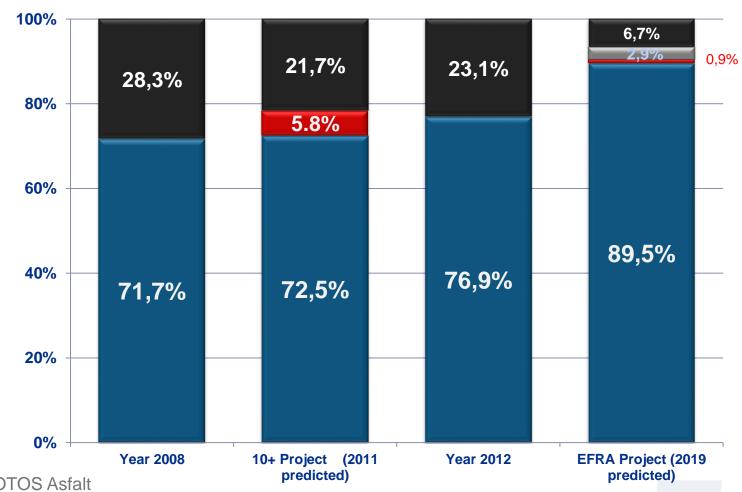
Products structure

■ Low value products

■ Coke

■ Hydrowax

■ High value products (fuels & lube oils)







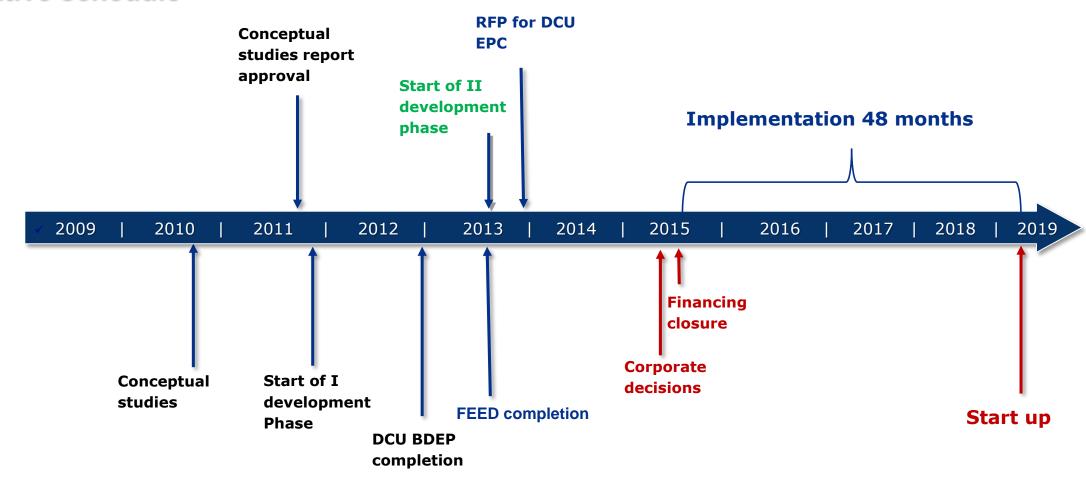
Coking Project major objectives

- > 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





Project LOTOS / Gdansk







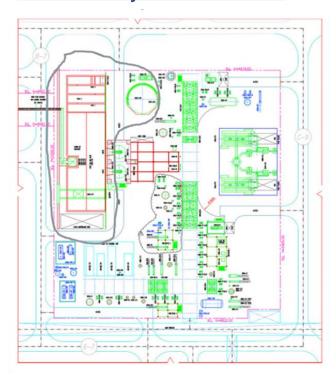


Project LOTOS / Gdansk

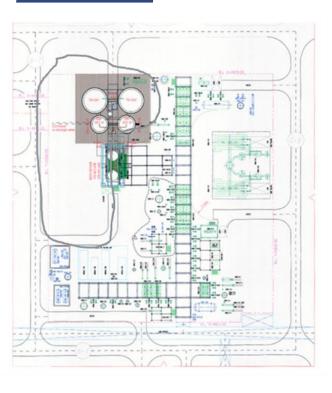
Facts

- 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

Conventional System



CCSS







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

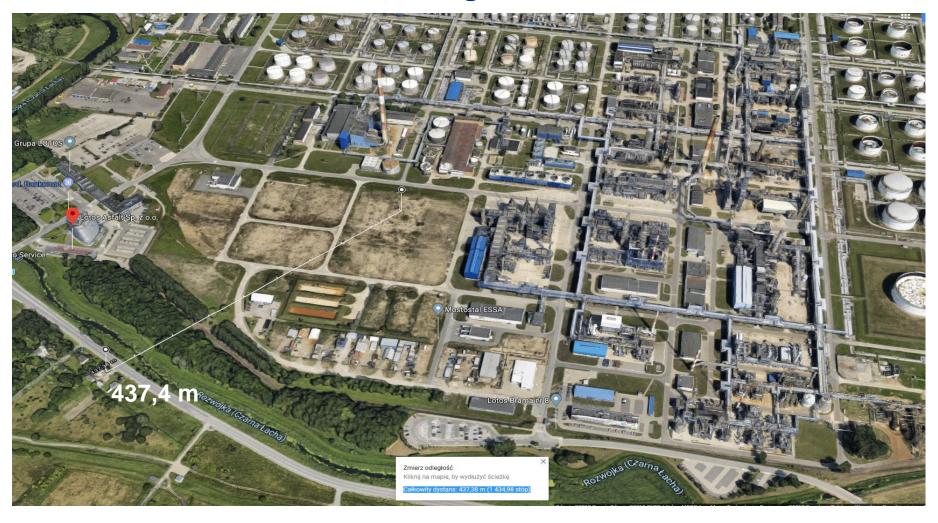
Solutions above BAT

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



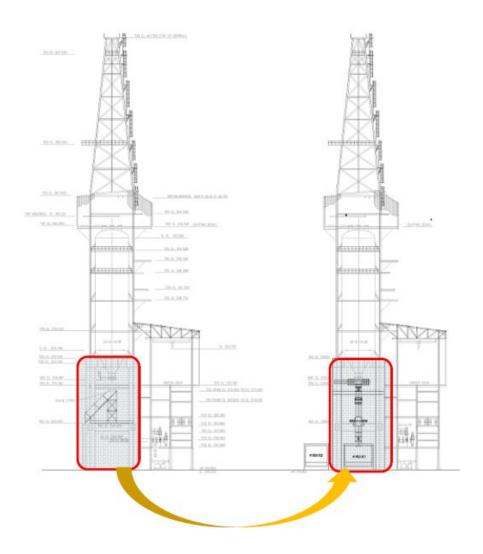


Distance from the nearest residential bildings









Features of CCSS

Reduced Hight of DCU Superstructure

Note:

Structure height for NEW DCU can be lower

Smaller & flexible footprint

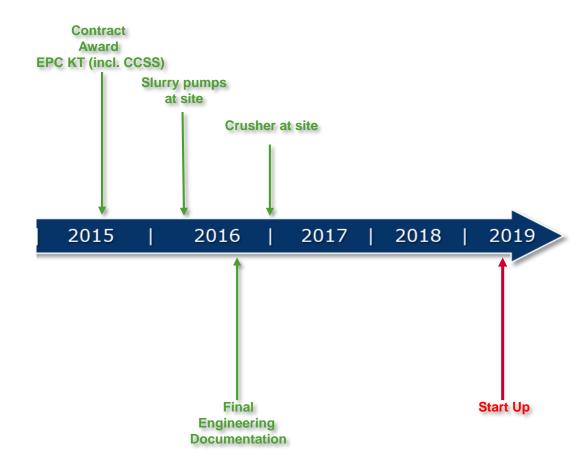




Project LOTOS / Gdansk

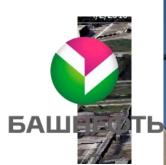
Triplan Facts

- Long Leads:
 - Crushers: max 18 month
 - Pumps: max 12 month



























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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