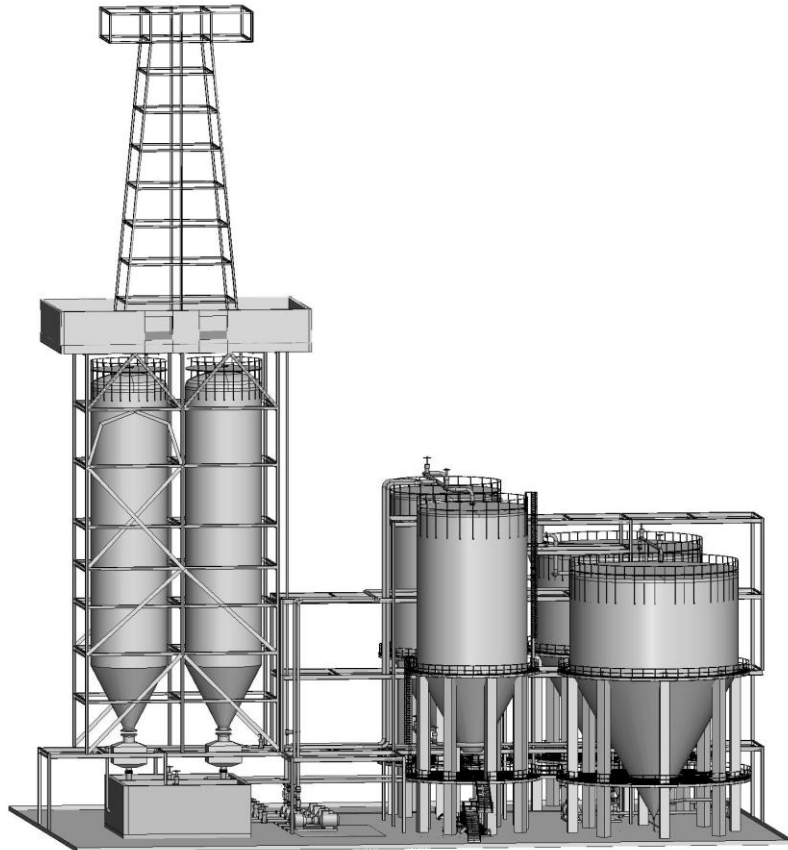




Closed Coke Slurry System

An Advanced Coke Handling Process

- Environment-Friendly
- Economical
- Safe

TRIPLAN Technology GmbH
Essostrasse 16
76189 Karlsruhe
Germany

Ralf Gast / Bernd Lankers

Summary

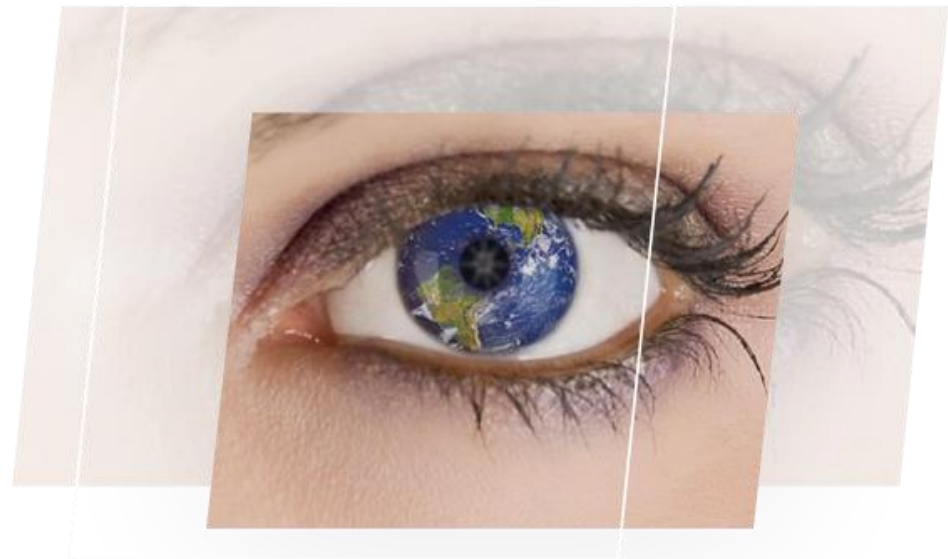
TRIPLAN is offering a unique system for coke handling in a Delayed Coker Unit (DCU).

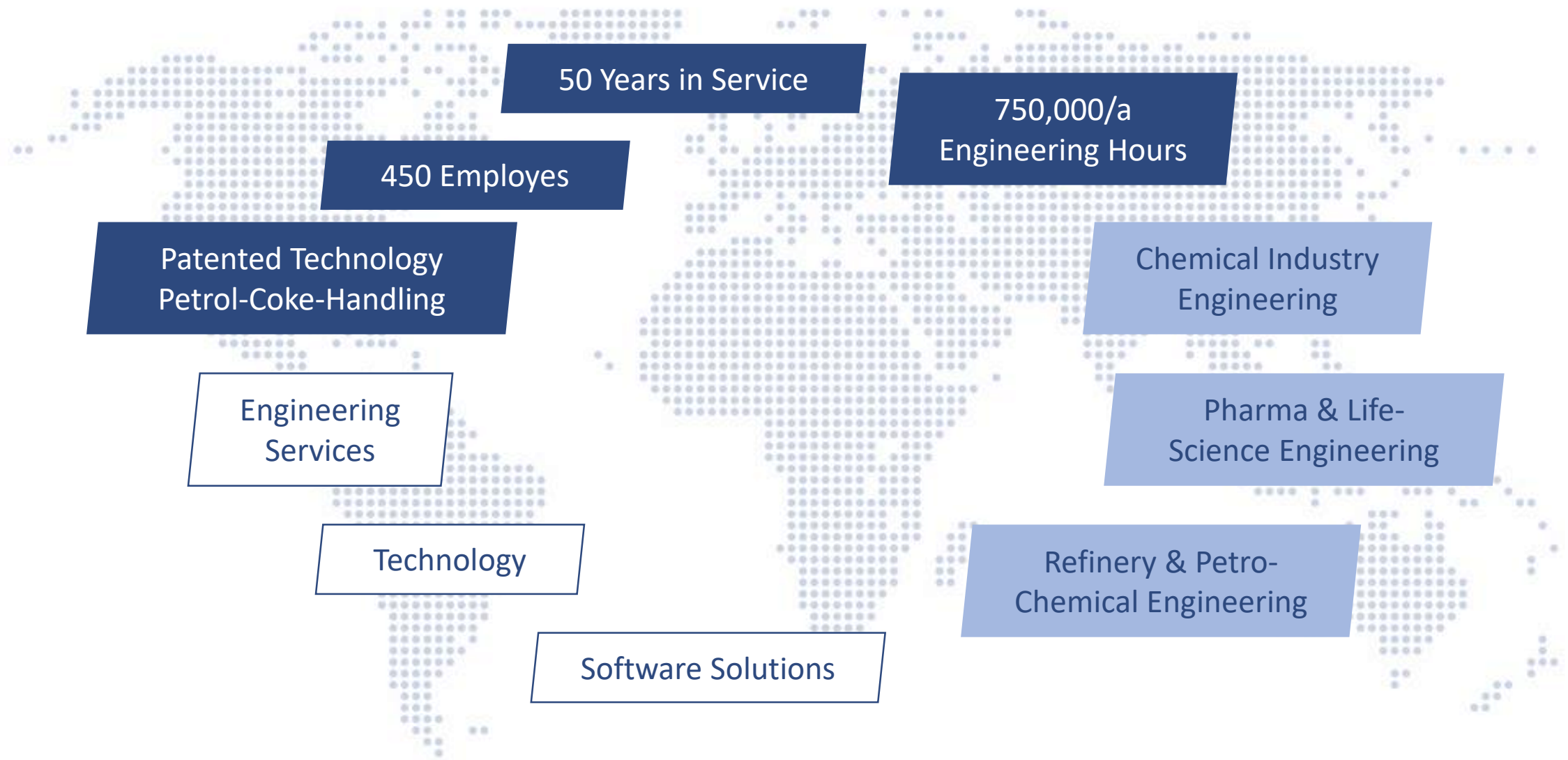
Unique in a way that the system;

- 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

- 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**



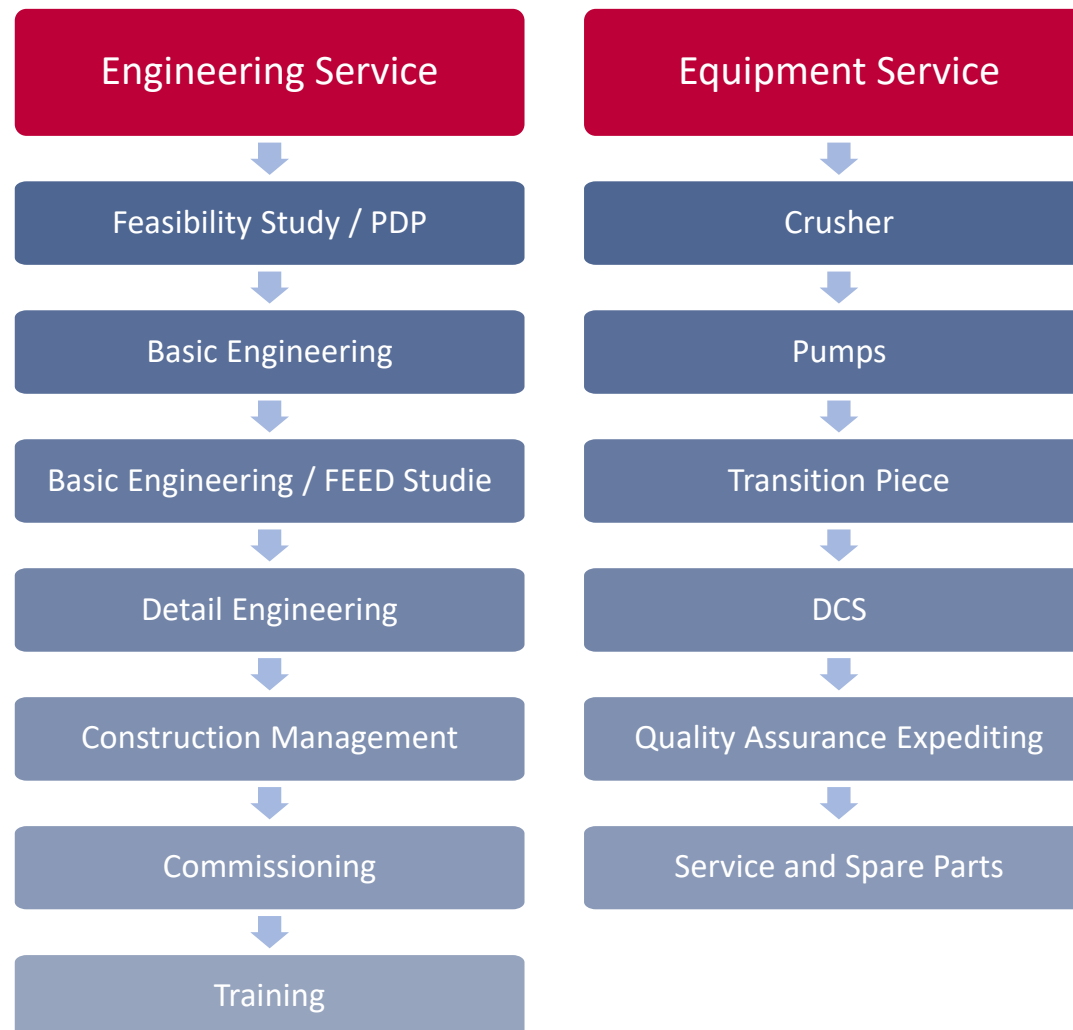
Closed Coke Slurry System

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





Delayed Coker Unit

How they are presented

Source: IOCL

Delayed Coker Unit

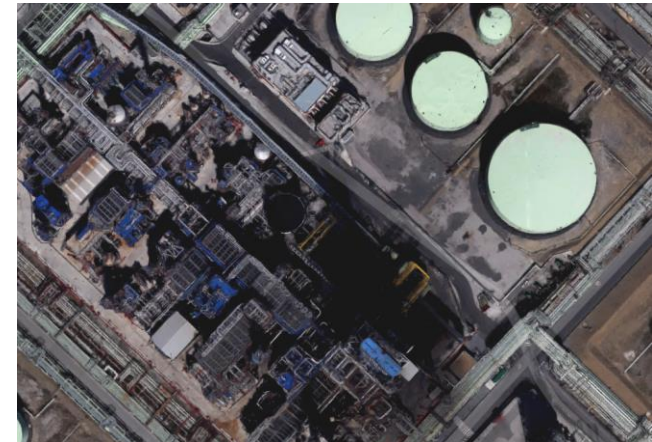
How they are presented



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

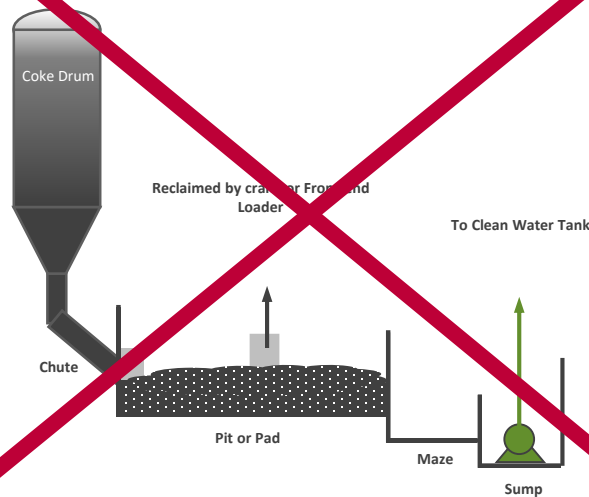
- Fines in the Cutting Water

Poor Reliability and High Maintenance Cost

- e.g. Bridge Crane & Pumps

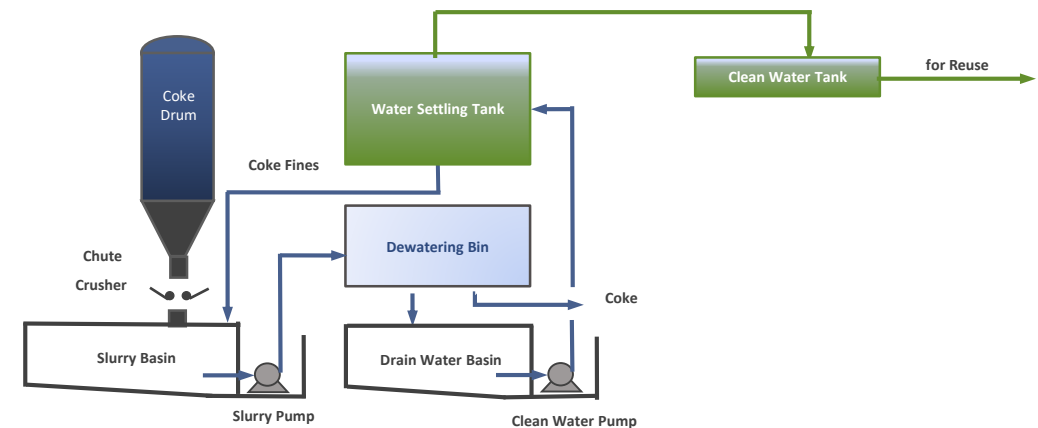
Closed Coke Slurry System

Pit or Pad System



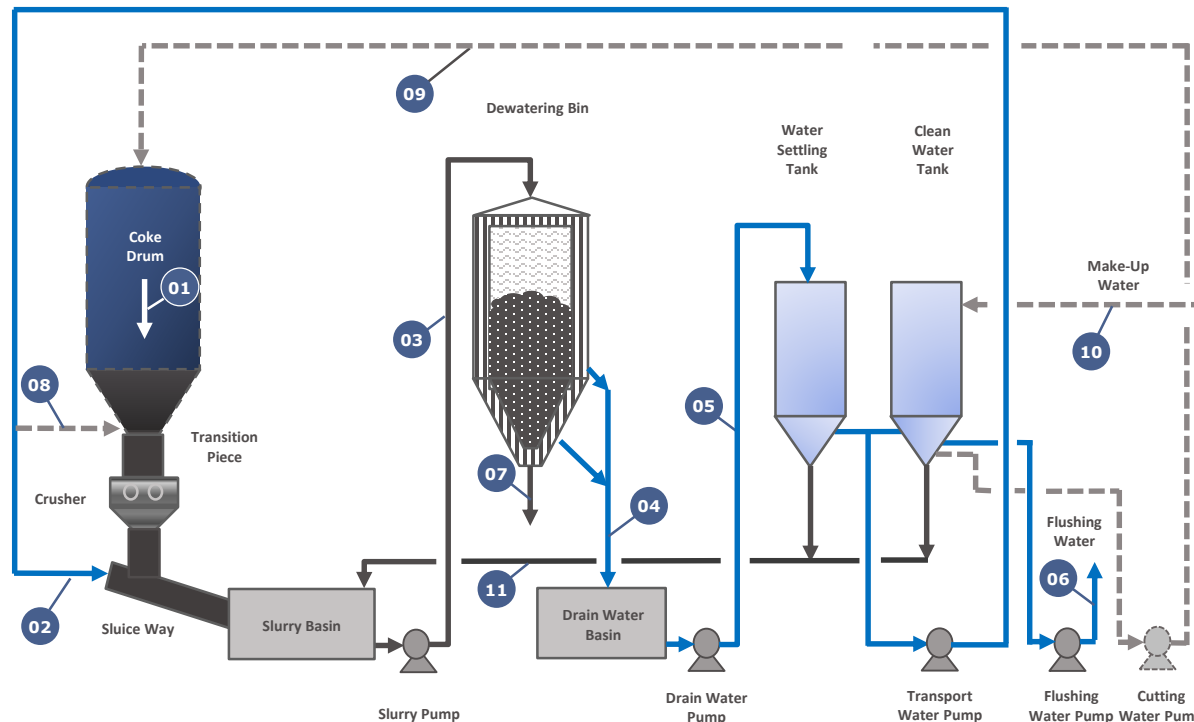
- Open System
- No In-Line Crusher
- Crane or Front-End Loader for Coke Transport
- Sludge Settling in Maze

TRIPLAN's Proprietary Closed Coke Slurry System – CCSS



- Closed System
- Continuous Process between Cutting & Unloading

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

EF

- No Effluents
- Minimum Steam Exhaust



Safe

S

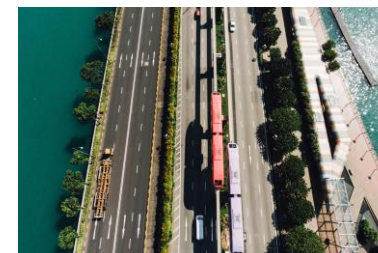
- Safe & Healthy Environment for Fellow Worker
- Minimization of Occupational Accidents & Fire Hazard within the DCU



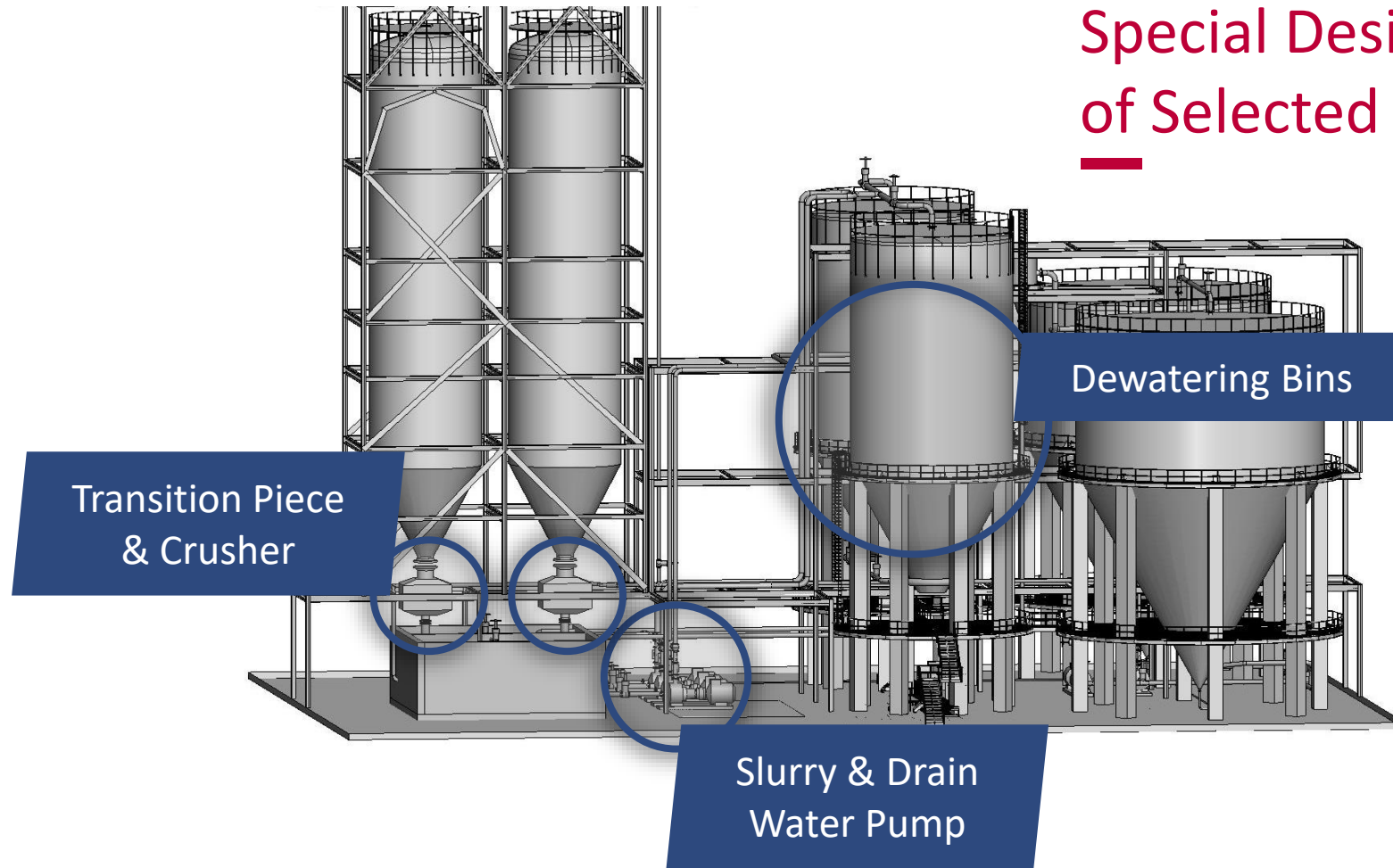
Efficient & Economical

EE

- 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



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

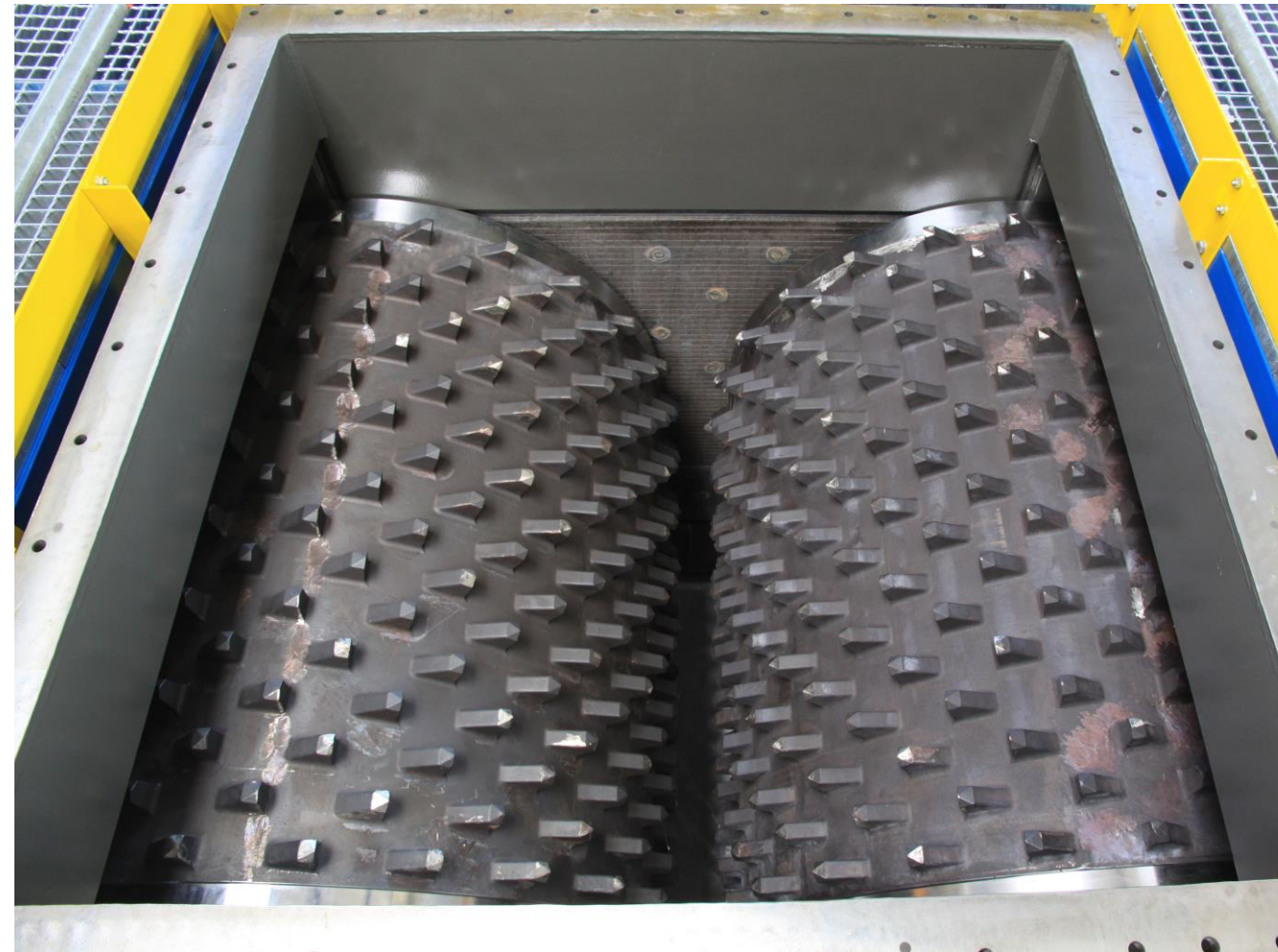
In-line grinding from 40"/1,000 mm to 4"/100 mm in one single step



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 Pump

Critical Equipment

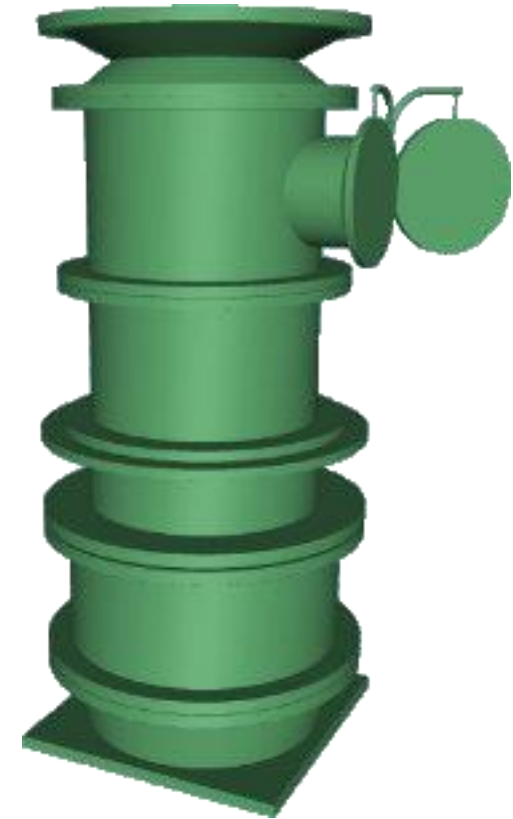
- No fines generation at low speed 600 RPM
- Design, construction and materials selection enable long cycle life
- Cavitation protection by impeller design

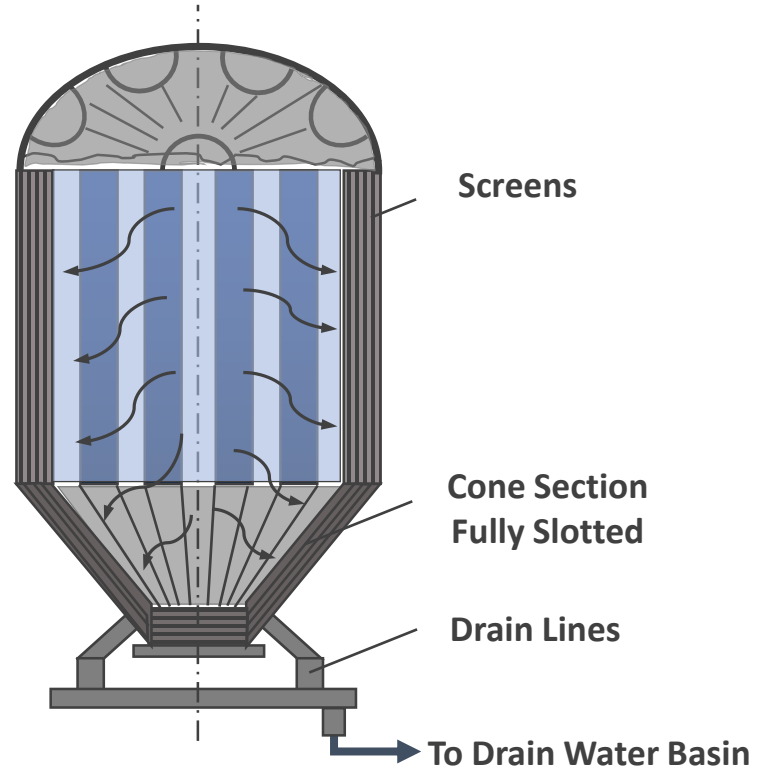


Transition Piece

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 ...

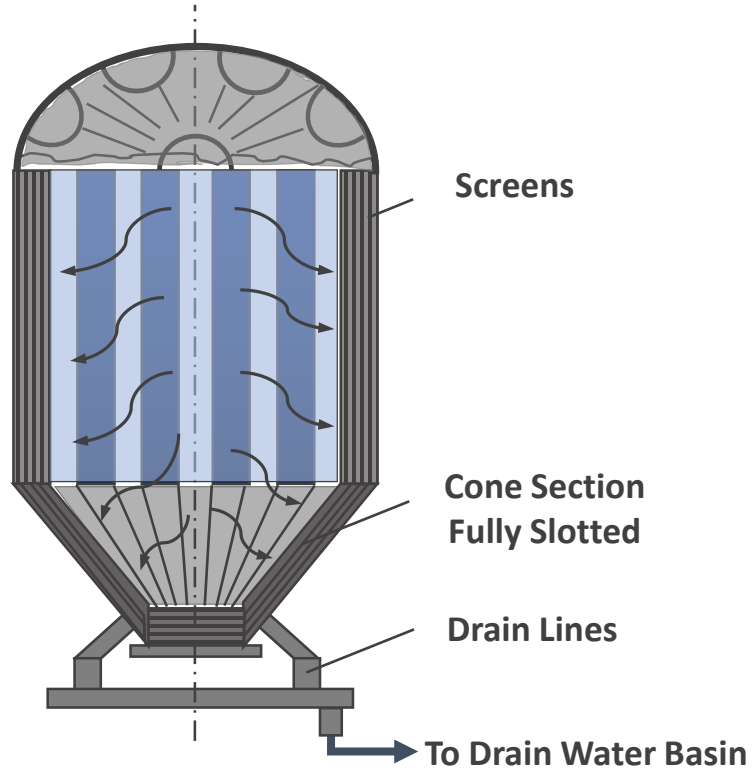
Hydrostatic Pressure enhances Drain Water Velocity

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



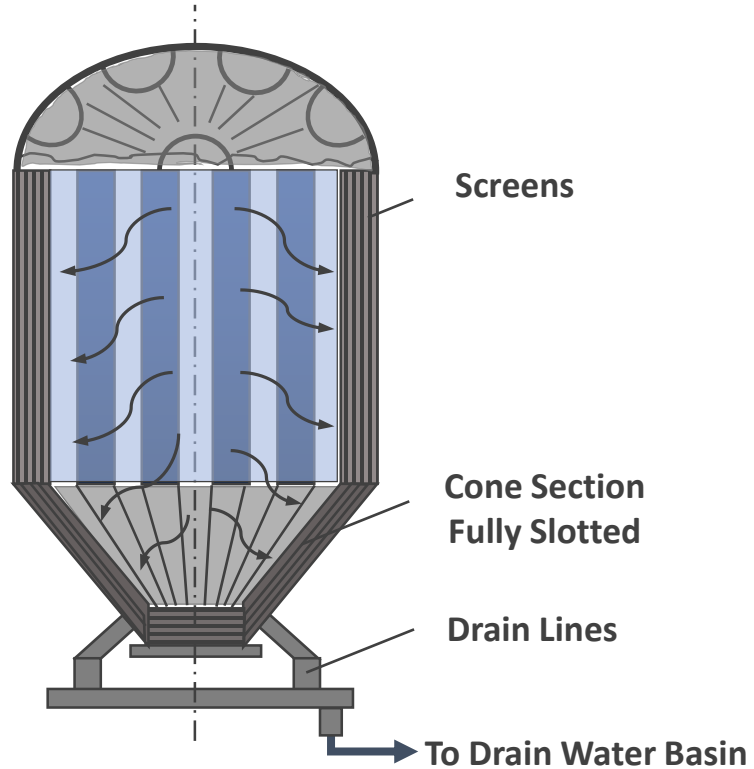
- Closed Drum with Vent
- Drum Wall and Cone Section Fitted with Special Screens
- Uniform and Fast Dewatering
- Non-Clogging Type Screens
- Permanent Water Removal due to Static Draft

Dewatering Bin



Dewatering Bin

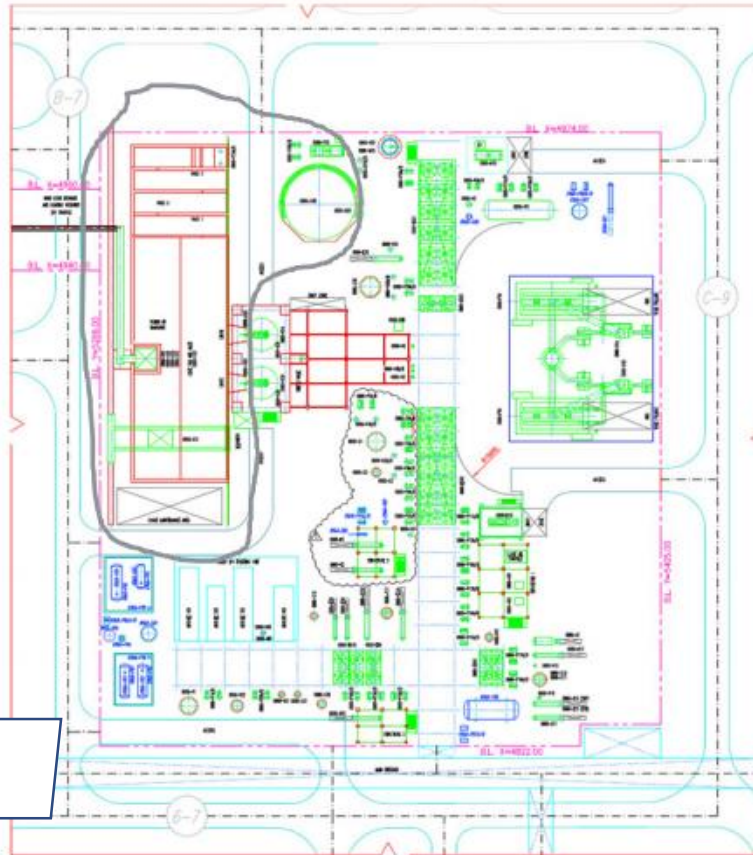
It can be placed anywhere where you need dry coke. ... thus kilometers away from your DCU location.



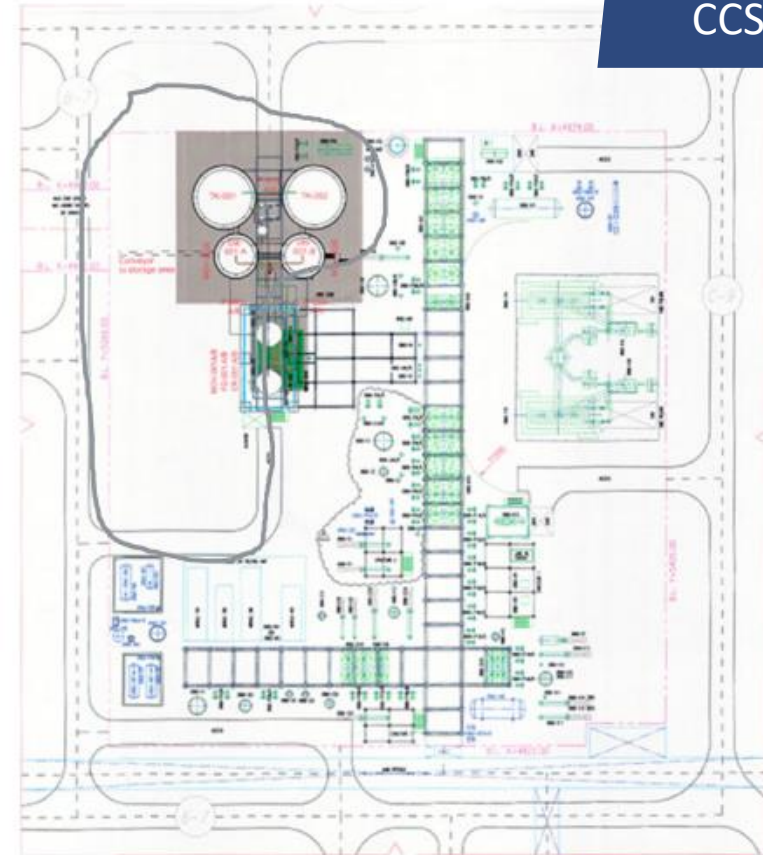
Features of CCSS

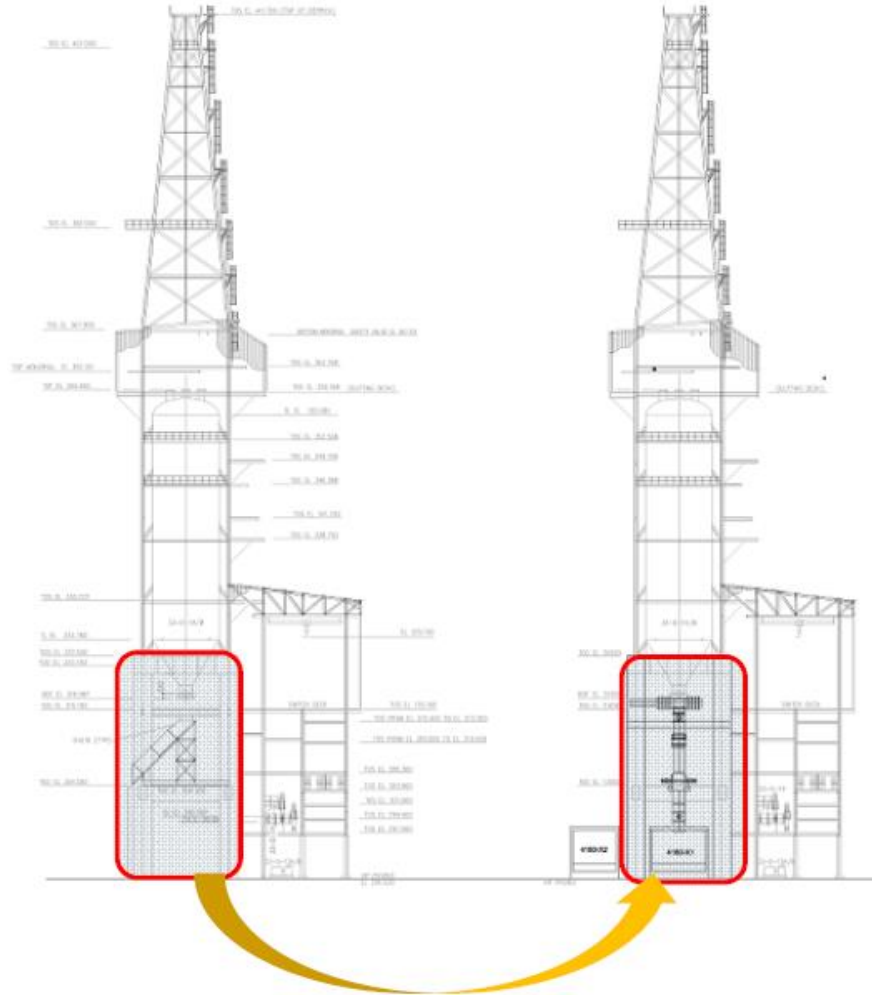
Smaller footprint

Conventional System



CCSS





Features of CCSS

Reduced Hight 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

No Emissions

- Closed System to “cover” Processing

Continuous Operation

- In-line Crusher

Efficient Dewatering

- Special Dewatering Bin (Water Content $\leq 10\%$)

Low Make-Up Water Consumption

- Water Cooling -> Less Exhaust Steam Losses

Low Manpower Requirement

- High Level of Automation

Effective Water Clarification

- Water Filtering and Internal Sludge Recycle

Higher System Reliability

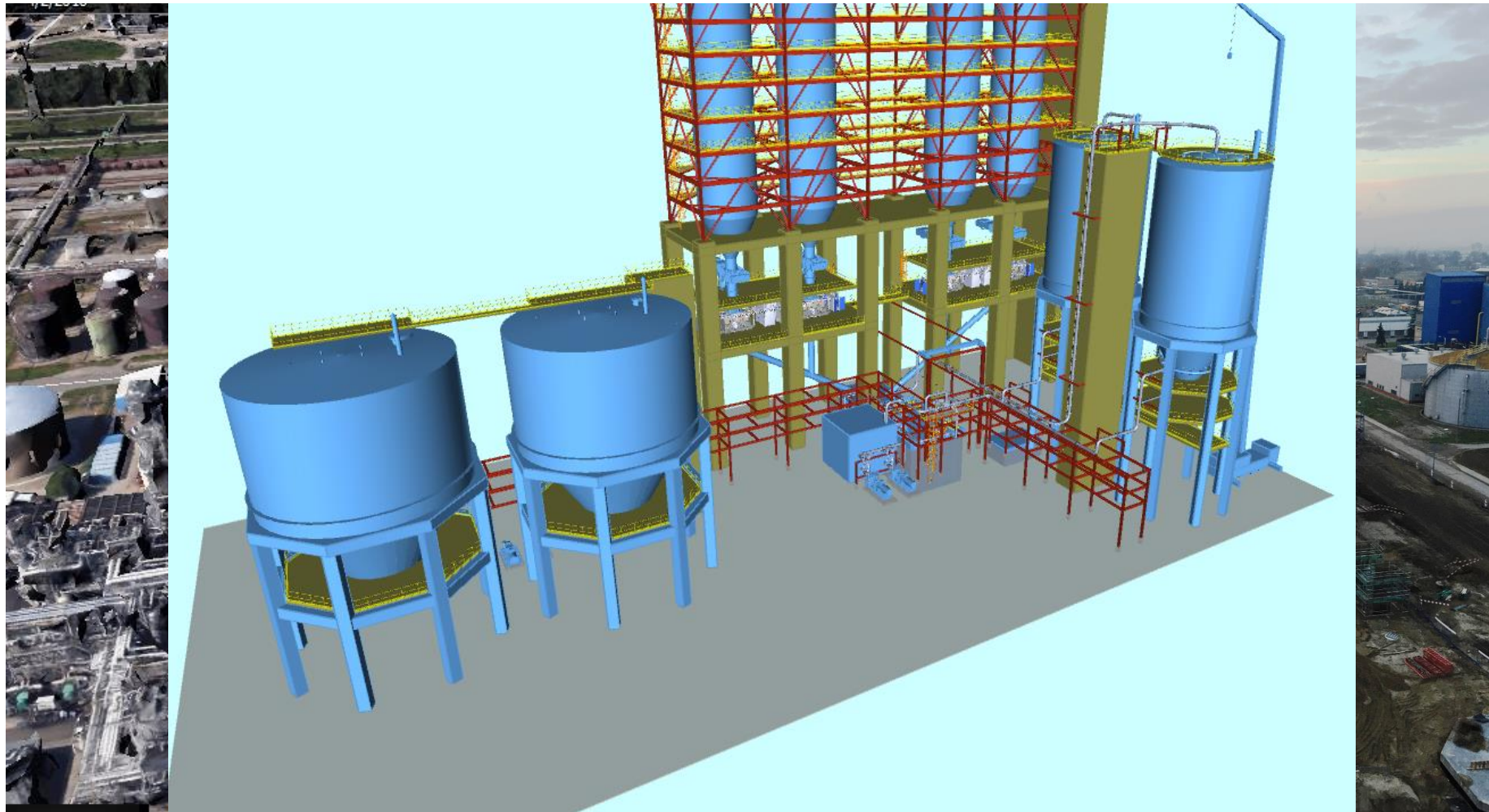
- Unique Design & Construction

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)



miRO

LOTOS

GAZPROM
NEFT

Thank you for your attention



More on Wikipedia:

<https://de.wikipedia.org/wiki/Closed-Coke-Slurry-Verfahren>

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