A CLEAN FUTURE FOR COKE PRODUCTION:

KT experience in grass root project & a revamp option case study

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KT
Kinetics Technology

SUMMARY

1. Introduction
2. Grass root EFRA project case study
3. Revamping case study
4. Conclusions

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SUMMARY

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INTRODUCTION

KT - Kinetics Technology is an EPC contractor with more then **40 years'** experience as Process Engineering Contractor in oil & gas, chemical and petrochemical industry.

KT is a well recognized international player in Licensing hydrogen and Sulphur Recovery and Tail Gas Treatment Technology with more then **120 Projects** completed in the last 10 years.

In the 2nd quarter of 2015 , KT awarded the LSTK contract for Engineering Procurement and Construction of a new Delayed Coking Complex for **LOTOS Refinery** in Gdansk, Poland.
This is part of **EFRA (Effective Refining)** project.

Grupa **LOTOS** is one of the most important and historical client of KT since 10 + Program

INTRODUCTION

Grupa Lotos S.A. is a vertically integrated oil company based in Gdansk, Poland. Its main activity branches are: crude oil production, refining and marketing of oil products. The company is a leader in lubricants.

Thanks to EFRA Project heavy residues from the refining process will be used more effectively.
The new Delayed Coke and Hydrogen Generation Complex is a fundamental part of this project.

LOTOS is a company highly focused to innovative solutions with special regard to environmental impacts and healthy of his operators together with care of neighbors.

The close cooperation of LOTOS and KT teams has been a fundamantal key point during project execution

INTRODUCTION

KT experience in EFRA project

The **EFRA (Effective Refining) project** is the natural continuation of Gdansk Refinery modernization plan started with 10+ program and a New Delayed Coking Unit to maximize heavy residues conversion becomes part of the new refinery scheme.

But….

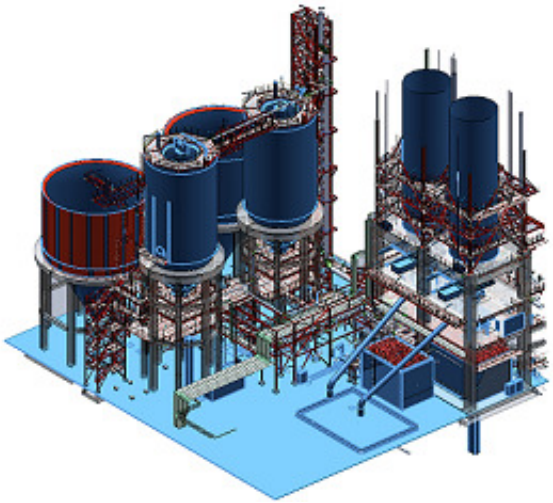
(too) close to Gdansk

INTRODUCTION

KT experience in EFRA project

In the frame of the EFRA project, LOTOS Refinery will be provided with an innovative system for coke handling, the **Closed Coke Slurry System (CCSS)** technology licensed by TRIPLAN.

The aim is to build a modern Delayed Coking Complex to minimize emissions from coke handling area.



Property of KT-Kinetics Technology

SUMMARY

2. Grass root EFRA project case study

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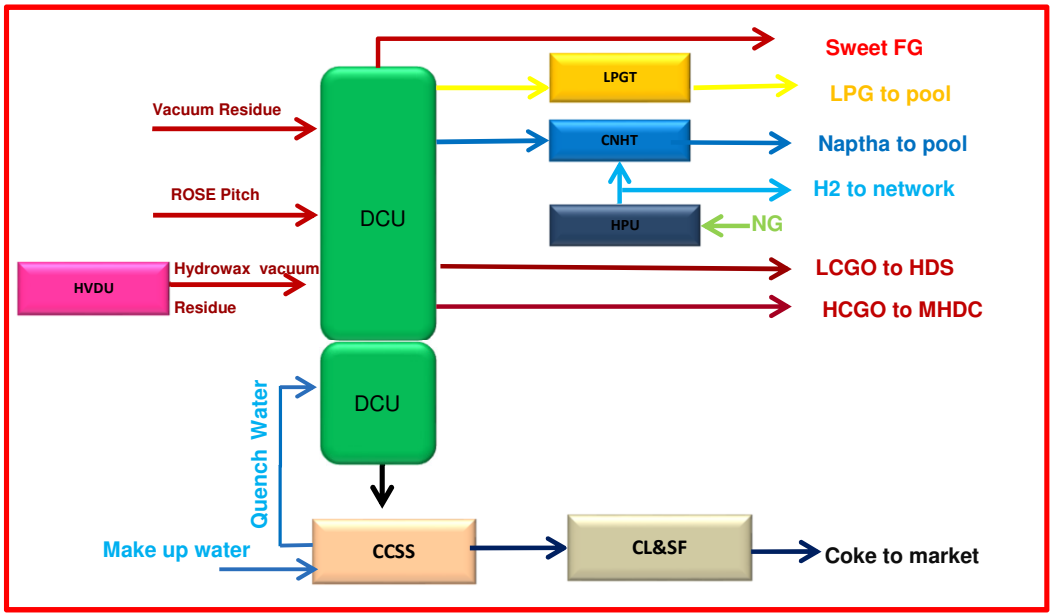
INTRODUCTION

KT experience in EFRA project (DCU complex)

Source: TRIPLAN's presentation 2015



- EPC scope , LSTK project
- Units capacity:
  DCU : 30000 BPSD
  CNHT : 3400 BPSD
  LPGT : 10 m3/h
  HPU : 28000 Nm3/h
  HVDU : 20000 BPSD
- Stringent Environmental constraints : Implementation of closed coke handling system (CCSS) licensed by Triplan

GRASS ROOT PROJECT CASE STUDY

Engineering topics of EFRA project Delayed Coking Unit

The Basic Design of CCSS (by TRIPLAN) has been integrated by KT in the basic design of DCU made by the Licensor (CBI/Lummus) and engineered in detail during project execution .

In comparison to the conventional Pit/Pad system, environmental and economical benefits were evident in TRIPLAN's closed system.

During project execution KT in cooperation with LOTOS technicians and operators has also developed additional features to further improve the design of the unit.

1. Environmental :
   - Minimization of emission to atmosphere
2. Operation and maintenance
   - Less manpower
   - More safety and healthy
3. Layout optimization
   - Footprint saving of 2500 m2

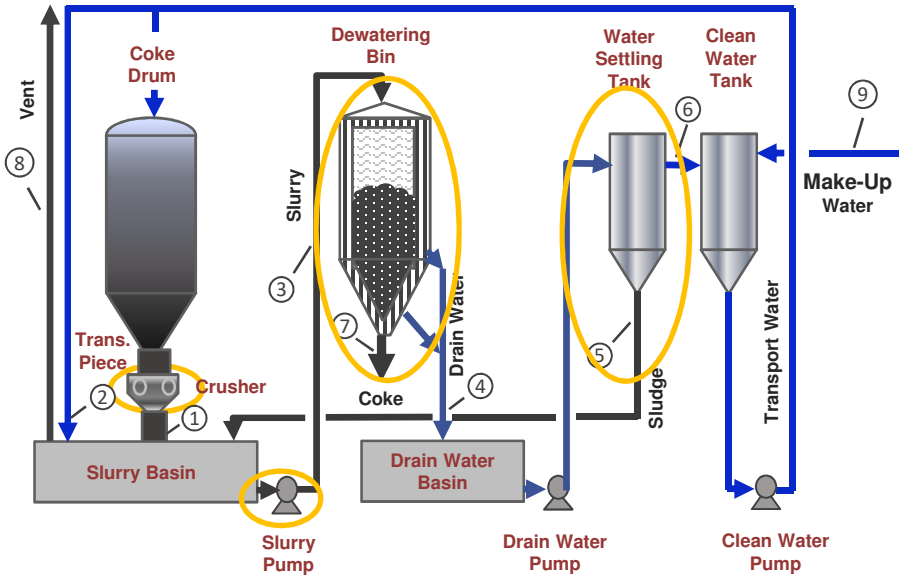
GRASS ROOT PROJECT CASE STUDY

Environmental : zero emission to atmosphere

Close Coke Slurry System (CCSS)

Refer to TRIPLAN's presentation for details

The elimination of emissions of fines (PM10) to atmosphere, typically in a range of 0.15-0.2 g/bbl of feed, is achieved by making in a "closed" loop all the operations conventionally executed in sequence to open air inside the open PIT/PAD.



Source: TRIPLAN's presentation 2015

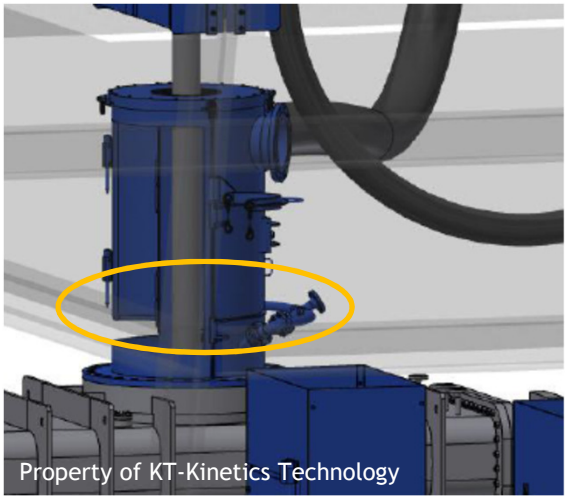
- The crushing of coke to desired size is done in-line after cutting, thanks to the location of the crusher just below the coke drums.
- The coke and the water used for cutting are collected in a closed basin forming a "slurry stream" suitable for pumping .
- The dewatering is performed in closed silos filled in batch via slurry pump.
- Recovered water is clarified from fines before re-use in the system

CCSS technology is a Patent

GRASS ROOT PROJECT CASE STUDY

Enclosure on Top flange connection

Environmental : Minimization of emission to atmosphere



To make more “closed” the entire system, the elimination of potential particles dispersion to atmosphere and in the cutting deck has been achieved with:

- provision of top flange with enclosure.
- provision of water spray nozzles for minimization of solid particles entrainment in the vapors during cutting
- collection of exhaust vapors out from cutting deck, with dedicated vent to atmosphere
- displacement of remaining coke particles (if any) to removable cart at slurry basin level.

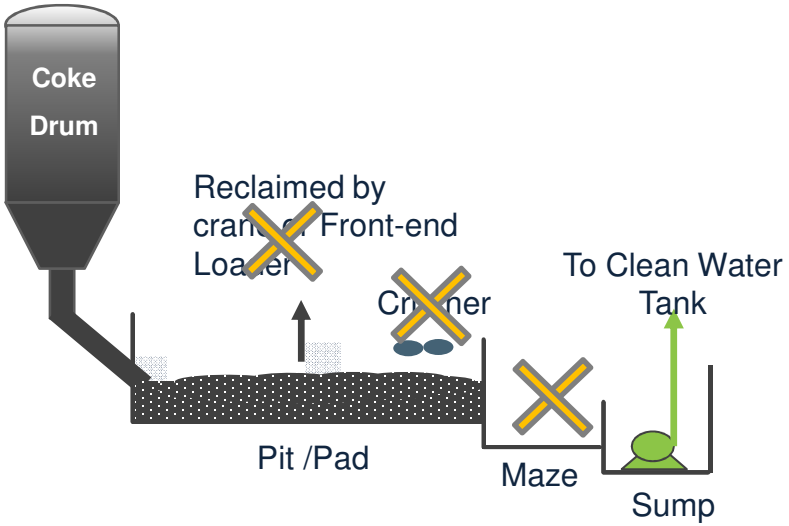
This system has been engineered by KT in cooperation with Rurhpumpen.

GRASS ROOT PROJECT CASE STUDY

Operation and Maintenance: less manpower

The conventional pit/pad system requires a substantial amount of manual work, especially for operating the overhead cranes or the front loaders, for coke crushing and sludge handling.

with the CCSS the following steps are avoided



Source: TRIPLAN's presentation 2015

. Crane operation

. Crusher loading

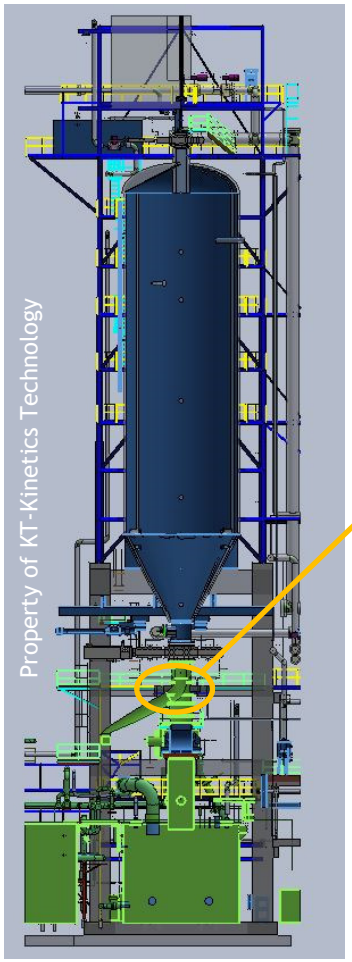
. Sludge handling

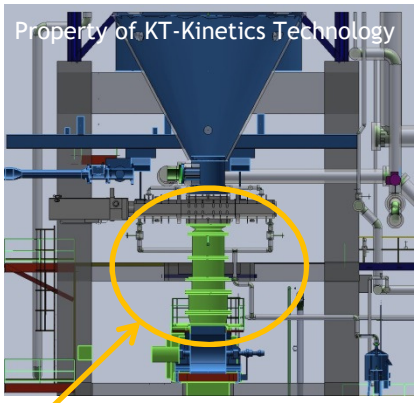
Save 6 to 8 workplace on permanent basis

GRASS ROOT PROJECT CASE STUDY

Transition Piece

Operation and Maintenance: less manpower/higher safety and healthy





The existing application of CCSS, is at MIRO refinery.
In this unit, the slurry basin is not located below the coke drums and the crusher not permanently connected.

The intervention of technicians from maintenance is required at every cycle, to connect and disconnect the crusher.

The improvement made for EFRA project has been the introduction of a special pipe (Transition piece) connecting the coke drums to the crushers.

This is always in place and is designed to withstand to different thermal expansion (axial and radial) over coking cycle.

Save additional 2 to 3 workplace on permanent basis

The transition piece is a Patent Application

GRASS ROOT PROJECT CASE STUDY

Operation and Maintenance: higher safety and healthy

The CCSS in comparison to a conventional system is a considerable improvement for the overall operability of the unit:

- Elimination all man power required for Pit/Pad system operation, mostly manual operation
- No exposure to un-healthy environmental ambient **(PM_{10}).**

Thanks to the transition piece implementation, LOTOS refinery will take advantage of:

- further reduction of 2 to 3 technicians (as minimum) from maintenance and operation.
- elimination of exposure to potential hazard during coke drums/crusher connection and disconnection

Saves up to 500000 € per year

Estimated 8 workplace (minimum) reduction on permanent basis.

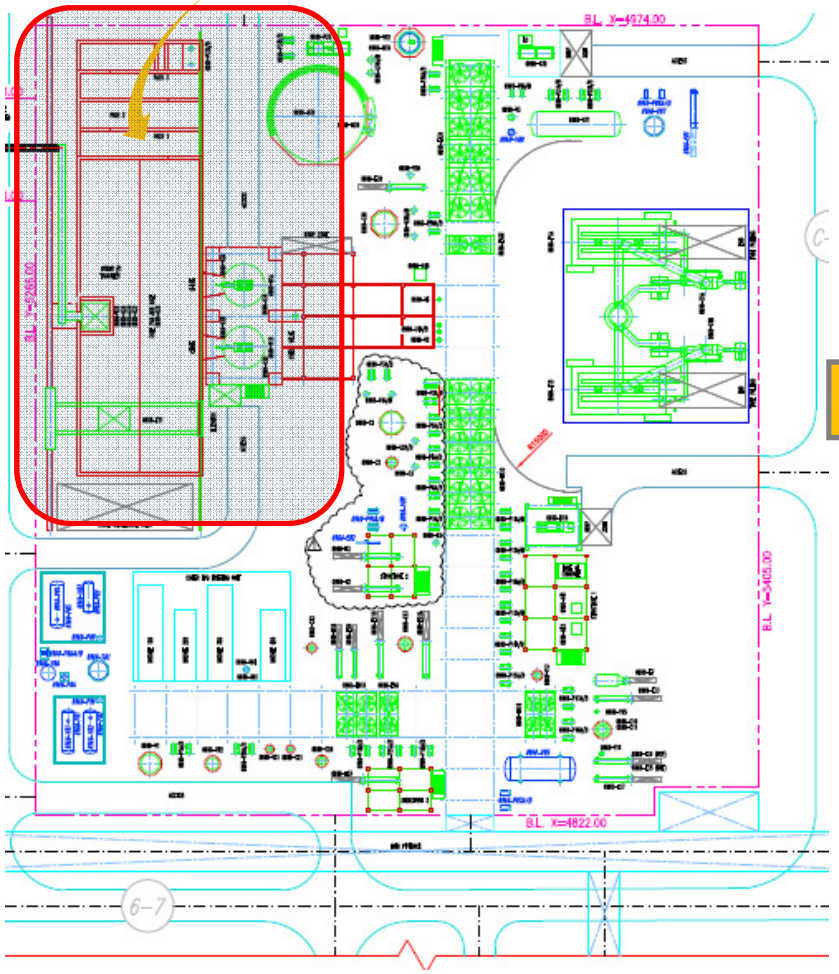
GRASS ROOT PROJECT CASE STUDY

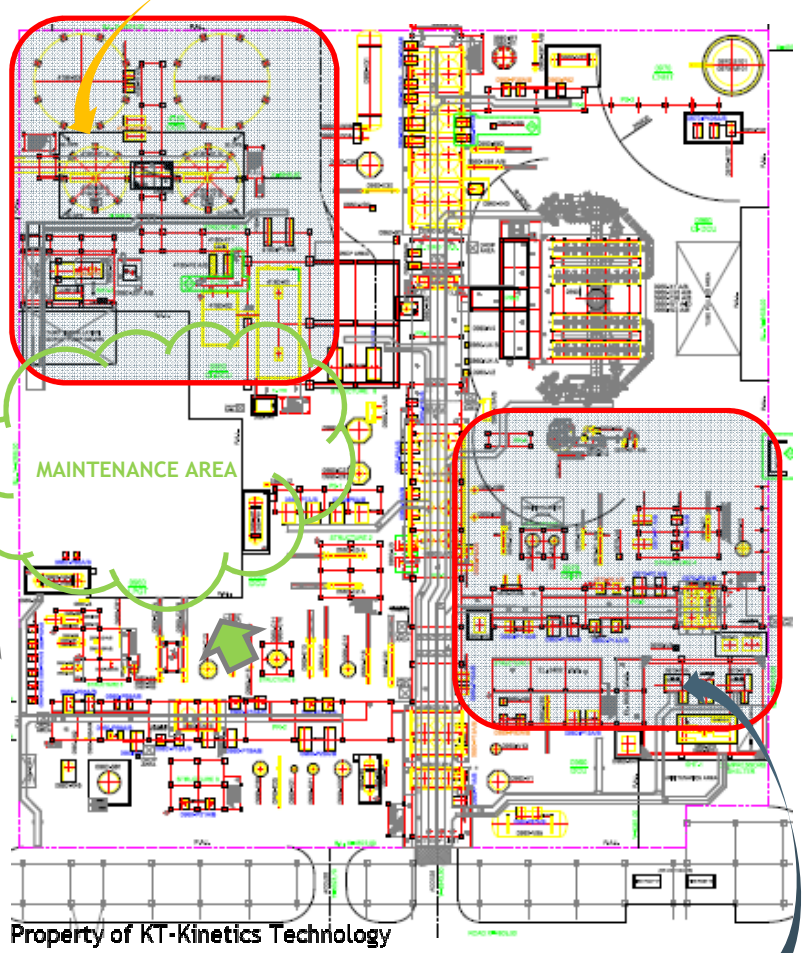
Layout optimization

-30%

CONVENTONAL SYSTEM FOR COKE HANDLING

CCSS : Closed system for coke handling



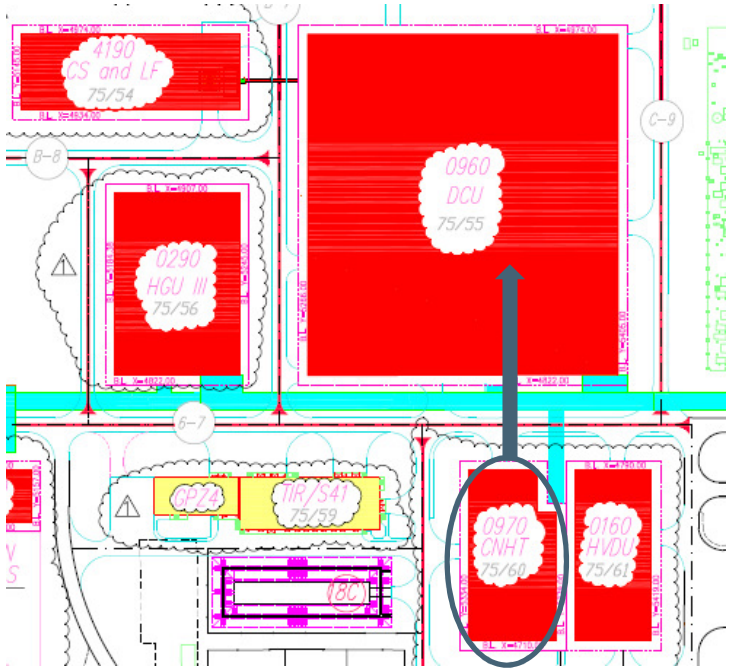


CNHT LOCATED OUTSIDE THE DCU AREA CLOSE TO HVDU (IN THE OTHER SIDE OF RACK AND ROAD)

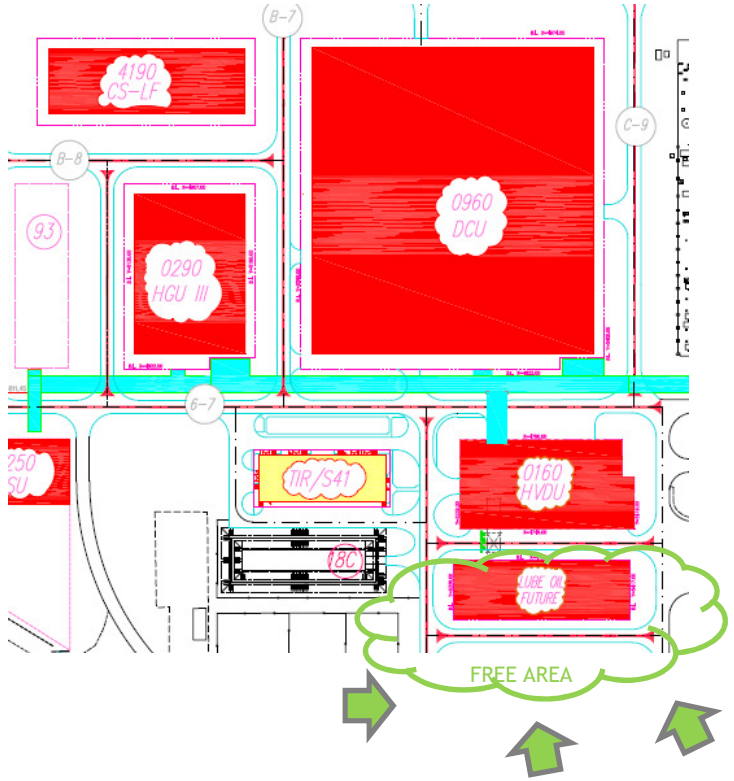
Coker Naphtha Hydrotreating Unit

GRASS ROOT PROJECT CASE STUDY

Layout optimization



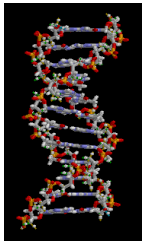
- ❑ - 30% footprint in coke handling area
- ❑ Integration of CNHT in the DCU area



2500 m2 net free area left to the refinery

GRASS ROOT PROJECT CASE STUDY

KT experience in EFRA project



The **technological DNA of KT** linked to its capability **as main contractor**

has been the perfect **synergy** during project execution

To turn LOTOS needs and wishes into their next reality

Source : LOTOS S.A

SUMMARY

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REVAMPING CASE STUDY

Topics

Can be implemented on a existing plant ?

Based on the know-how accumulated during project execution, KT with the support of TRIPLAN have developed a revamping case study to highlight major changes required to implement as a package a closed system instead of a open pit/pad.

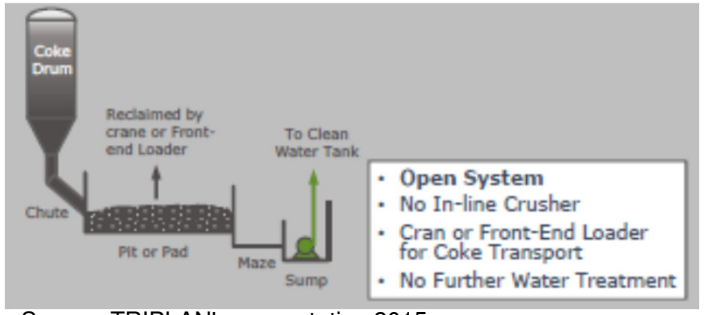
The following are the key points :

1) Flow scheme change.
2) Plot plan options
3) Schedule for execution and Investment

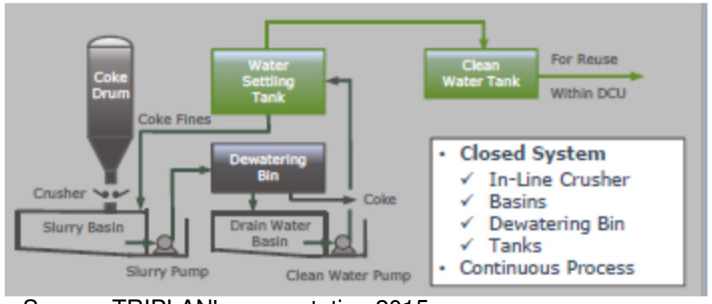
The TRIPLAN's CCSS can be implemented like a **package**

REVAMPING CASE STUDY

Flow scheme change



Source: TRIPLAN's presentation 2015



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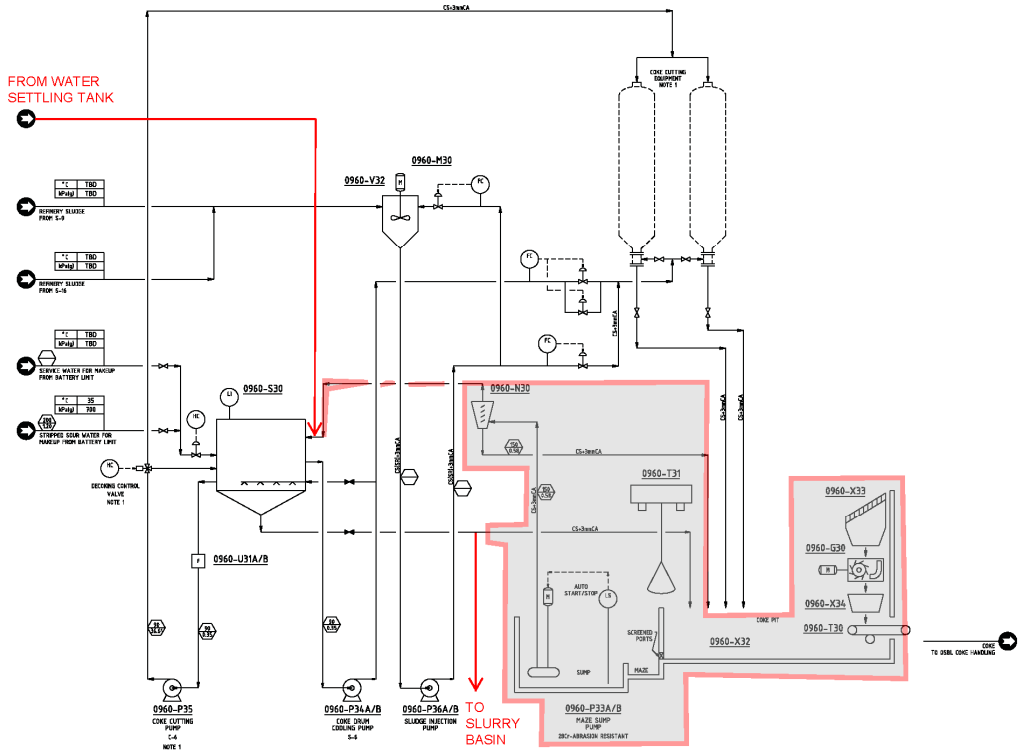


Source: CBI/Lummus Process Flow Diagram

Unchanged items

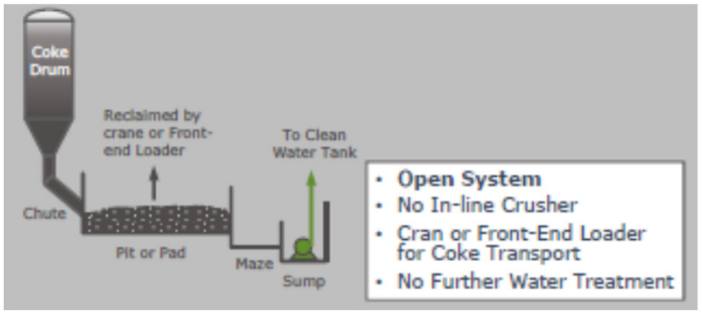
1) Coke drums and structure
2) Water tank
3) Cutting pump
4) Cooling water pump

Deleted items

1) Pit and maze
2) Maze sump pump
3) Crane
4) Crusher/in/out hoppers

REVAMPING CASE STUDY

Flow scheme change



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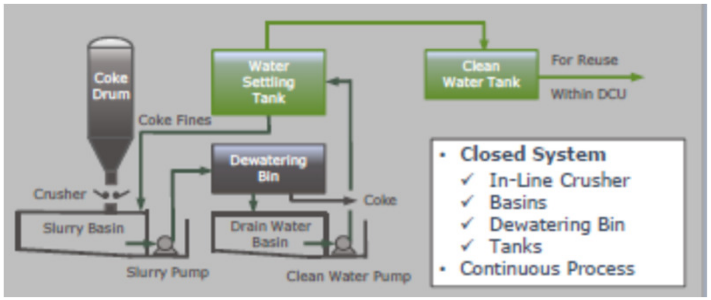

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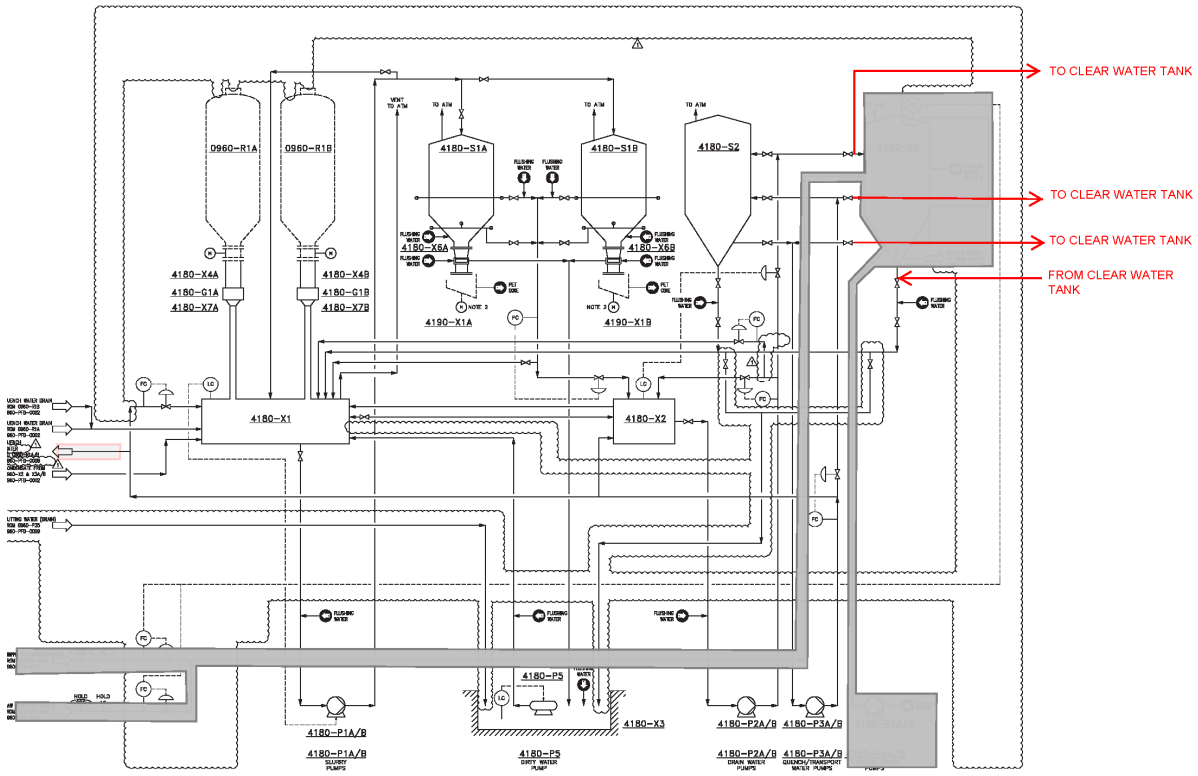


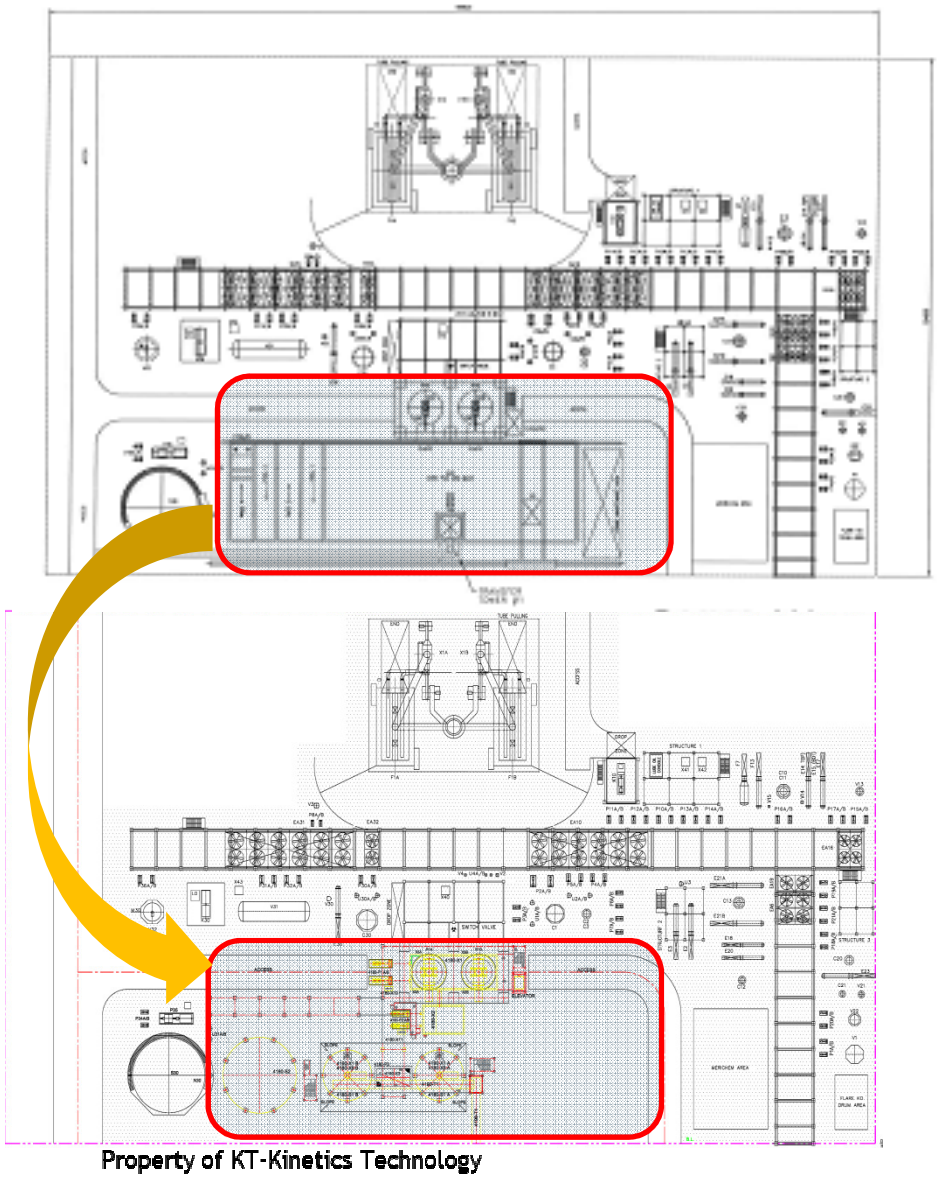
Source: TRIPLAN's Process Flow Diagram

New items

1) Crusher and relevant structure
2) Connecting pipe (Transition Pipe)
3) Slurry & drain water basin
4) Dewatering bins
5) Transport pump
6) Dirty water settling tank
7) Slurry and drain water pumps

REVAMPING CASE STUDY

Plot plan



"Local" dewatering

Refer to TRIPLAN's presentation for details

All new structures/items of CCSS are installed in pit/pad area.

Almost 70% of the area is reused

"Delocalized" dewatering

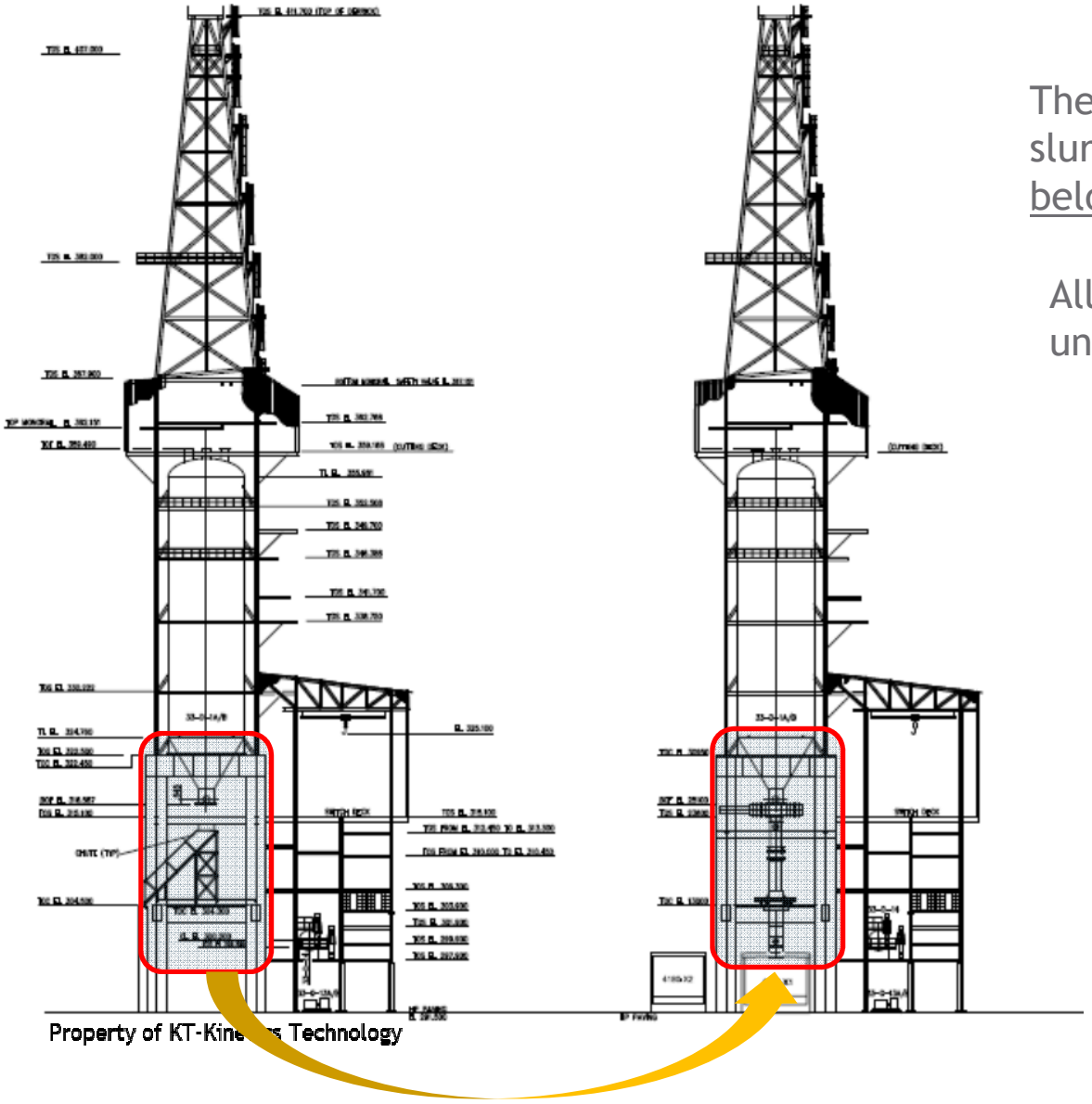
Refer to TRIPLAN's presentation for details

Most of new structures/items of CCSS are installed in separate area.

Coke drum structure only must be modified

REVAMPING CASE STUDY

Plot plan (elevation)

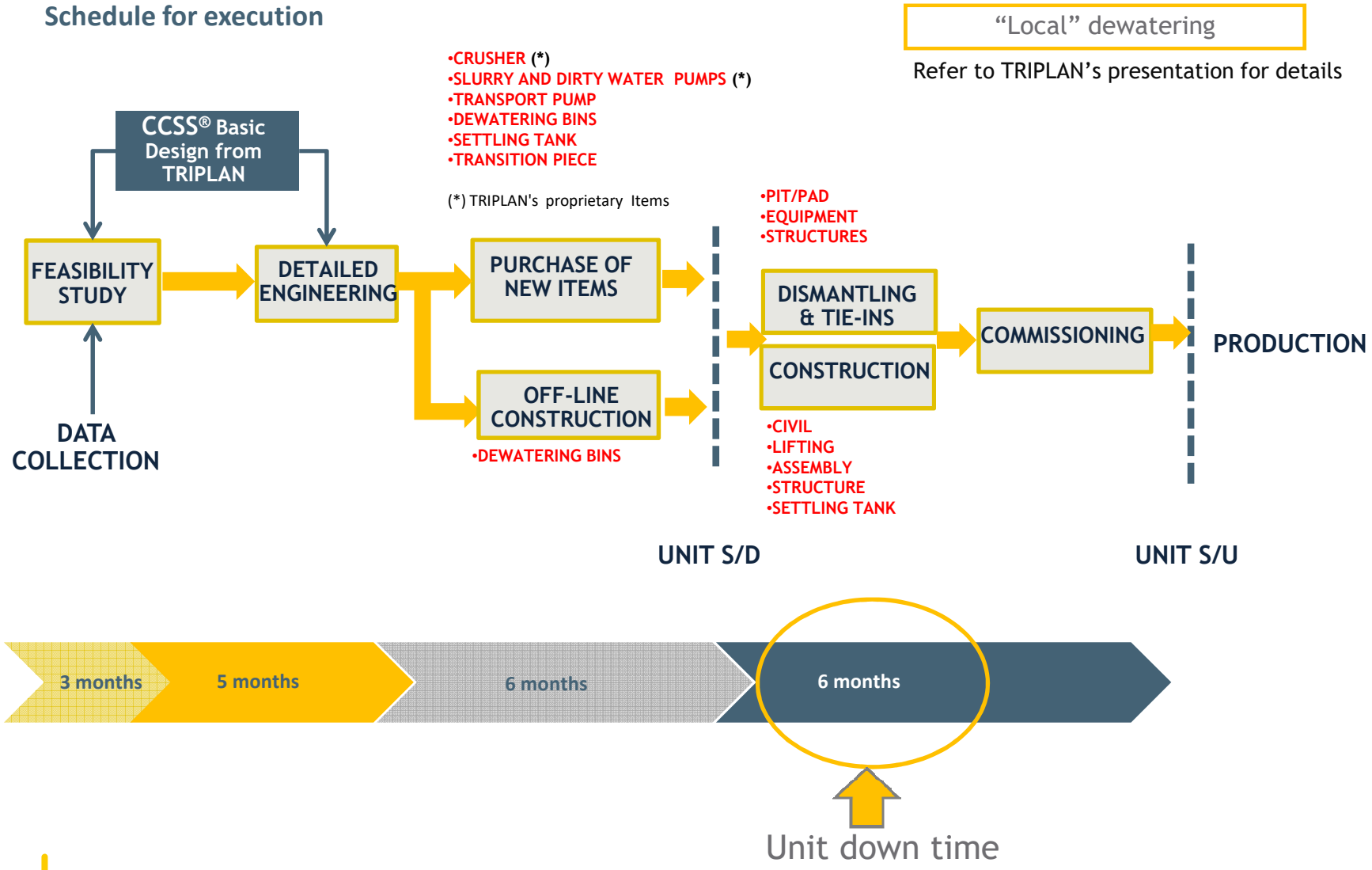


The inline crusher and the slurry basin are installed below the coke drums

All elevations remain unchanged

REVAMPING CASE STUDY

Schedule for execution



Expected **20 months** from idea to realization

REVAMPING CASE STUDY

Schedule for execution

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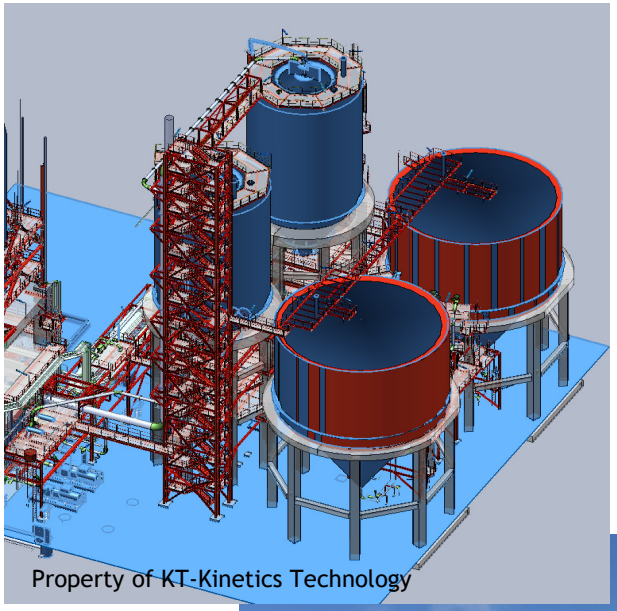
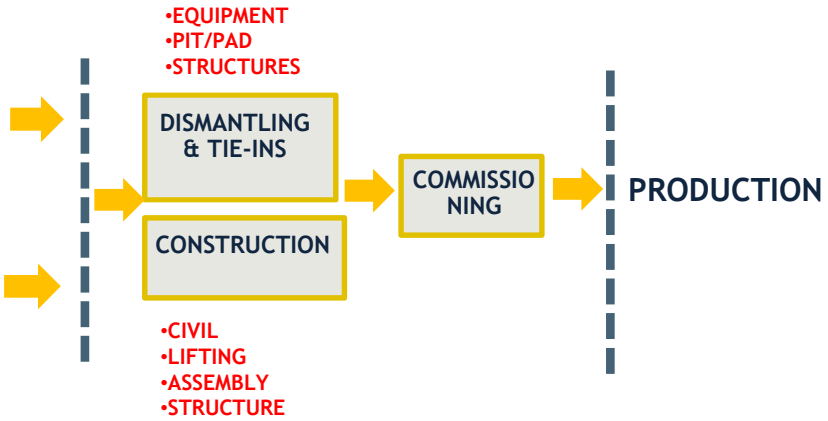


"Delocalized" dewatering

Refer to TRIPLAN's presentation for details



Most of construction activities relevant to CCSS are executed off-line with unit in operation

Expected shutdown time shortened to 2,5 months

SUMMARY

4. Conclusions

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CONCLUSIONS

A Clean Future For Coke Production

❑ In today's world and more for the future, Delayed Coking Technology must be suitable for environmental requirements and the healthy of operators together with care of neighbors.

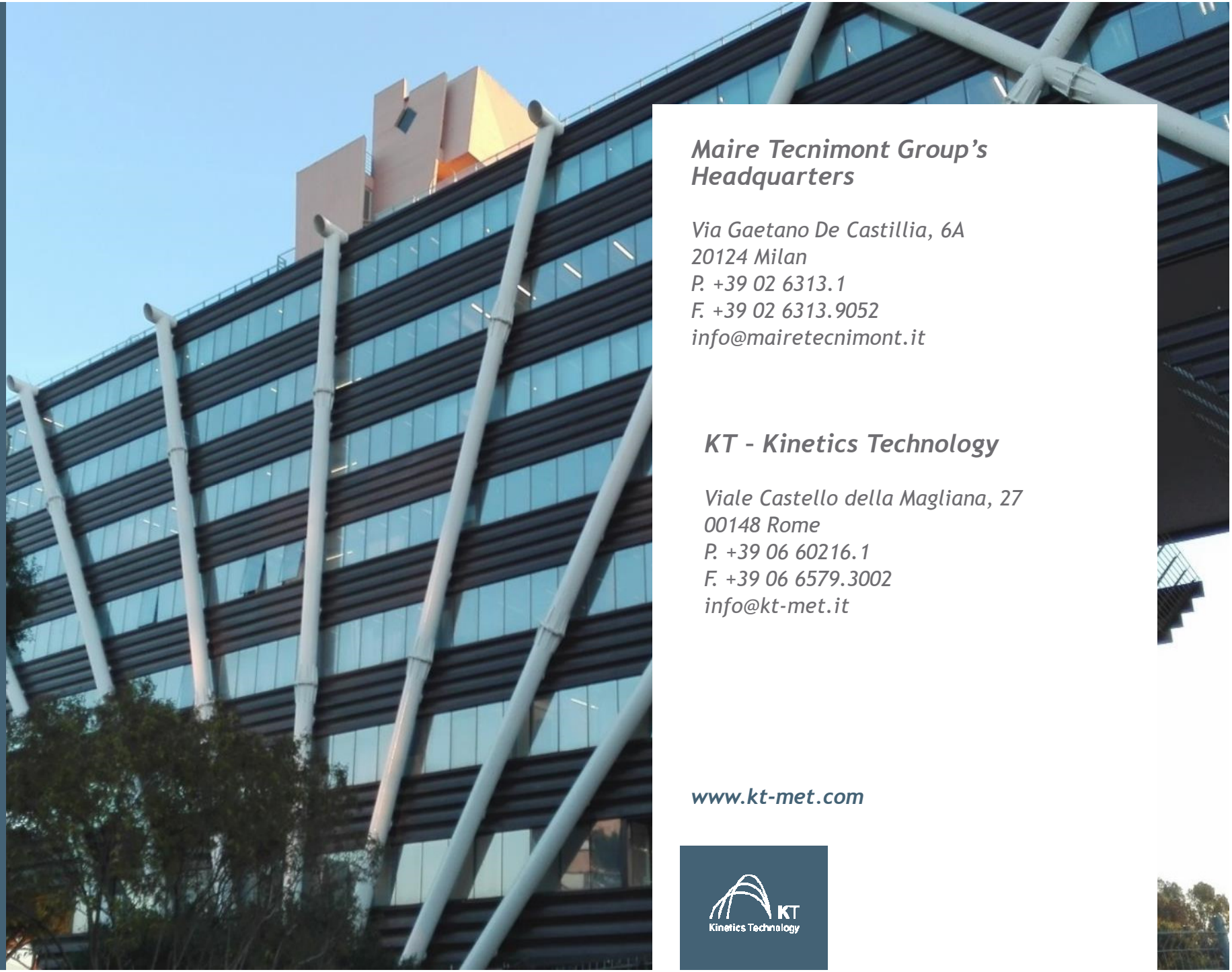
❑ The DCU complex under construction at LOTOS Refinery in Gdansk represents an excellence within this context.

❑ The CCSS technology and all other features implemented for EFRA project are becoming the bench mark package for the future of this section of DCU unit.

❑ KT can customize any Delayed Coking Technology directly implementing CCSS Package. KT and TRIPLAN have in place an agreement for execution of grass root projects and revamping on EPC basis.

THANKS FOR YOUR ATTENTION !

…..ANY QUESTIONS?



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