

Modernization of Romanian Cokers, Executed in a Major Revamp at OMV Petrom Petrobrazi Refinery





**Improve Safety
Operation in Coker Unit**

Vera Predescu,
Refining Technologist
Vera.predescu@petrom.com



OMV Petrom

We are the leading industrial company in Romania

	One of the largest private employers c.15,000 direct employees and more than 45,000 indirect jobs ¹		#1 energy supplier Accounts for ~40% of oil, gas and fuel supply, and can cover up to 10% of power generation in Romania
	Substantial investor Over EUR 1bn Capex spent per year since privatization		Largest contributor to state budget EUR 2.2 bn ²

All data refers to 2016

¹ Source: internal data and analysis; ² Includes: profit tax, royalties, employer social contributions, excises incl. custom duties, VAT, employee related taxes, other direct and indirect taxes paid to Romanian State

Operating in the integrated oil and gas sector



Upstream

Romania

- ▶ 3.66 mn toe/yr crude oil and NGL
- ▶ 5.25 bcm/yr gas
- ▶ 582 mn boe proven reserves (~10 yrs of current production)



Kazakhstan

- ▶ 0.36 mn toe/yr crude oil and NGL
- ▶ 0.05 bcm/yr gas
- ▶ 24 mn boe proven reserves



Downstream Oil

- ▶ Petrobrazi refinery, 4.5 mn t/yr capacity
- ▶ 783 filling stations, operated via 2 brands: Petrom (479, Romania, Moldova) and OMV (304, Romania, Bulgaria, Serbia)
- ▶ 2.6 mn t retail sales



Downstream Gas

- ▶ Gas sales 4.6 bcm/yr, meeting up to ~40% of Romania's demand
- ▶ Brazi gas-fired power plant (860 MW)

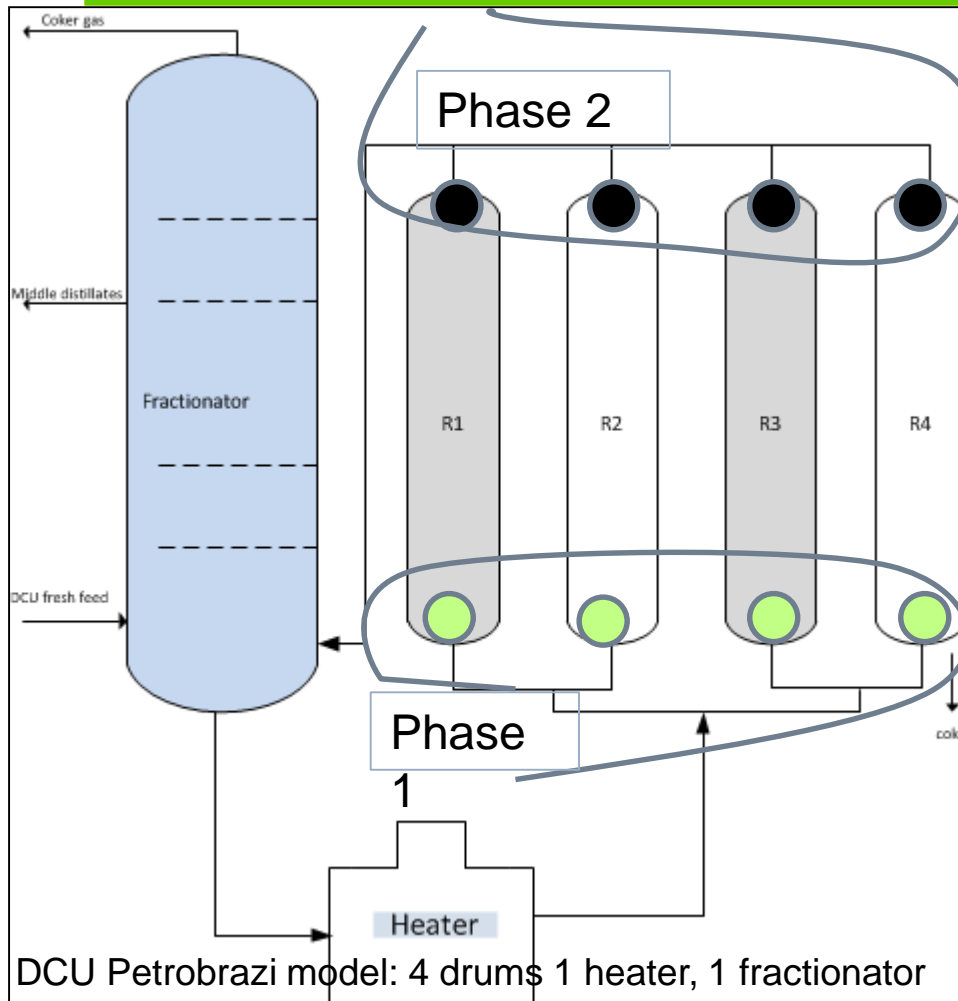
All data refers to 2016

Summary of Delayed Coker Unit



- Actual DCU Petrobrazili is in operation since 1989.
- **Passed through certain modernization programs as:**
 - ❖ Install low NOx Burners & Burner Management System in 2010.
 - ❖ Energy improvements (reduce EII with 1%) and Increase unit capacity with 18 % in 2012.
 - ❖ Implement DCS/ESD and APC in Coker unit in 2014.

DCU Petrobraz



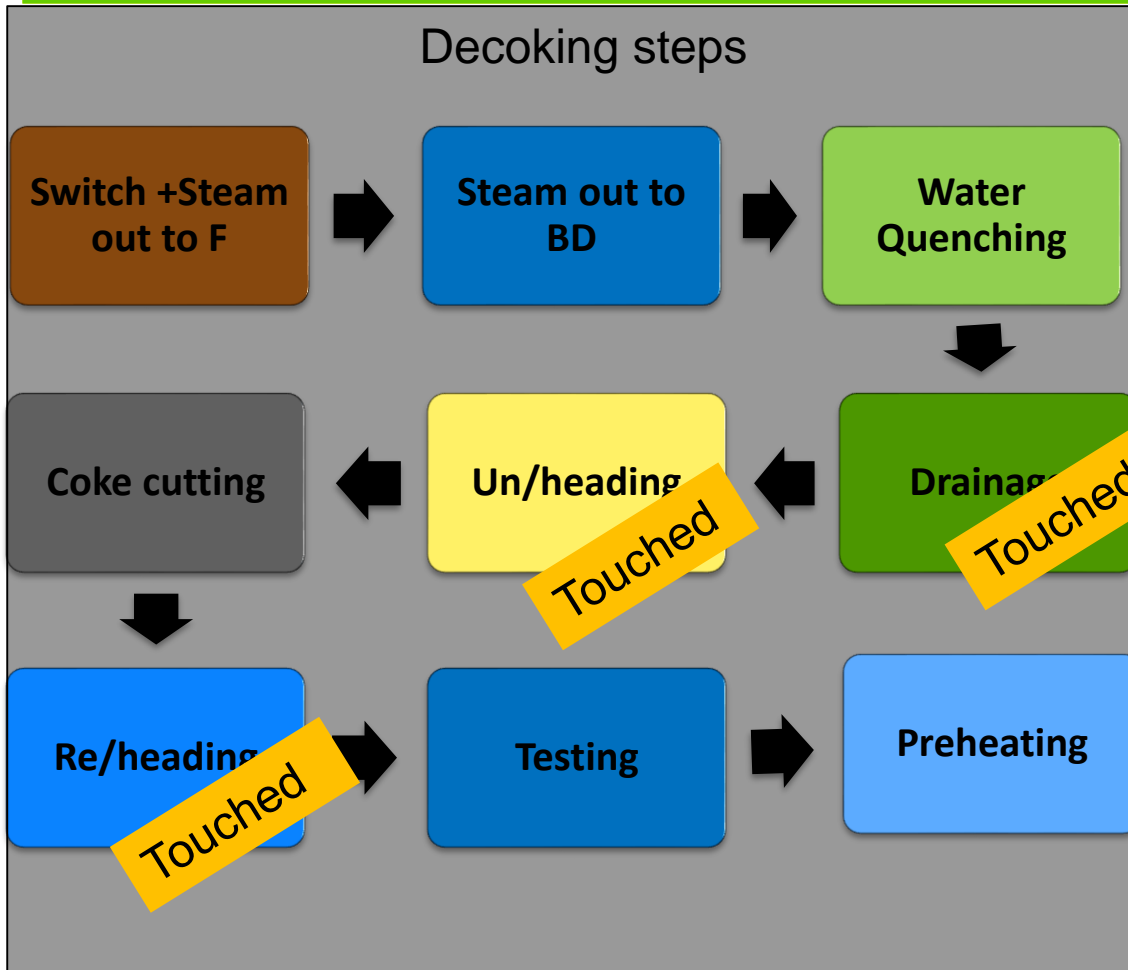
➤ Also, during 2014 and 2016 has been executed a big project focused mainly on safety operation during decoking time, triggered by the necessity of safety increasing around coke drums executed by Ruhrpumpen Company

- Project implemented in 2 phases:
- ❖ **Phase 1- 2014-** Bottom side- Ruhrpumpen bottom chute system and increased drainage line diameter
 - ❖ **Phase 2- 2016-** Top side- slide valves, new crane and guide frame

Selection of the right solution was a real challenge

Find the most appropriate solution	Top/ bottom fully automatic systems (e.g slide valves)	Top-fully automatic Bottom –semiautomatic system
Safe conditions	yes	yes
Fit into existing system	yes	yes
Existing structure is able/ not able to sustain additional overload	No High Capex	Yes Reasonable Capex
Bring benefits	yes	yes
Decision	No Go	GO

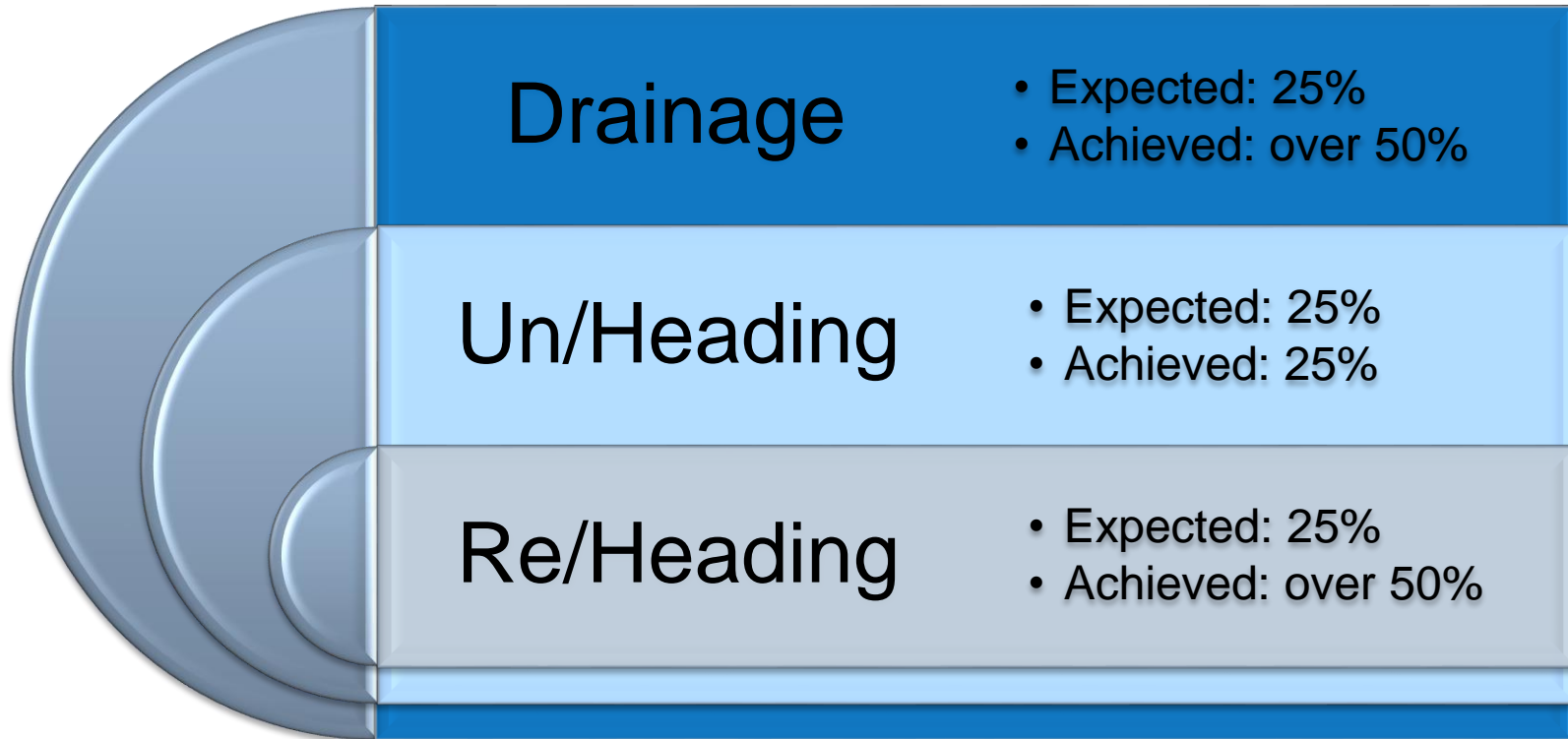
Decoking steps “touched” by automatic system



Batch schedule of DCU

[illegible]

Expected versus achieved reduction time*



This overall reduction of cycle time led to increasing of amount processed in DCU with 10% and it improved unit efficiency.

Top heading/un-heading operation

New slide valve takes few minutes to open or close.

Before



Old system: Manually open/close the bolts, lift up the top cover with local crane.,

After



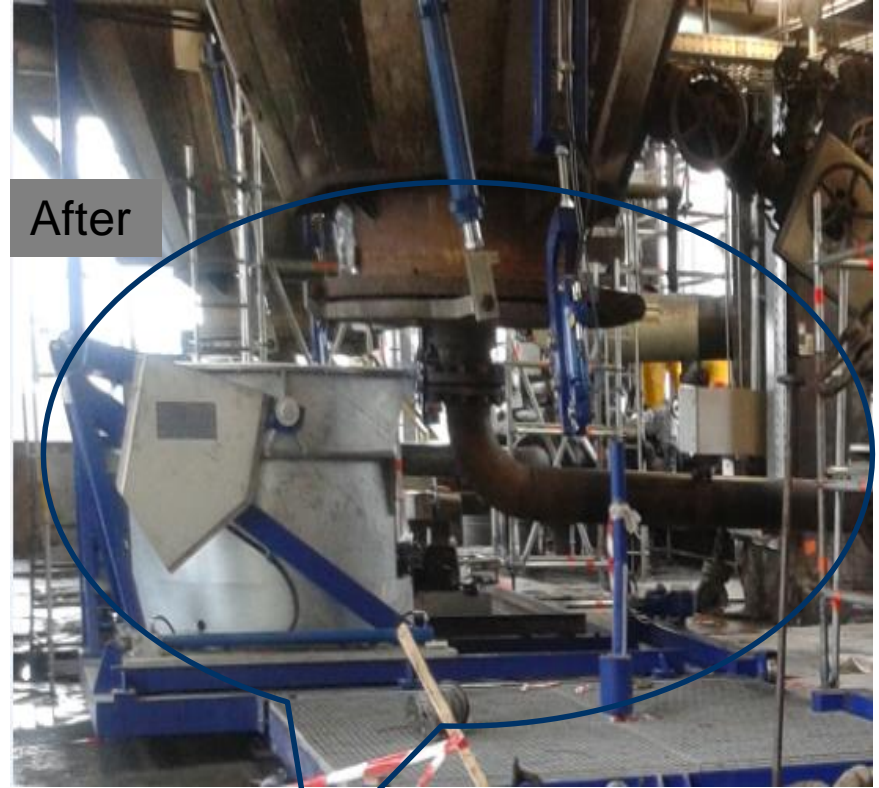
Bottom heading/un-heading operation

Before



Metal fence protects the coke to be spread around coke drum platform

After



New bottom chute system, movable on rail way

Feedback operators & Coker Unit manager

1. “Safety”
 2. “Easier and faster”
 3. “Cleaner”
- ranking made by Coke drums operational staff after Project realization.



“The people works now in safety conditions and the Coker unit gained a plus in processed feedstock”.

Coker Unit manager

Thank you for your attention!



Modernization of Romanian Cokers, Executed in a Major Revamp at OMV Petrom Petrobrazî Refinery



Dr. Wolfgang Paul, wpaul_dr@ruhrpumpen.com
Vera Predescu, vera.predescu@petrom.com



Introduction



Location: RuhRPumpen Witten, Germany

1950 Founded in Witten / Germany

Specialist for: API Process pumps
API Pipeline pumps for Crude Oil,
Products, Water

1963 Part of THYSSSEN AG

THYSSSEN RUHRPUMPEN

1997 Part of Cooperation EG, Monterrey, Mexico



Our Mission: Become a worldwide company

2000 Start with Hydraulic Decoking System

2001 First Order: Petroleras Ameriven

/04 ConocoPhillips, PdVSA, Chevron Texaco

Since that time orders for revamps, new Units and Components



Ruhrpumpen Business Units



Witten, Germany

Area: 48,000 m²
Testing: 8,850 HP



Tulsa, USA

Area: 28,000 m²
Testing: 2,000 HP



Monterrey, Mexico

Area: 14,370 m²
Testing: 7,500 HP



Changzhou, China

Area: 7,500 m²
Testing: 6,000 HP



Chennai, India

Area: 7,500 m²
Testing: 6,000 HP



Orland, California

Area: 2,500 m²

Rio de Janeiro, Brazil

Area: 7,500 m²
Testing: 6,000 HP

Buenos Aires, Argentina

Area: 7,500 m²
Testing: 1,500 HP

Suez, Egypt

Area: 2,280 m²
Testing: 2,680 HP



Coker in Romania and CIS

Overview

- **Delayed Coking units in Romania and CIS**
 - built between 1960's and 1990's
 - built acc. GOST and Romanian standard
- **Upgrades and modernisation**
 - for higher through put
 - for higher safety standards
 - to meet international standards
- **Requirements**
 - Ambient conditions, warm and cold
 - Refinery conditions
 - Company and Licensor specifications
 - Local codes and standards

Coker in CIS and Romania

Basic design of Decoking System

- **Design**
 - does not depend on process
(mostly production of anode grade / fuel grade coke, no shot coke)
 - derrick design to accomodate cutting system only,
- **Soviet Union, Romania**
 - Open derrick, torque will not be transferred into derrick
 - Double deck system, process deck and cutting deck
 - Turn Table arrangement with square drill stems
 - Electrical hoists and Turn Table
- **Western countries**
 - Drill Stem Drive with round Drill Stems
 - Hoists and DSD's are driven pneumatically, hydraulically, electrically
 - Derrick with main beams, Torque will be transferred in the derrick
 - Single deck design

References for Revamp Coker Projects Top and Bottom

- **2003 BP-Gelsenkirchen**
Top semiautomatic MOTICAR
Bottom semiautomatic
Car version with 100t lift power
- **2004 BP-Lingen**
Top automatic 36" Z&J electric driven top valve
Bottom semiautomatic
clamp-version with 80t clamp force
- **2006 BP-Lingen**
Top automatic 30" Z&J electric driven top valve
Bottom semiautomatic
clamp-version with 80t clamp force

References for Revamp Coker Projects Top and Bottom

- **2013 Rompetrol, Romania**
Bottom semiautomatic
chute system, hydraulic operated
- **2015 OMV, Ploest, Romania**
Top automatic 30" Z&J electric driven top valve
Bottom semiautomatic
chute system, remote-hydraulic operated

Coker in Romania



- OMV
- Rompetrol
- Lukoil

Coker in Romania

Cutting deck



Petrom

- Hoist
- Turn table
- Square Drill Stem

Coker in Romania

- **Design**
 - Derrick design for Zero torque due to Square Drill Stem and Turn Table



Coker in Romania

- **Derrick Design**

- Swivel
- free hanging
- no torque



OMV Petrom Modernization

Project: Deheading System 2012-2015

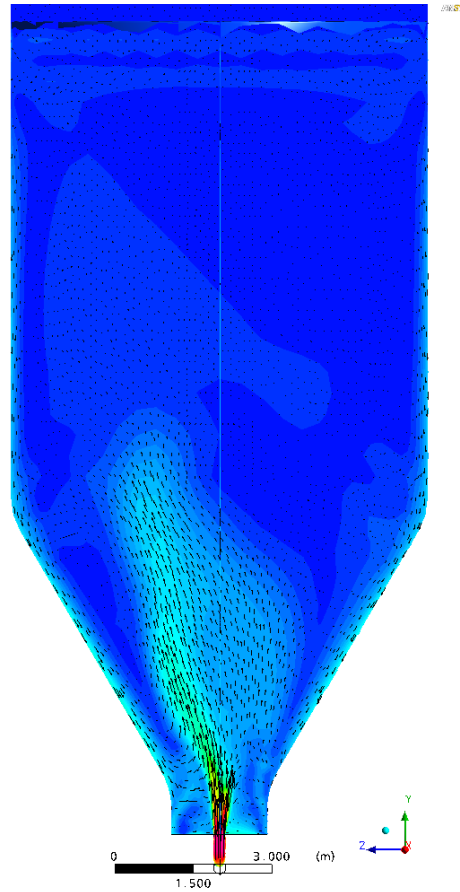
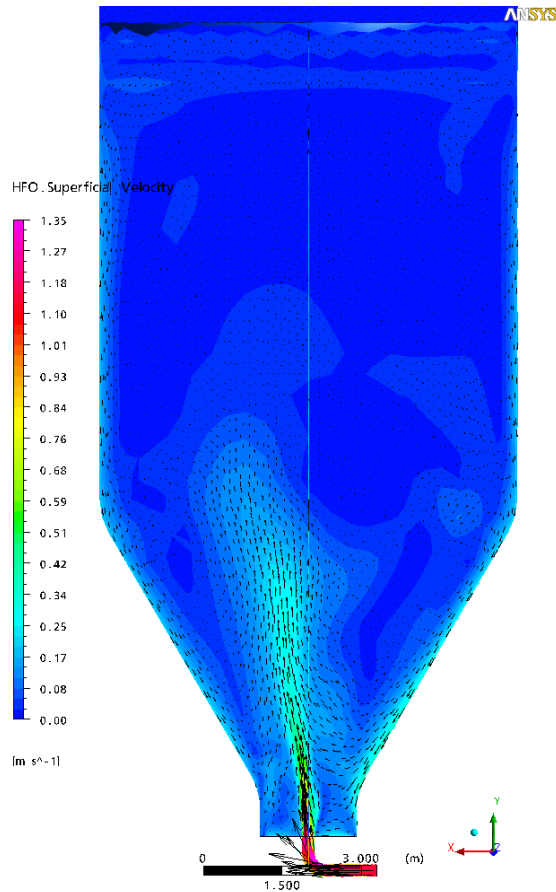
- **Target**

- Increase of safety
 - Reduction of cycle time
 - Increase of reliability
- To be more profitable

- **Steps**

- Revamping of Bottom Unheading System
- Modernisation of Top Unheading System
- Improvement of cutting cycle (optimal)

Situation 2012



Petrom

4 Drums

- V approx 700 m³
- m coke 450.000 kg
- m drum, approx 90.000 kg
- m function 656.000 kg

Bottom

- **Situation 2012**
 - open chute
 - Manual operation
 - Without safety system

Bottom



- up to 2013
 - open chute
 - Manual operation
 - Without safety system

Bottom

Plan

Chute System

- Remote operated

Safety System

- Safety Clamp
- Manual operation
- BUT SAFE

Chute Holes

- Cover Plates

Switch deck

Chute System

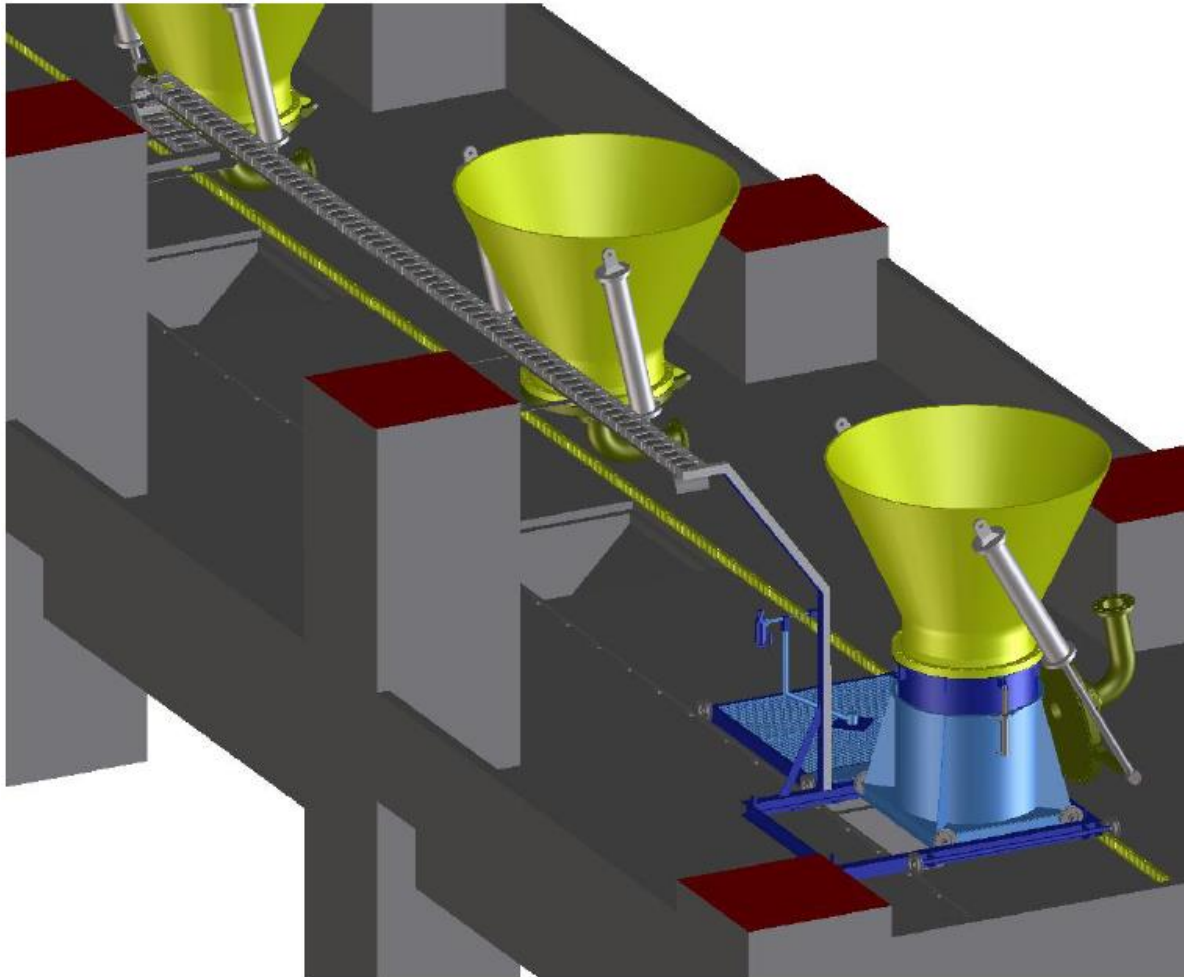
- Ruhrpumpen

Safety Clamping Device

- Reinforced hydraulic cy

Auxiliaries

- HPU
- Operator Shelter
- MCC
- PLC Cabinet



Switch deck



Chute System

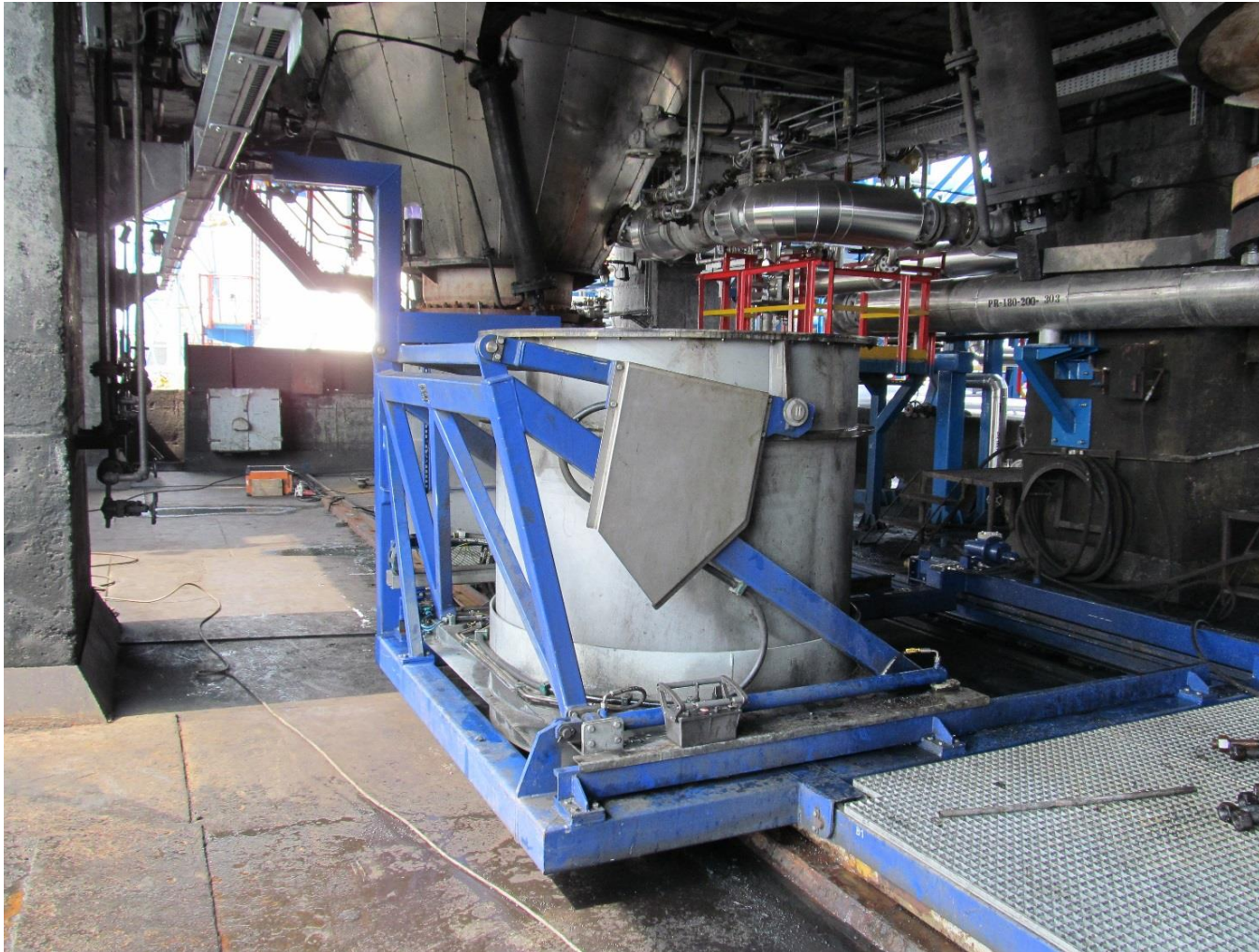
- Ruhrpumpen

Safety Clamping Device

- Reinforced hydraulic cy

Auxiliaries

- HPU
- Operator Shelter
- MCC
- PLC Cabinet



Switch deck

Chute System

- Ruhrpumpen

Safety Clamping Device

- Reinforced hydraulic cy

Auxiliaries

- HPU
- Operator Shelter
- MCC
- PLC Cabinet



OMV-Petrom

Bottom

Actual Situation:

**- Safety Clamping
Device**

**Increased
safety system**



**OMV-Petrom
Romania**

Bottom

Actual Situation:

**- Safety Clamping
Device**

**Increased
safety system**

OMV Petrom-Solution

[Top](#)



OMV Petrom-Solution

Top

- **Solutions**
- **Proposal A: Semiautomatic**
manual operated, but closed by automatic operated device
 - Swingversion
 - Plate version
 - Moticar version
- **Proposal B: Automatic** (recommended when possible)
automatic valve version, remote operated
 - Z&J Double Disk Valves
 - DV Single Disk Valves

RP references

Germany

Top Valve

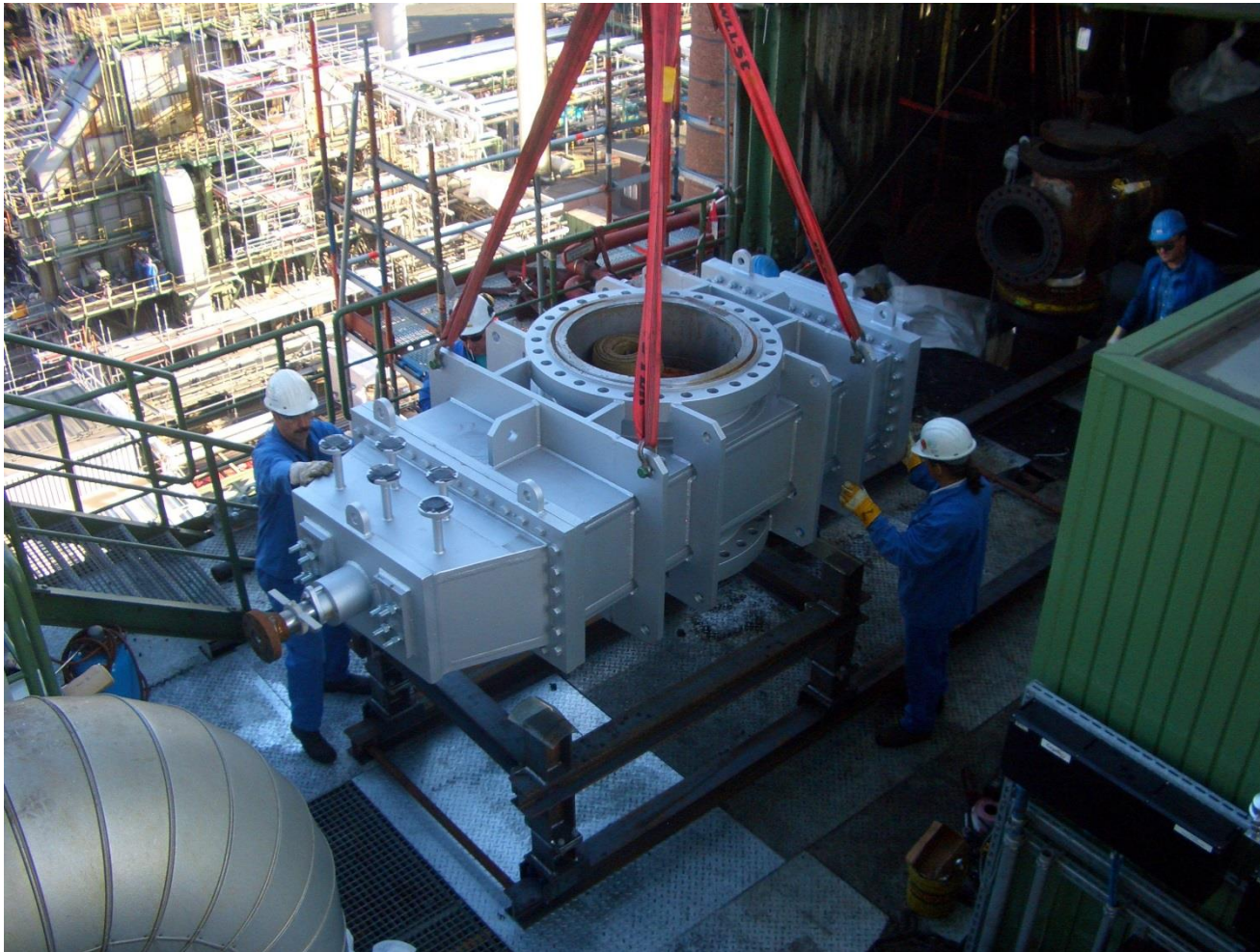
- ZJ 30"
- Adapter drum
- Adapter Top

Derrick

- Guide device

Weight

- Valve 8.000 kg
- Adapter 1x500 kg



RP-References



Germany

Top Valve

- ZJ 30"
- Adapter drum
- Adapter Top

Derrick

- Guide device

Weight

- Valve 8.000 kg
- Adapter 1x500 kg

OMV Petrom-Solution

Top

- **Weight comparison**

- **Semiautomatic**

• Swingversion (MIRO)	30"	750 mm	1.000 kg
• Plate version (OMV-Bgh)	24"	600 mm(?)	5.000 kg
• Moticar version (BP-Ge)	22"	550 mm	2.000 kg

Additional HPU required

- **Automatic**

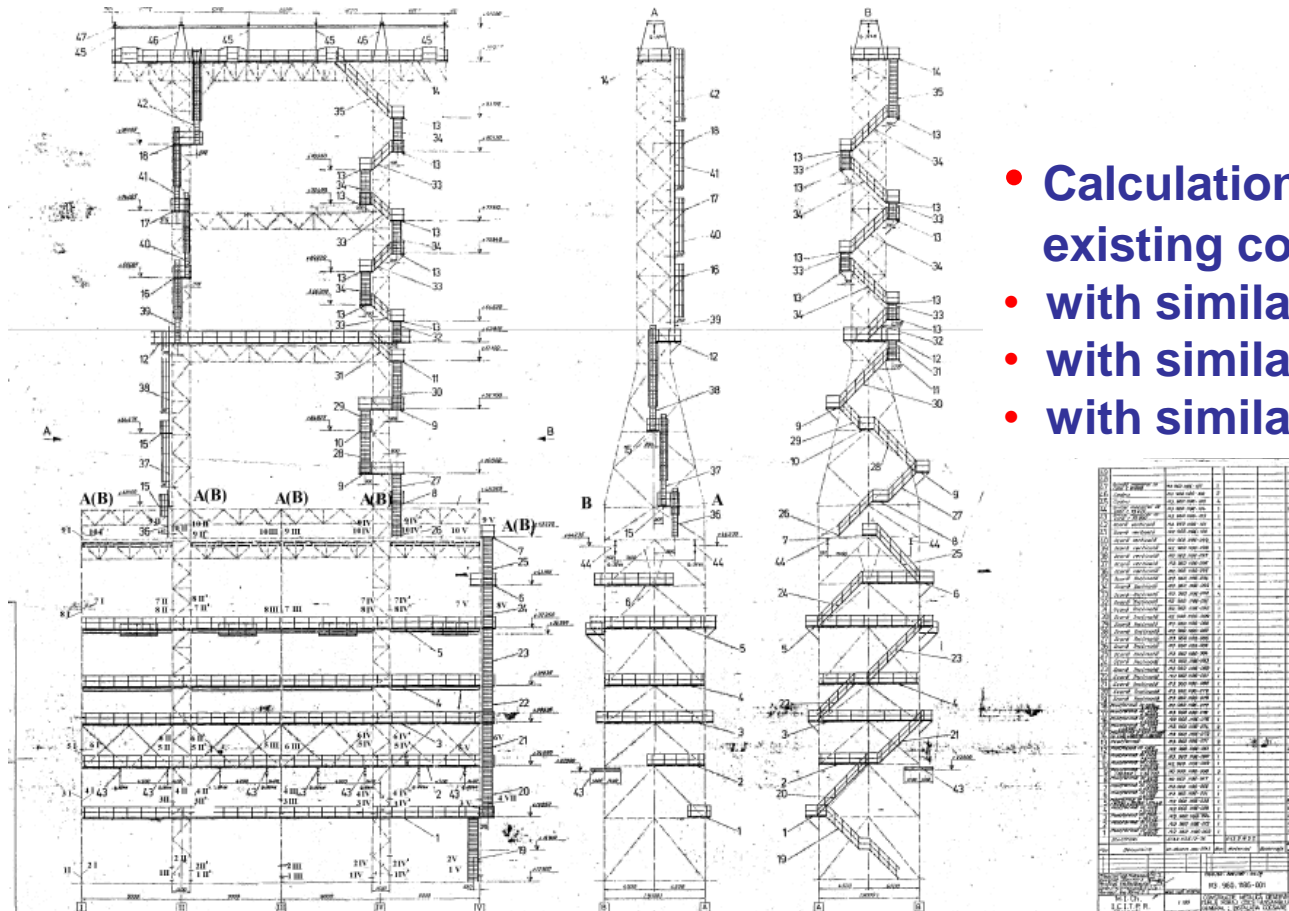
• Valve 1	30"	750 mm	5.000 kg
• Valve 2a	26"	660 mm	5.500 kg
• Valve 2b	30"	750 mm	7.900 kg

- **RP Tool**

• Tool	13,5"	330 mm	
--------	-------	--------	--

OMV Petrom-Solution

Structure



- Calculation of an existing coker,
- with similar design
- with similar drum size
- with similar arrangement

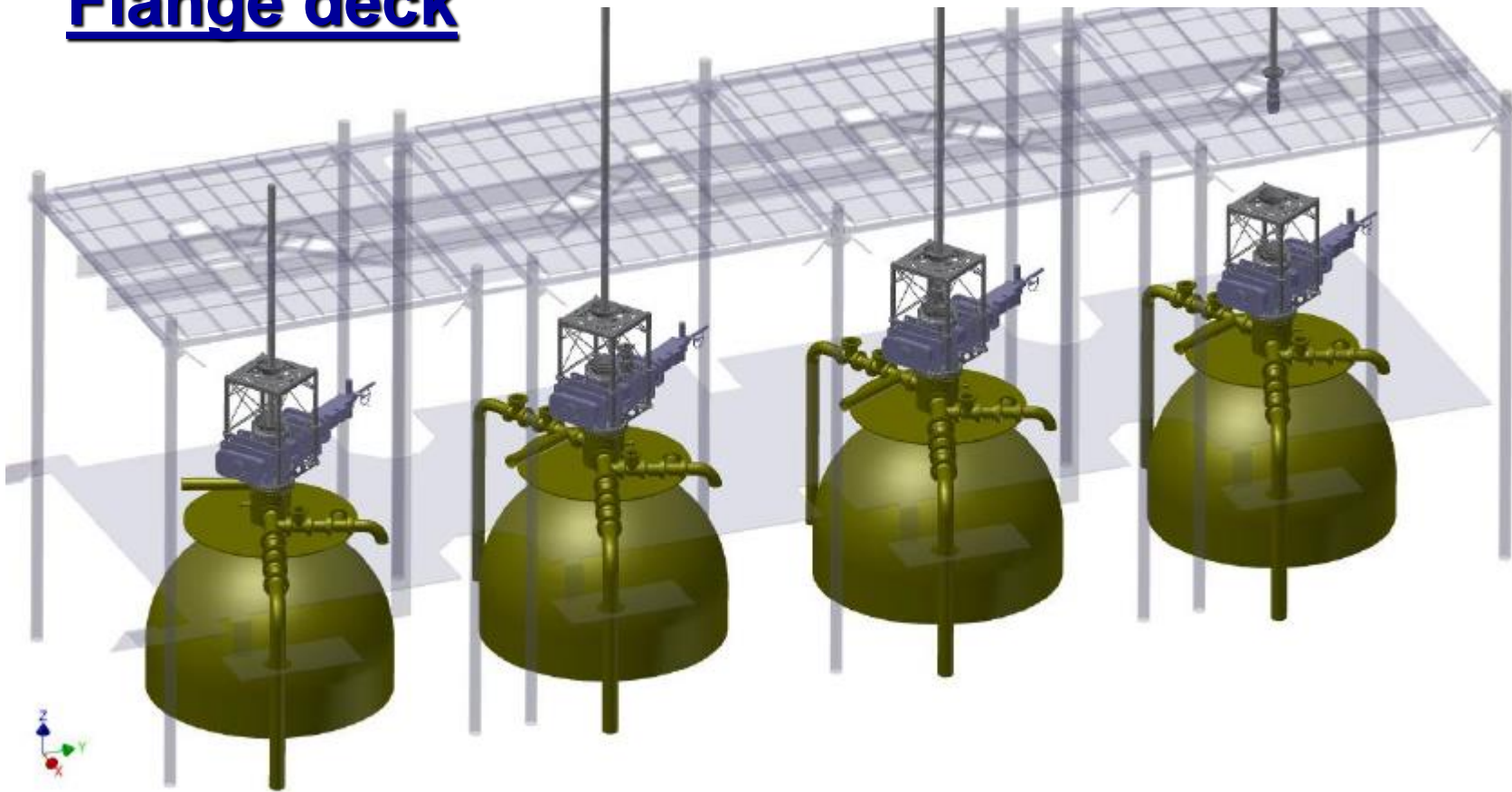
OMV Petrom-realisation

Realisation top, phase II

- Top Deheading
 - 30" Top Deheading System
 - 30" Top Valves
 - Steam Purge system
- Details
 - Operator Shelter
 - adapter between drum and top valve
 - Guide device above top valve
- Auxiliaries
 - new 10t crane for installation and maintenance

OMV Petrom-realisation

Flange deck



OMV Petrom-realisation

Top valve assembly



Adapter
Top valve
Guide device

OMV Petrom-realisation



Top valve assembly

- Adapter
- Top valve
- Guide device
- Tool

Summary and Conclusion

Target:

Increase of safety and reliability of top- and bottom deheading systems.
Installation of a system without modification of existing drums and structure.

RUHRPUMPEN and OMV Petrom:

OMV provided to Ruhrpumpen a turn key project.
A successful project has been executed to increase safety and reliability for the drum deheading process.
Cycle time has been reduced. Coker works more profitable.

RUHRPUMPEN

THANKS FOR YOUR
ATTENTION

Questions ?