



Coking.com 2016



Coke Cutting Systems

for

Cokers in India



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RUHRPUMPEN



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

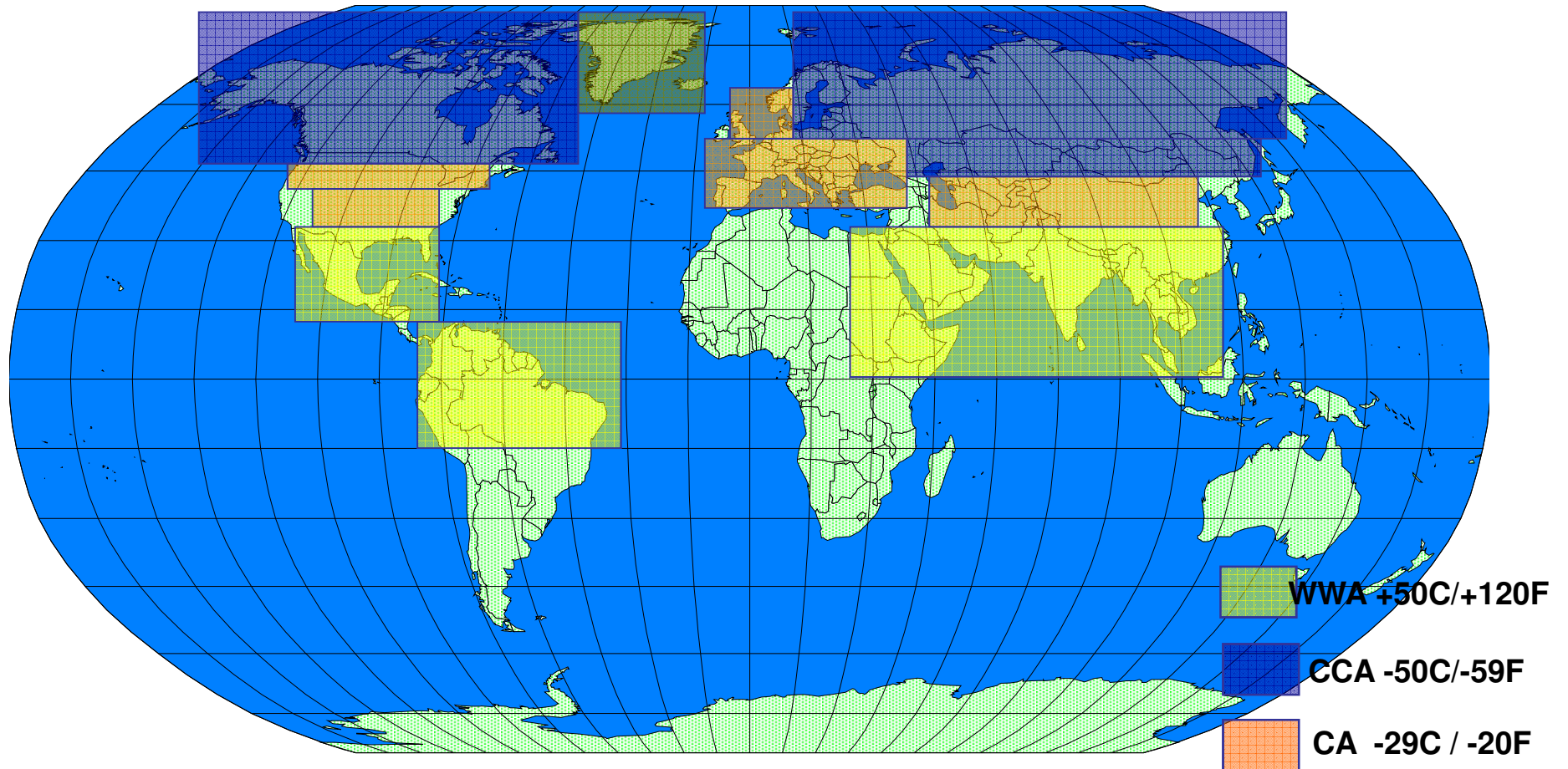
Area: 7,500 m²
Testing: 1,500 HP

Suez, Egypt

Area: 2,280 m²
Testing: 2,680 HP



Area definition



Decoking Systems in extreme Areas

More and more Delayed Coker Units (DCUs) are built in extreme ambient.
All equipment including the Coke Cutting Systems have to meet these requirements.

The requirements are summarized as

a) Ambient and Design conditions in warm areas

- temperature ranges from **-3 °C to +50 °C, wetted parts 3 °C to 120 °C**
- sun, wind, rain, dust, humidity **Humidity above 90%, often 100%**

b) Refinery conditions

- hazardous, corrosive atmosphere, sea side
- operation mode manual / remote / automated

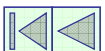
c) Company specification

- specification of final user, contractor, licensor

d) Local codes and standards

- other local codes

In the project and design phase items c) and d) are most important and should be met later
a) and b) are most important.



Decoking Systems in extreme Areas

RP classifies the Decoking Systems into 3 classes

- **Class I.** area in warm temperatures Warm-Warm Area
 - **Mech. equipment T design $>0^{\circ}\text{C}$ to $+50^{\circ}\text{C}$** **WWA**
 - **Instruments**
- **Class II.** area in medium temperatures Cold Area
 - Mech. equipment Tdesign $>-29^{\circ}\text{C}/-20^{\circ}\text{F}$ CA
 - Instruments Tdesign $>-29^{\circ}\text{C}/-20^{\circ}\text{F}$ CA
- **Class III.** area in low temperatures Cold-Cold Area
 - Mech. equipment Tdesign $>-50^{\circ}\text{C}/-59^{\circ}\text{F}$ CCA
 - Instruments Tdesign $>-60^{\circ}\text{C}/-76^{\circ}\text{F}$ CCA



Decoking Systems in Warm-Warm Areas

Middle East India WWA		Mech. equipment Design Temp.	Instruments Design Temp.	Comments / Special requirements
		Material acc. ASTM / DIN-ISO	Zone 2 ATEX	Humidity 100% Dust, sand (Seaside athmosp) Refinery athmosp.
Pump area	Hazardous area	Pump / wet parts 65° C / 120° C Equipment 1° C to 50° C	Instrumt. 50° C ATEX Control Panel, purged, cooled	
Cutting Deck Derrick	Hazardous area	Wetted Parts 65° C/ 120° C Equipment 1° C to 50° C	Instrumt. 50° C ATEX	
Operator Shelter (local / remote)	Hazardous area		2x HVAC, inside 1° C to 35° C	
Control Room (PLC/automatic)	Control house, safe area		PLC <40° C Safe area	



Decoking Systems in Warm-Warm Areas

Summary

Design conditions

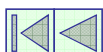
Installation in Hazardous area, Zone 2

Pump and wetted parts	rated 65 °C, max 120 °C
Mechanical equipment, outside	1 °C to 50 °C
Instrumentation, outside	1 °C to 50 °C
Humidity	80%, up to 100%
Instrumentation and control inside shelter	1 °C to 35 °C
HVAC for shelter, 2x 100% redundant	



Decoking Systems in Warm-Warm Areas

Year	Area	Company	outside T,	Design T (wet pats)	Humidity
2007	India, North	HMEL	+ 1 to +46 °C	+65 °C / max 93 °C	85%
2008	Saudi-Arabia	Yanbu	+ 0 to +45 °C	+60 °C / max 100 °C	100%
2009	India, South-West	MRPL	+17 to +40 °C	+66 °C / max 93 °C	91%
2009	Egypt	ERC	+ 2 to +45 °C	+60 °C / max 75 °C	85%
2009	Saudi-Arabia	Satorp	+ 6 to +47 °C	+66 °C	100%
2009	India, South-East	Paradip	+11 to +44 °C	+65 °C / max 90 °C	99,7%
2012	India, South-East	CPCL	+18 to +45 °C	+66 °C / max 93 °C	80%
2012	UAE	Takreer	+ 7 to +48 °C	+66 °C	100%
2014	Oman	SOHAR	+ 5 to +50 °C	+65 °C	100%
2014	India, East	Barauni	+5 °C to +46 °C	+65 °C / max 90 °C	
2015	Kuwait	KNPC	-3 °C to +50 °C	+65 °C / max 90 °C	100%
2015	Jamnagar	Reliance	1 °C to +50 °C	+65 °C / max 90 °C	80%
2016	India, North-East	Haldia	1 °C to +50 °C	+65 °C / max 120 °C	100%



INDIA MAP OF REFINERIES



RUHRPUMPEN

Coker Units

Coker in India

- Numarligarh
- Bongaigaon
- Guwahati
- Dig Boi
- Reliance I / II
- Gujarat
- Digboi
- Panipat
- Binar
- Essar
- HMEL
- MRPL
- NOCL
- Paradip
- CPCL
- BPCL
- Barauni
- Haldia

Coking.com , Mumbai 2016

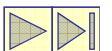




Coker HME

Installation: India

Coking.com , Mumbai 2016





RUHRPUMPEN **Jet Pump**



HMEL
Jet Pump area

Jet Pump unit
sheltered

Installation: India

Coking.com , Mumbai 2016





HMEL
Jet Pump area

- Jet Pump unit
sheltered

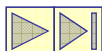
Installation: India

Coker IOCL Paradip

Installation: India



Coking.com , Mumbai 2016



Cutting system: Hoist and DSD

Hydraulic system

- **Features**
 - Hydraulic power unit HPU
 - Redundant m-p
 - Designed for hoist and DSD operation
 - Hyd. Driven hoist + DSD
- **Special features for WWA**

+/-

- HPU design to refinery standard
- hydraulic oil is needed in the derrick
 - flammable
- 3 Pipes per line required
- Cooling in WWA
- + powerful, precise controllable

Electrical system

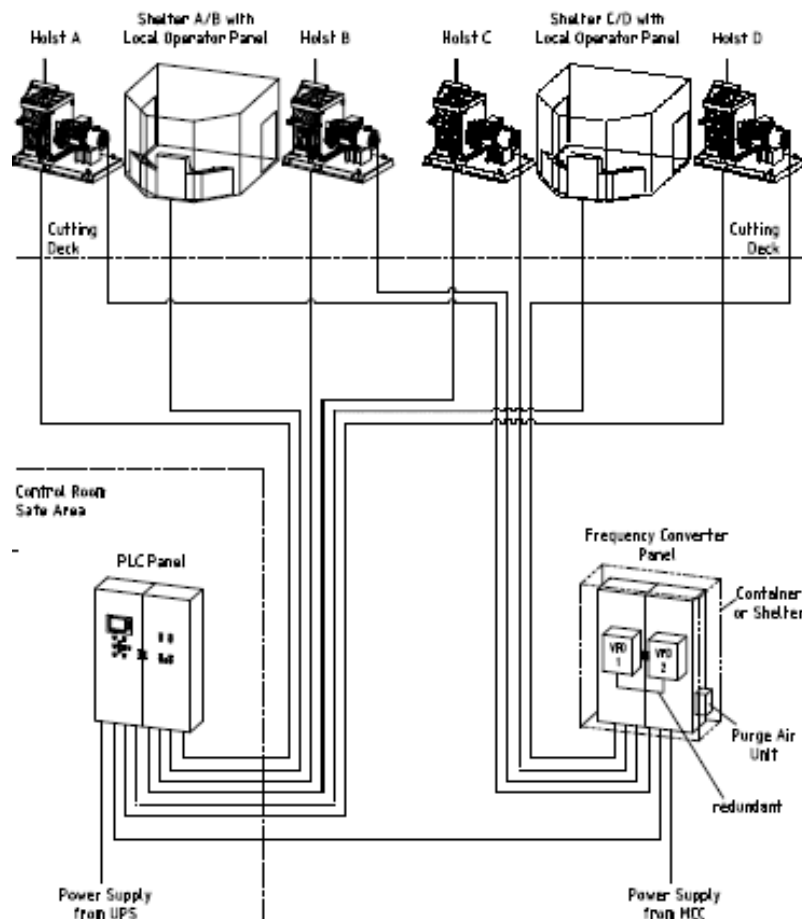
- **Features**
 - VFD for hoists and DSD
 - Redundant
 - Installed in safe area
 - Or on cutting deck (DSD)
 - Motors + brakes explosion proof
- **No limitation due to Temperature**

+/-

- VFD set is needed with limited cable
- + Not flammable
- ATEX required
- + Cabling is cheaper than piping
- + Powerful, precise controllable
- More space required

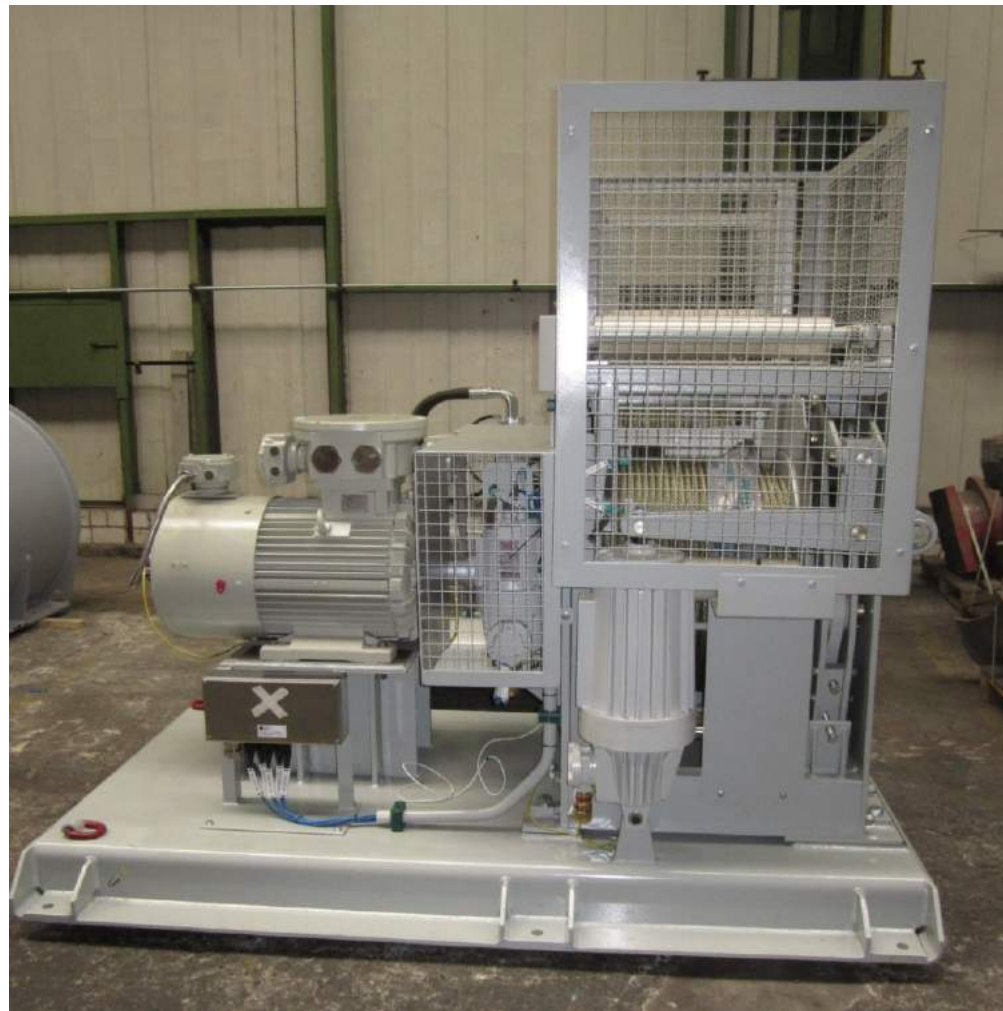


Control and process instrumentation



- **Hoist,**
- **Operation**
- **Variable Frequency Converter VFD**
- **Hoist** ATEX, CSA, CCOE
- **Rope** tension in the rope
 - indication at the operator panel
 - avoiding of overload
- **Variable Frequency Converter VFC**
 - Installed in purged cabinet

Hoist and Rope



- **Hoist with integral cartridge gear**
 - drum with grooves
 - Pull force 5000 kg
 - slack rope device and indicator
 - locks the hoist
- **Rope**
 - 16/18 mm
 - measurement of tension in the rope
 - indication at the operator panel
 - avoiding of overload

Lifting System



HMEL Cutting Deck

- Hoist
electrical driven
protected equipment

Capacity
pull force 5000 kg

Installation: India

Crosshead with DSD

Derrick

Crosshead

wheel type

Free Fall Arrestor

Meeting larger tolerances in derricks
compared to shoe type crossheads

Drill Stem Drive

- Electrical driven

All weather protected

Installation: Egypt



Crosshead with DSD

Derrick

Crosshead

wheel type

Free Fall Arrestor

Meeting larger tolerances in derricks
compared to shoe type crossheads

Drill Stem Drive

- hydraulic driven

All weather protected

Installation: India



RUHRPUMPEN – auto-combination Tool

Basic design

- Slim tool, OD 13"
- Low lift force
- Low torque

Switching devices

- Manual / Automated
- At the top of the tool

Valves

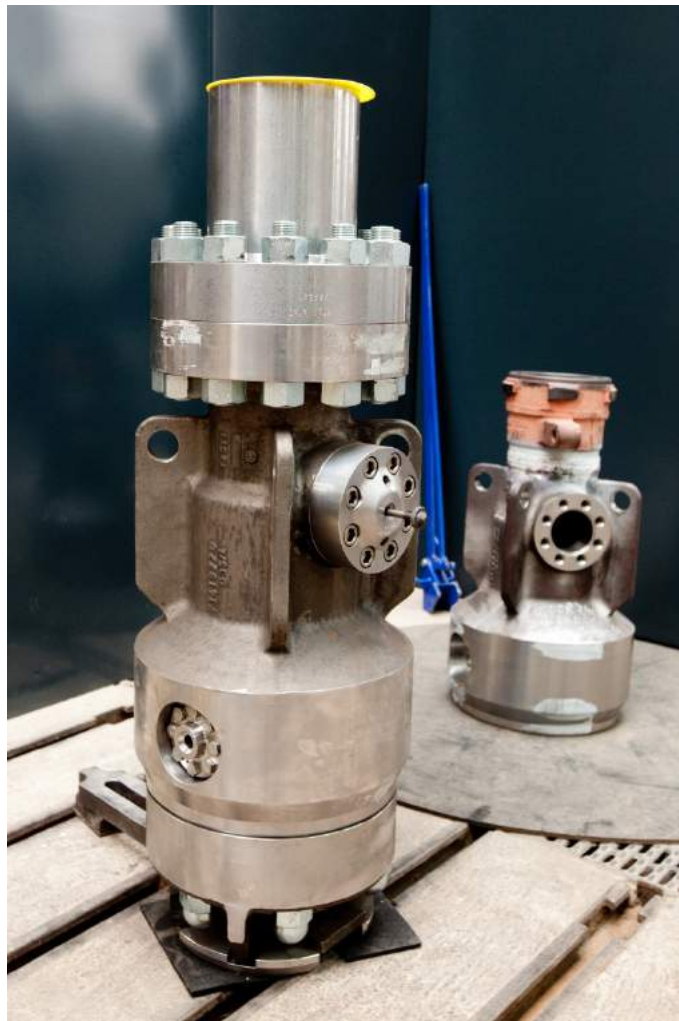
- Puck valves
- No seals
- Pressure operated

Nozzles, cutting

- 0°
- 10° up both cutting nozzles

Nozzles, drilling

- 1 strong centre nozzle
- 3 periphery nozzles



Control system



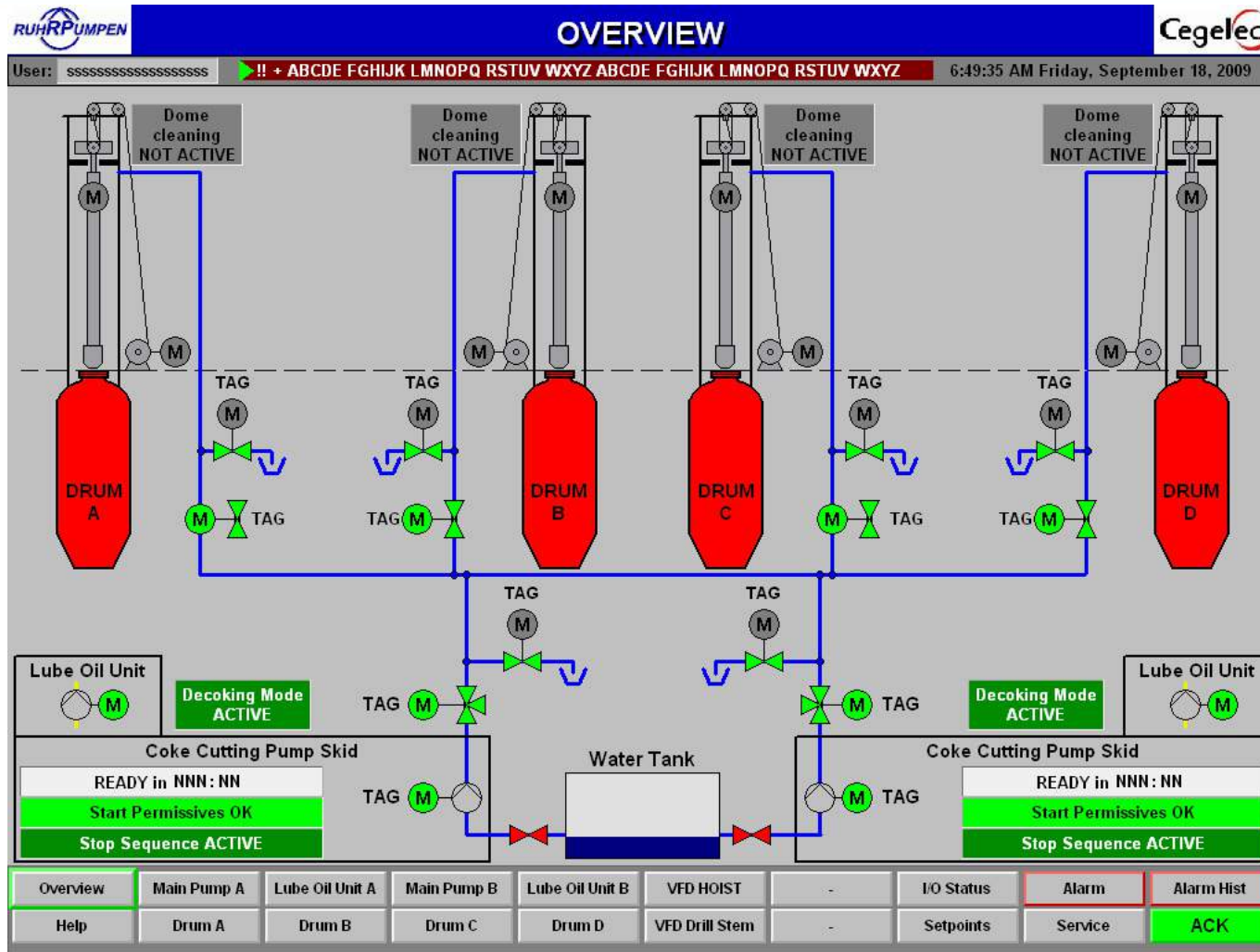
HMEL
Cutting Deck

Operator Shelter
2 x 100% HVAC
fire resistant material
safety glass

Operator Panel
- VFD Cabinet for hoist
purged, cooled

Installation: India

Control and process visualisation



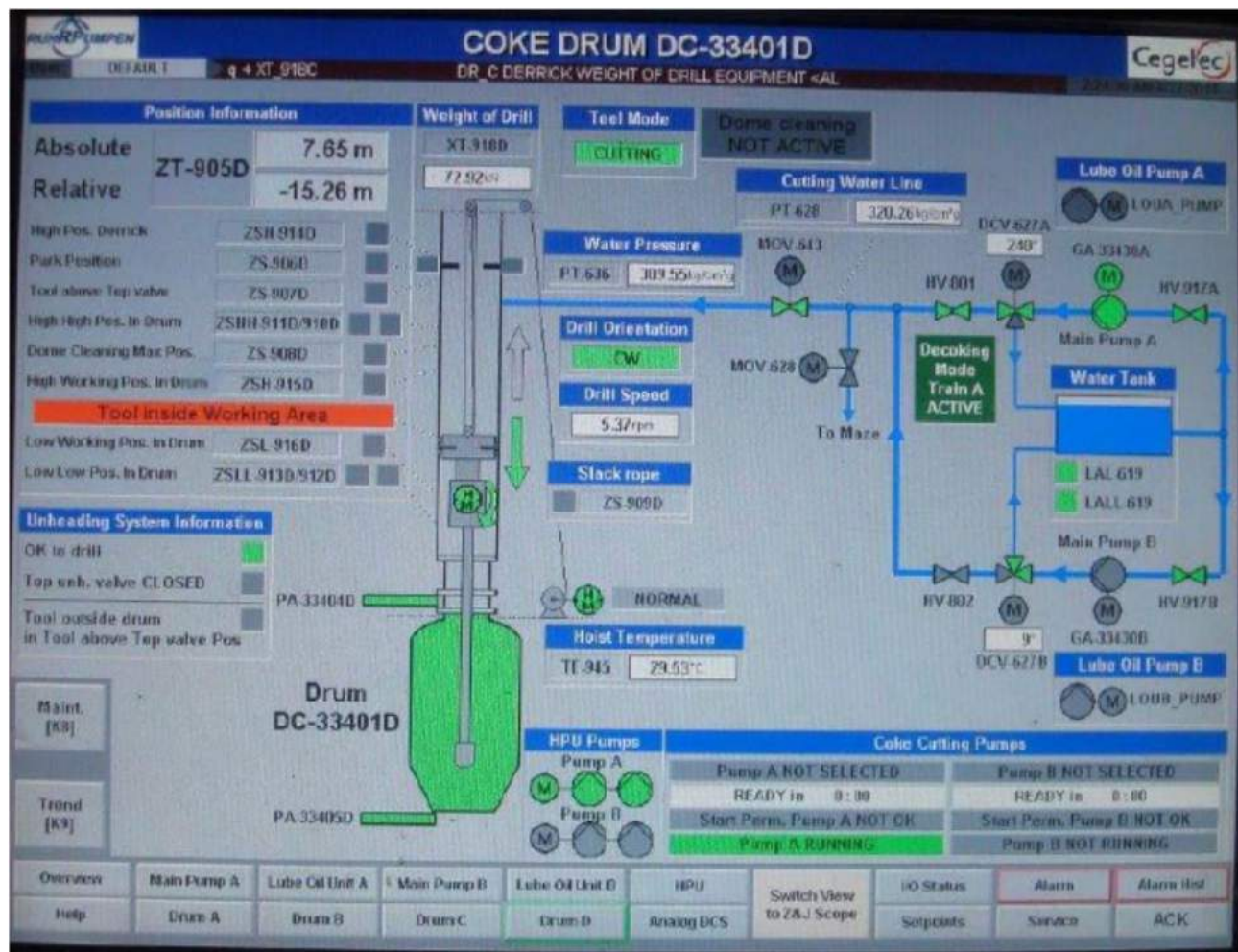
Operator Panel

Control of
hoist and DSD

With monitor
interactive PID
tendency

Installation: India

Control and process visualisation



Operator Panel

Control of
hoist and DSD

With monitor
interactive PID
tendency

Installation: India

Mechanical Design

Instrumentation, PLC design

Target : - high safety of the complete system

Result : -

RUHRPUMPEN:

- Design of a mechanical system with high safety and reliability
 - For project requirement
 - Related to project costs
-
- NOT: just technical acceptable to minimum costs (EPC)

Project specification - Licensor

Mechanical Design

Jet Pump unit

- Design related to coke cutting system (API 610, 613, 614)
- Flow and Head defined very precise,
 - often without relation to detailed piping

Instrumentation, PLC design

Control System

- Licensor spec. often not up to date
 - Long project time
- PLC redundant
- Basic Logic-Safety requirements

Cutting System

- Design spec. with basic requirem.
 - Hydraulic / electric
- Basic spec. of CCS-components
 - ie.: Auto-Tool, CH-FFA, (hoist), logic
 - Detail design responsibility by CCS vendor

Instrumentation

- Project P&ID
 - Detailed design by CCS vendor

Project Specification - EPC

Mechanical Design

Jet Pump unit + auxiliaries

1. Design acc. API 610, 613, 614
2. Client specification
3. EPC specification (- no deviation)
4. Manufacturer standard / Experience

Instrumentation, PLC design

Control System

- Licensor spec.
- Client specification
- EPC requirement
 - High safety -> QMR/TMR
 - SIL rated (Safety) PLC

Cutting System

- **No deviation**
 - All components to 1.- 3.
- **Special components**
 - to Client / EPC standard
 - ie:Auto-Tool, CH-FFA, hoist, HPU, VFD

Instrumentation

- **No deviation**
 - All components to 1.- 3.
 - All to AVL (App-Vendor-List)
- **100% to licensor P&ID**

Mechanical Design

Instrumentation, PLC design

Target : - increased safety of the complete system

Result :

- oriented to project specification and documentation
- not oriented to a strong mechanical system
- oversized and complicate control and instruments
- High Level Control System for a weak mechanical system

RUHRPUMPEN:

Design of a mechanical system with double mechanical safety via different components (not 2oo3) acc. project needs

Control System to operate the mechanical system.

Summary and Conclusion

Target should be a safe and strong Coke Cutting System

- Focus**
- strong mechanical system
 - meeting the actual requirements of the local plant
 - controlled from a safe and reliable control system
 - redundant with redundant I/Os for safety signal only

RUHRPUMPEN:

Designs and manufactures a mechanical system with double mechanical safety via different components (not 2oo3) acc. project needs

Control System is built to operate the mechanical system.



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THANKS FOR YOUR
ATTENTION

Questions ?