Session 22 –
Coking Process Overview & Hydraulic Decoking Process & Equipment

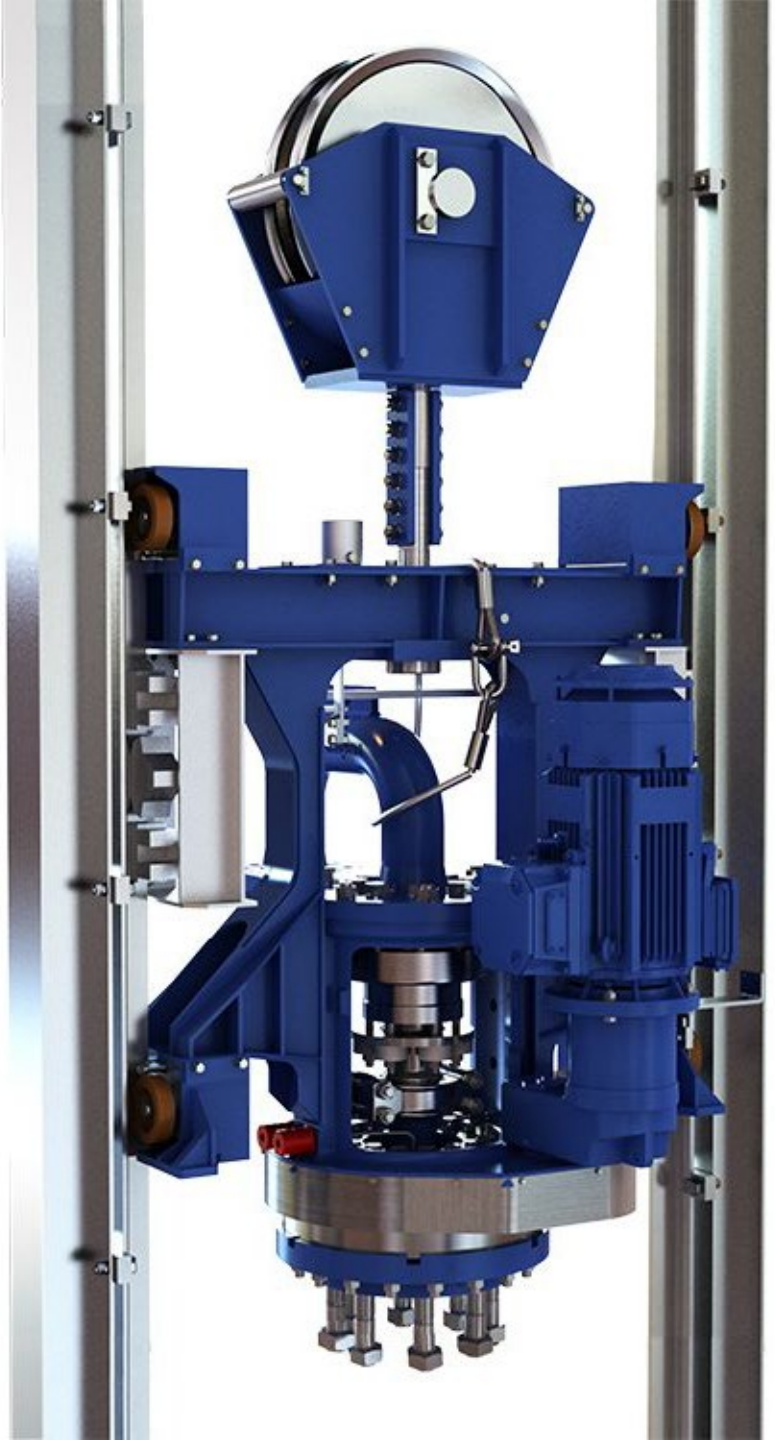
This short course will look at the Coking Process in Refineries as an overview and will look in detail at the Decoking Systems that Ruhrpumpen has developed and is now the market leader in their design and supply.

Aimed at Process and Mechanical Engineers, and Consultant Engineers who specify pumping equipment as well as Applications & Sales Engineers selecting and quoting them

Source Material – RP Decoking Team with special support from John Wong – Ruhrpumpen Decoking Specialist, Los Angeles

Agenda

- Delayed Coking
- Installation References
- Jet Pump Unit
- Cutting System
  - Hoist & Pulleys
  - Crosshead with Free Fall Arrestor
  - Drill Stem Drive
  - Cutting Tool (Drilling/Cutting)
- Control System



Introduction

Ruhrpumpen Today

- 2000 Start of Hydraulic Decoking Systems
- Witten, Germany – Heart of Decoking Operations
- Service Centers and Distribution Centers Worldwide

Delayed Coking

Coking and Decoking Processes

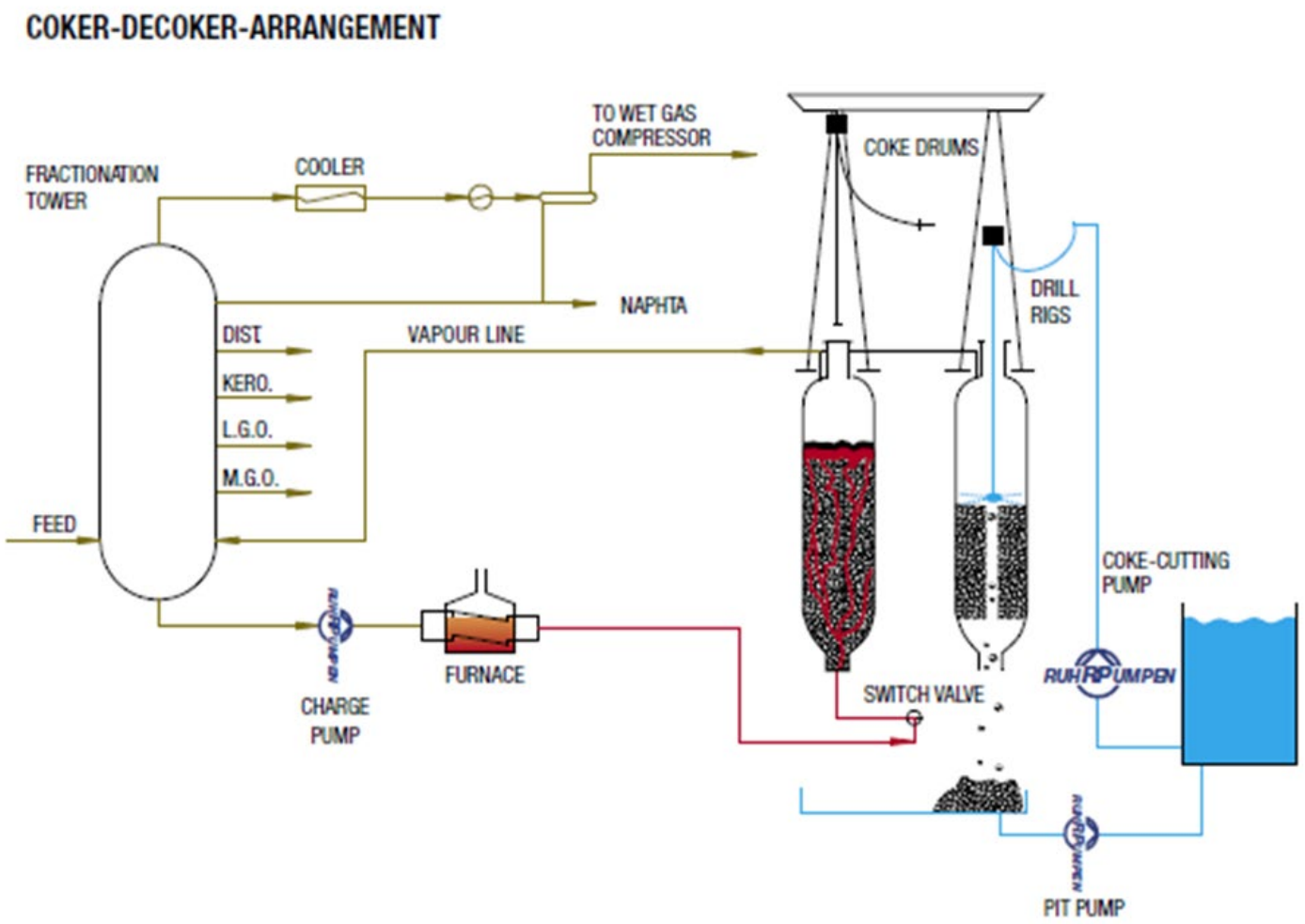
A delayed coker is a type of coker whose process consists of heating a residual oil feed to its thermal cracking temperature in a furnace with multiple parallel passes. This cracks the heavy, long chain hydrocarbon molecules of the residual oil into coker gas oil and petroleum coke.

Delayed coking is one of the unit processes used in many oil refineries. The adjacent photograph depicts a delayed coking unit with 4 drums. However, larger units have tandem pairs of drums, some with as many as 8 drums, each of which may have diameters of up to 10 meters and overall heights of up to 43 meters.

The yield of coke from the delayed coking process ranges from about 18 to 30 percent by weight of the feedstock residual oil, depending on the composition of the feedstock and the operating variables. Many refineries worldwide produce as much as 2,000 to 3,000 tons per day of petroleum coke and some produce even more.

Delayed Coking

Coking and Decoking Processes

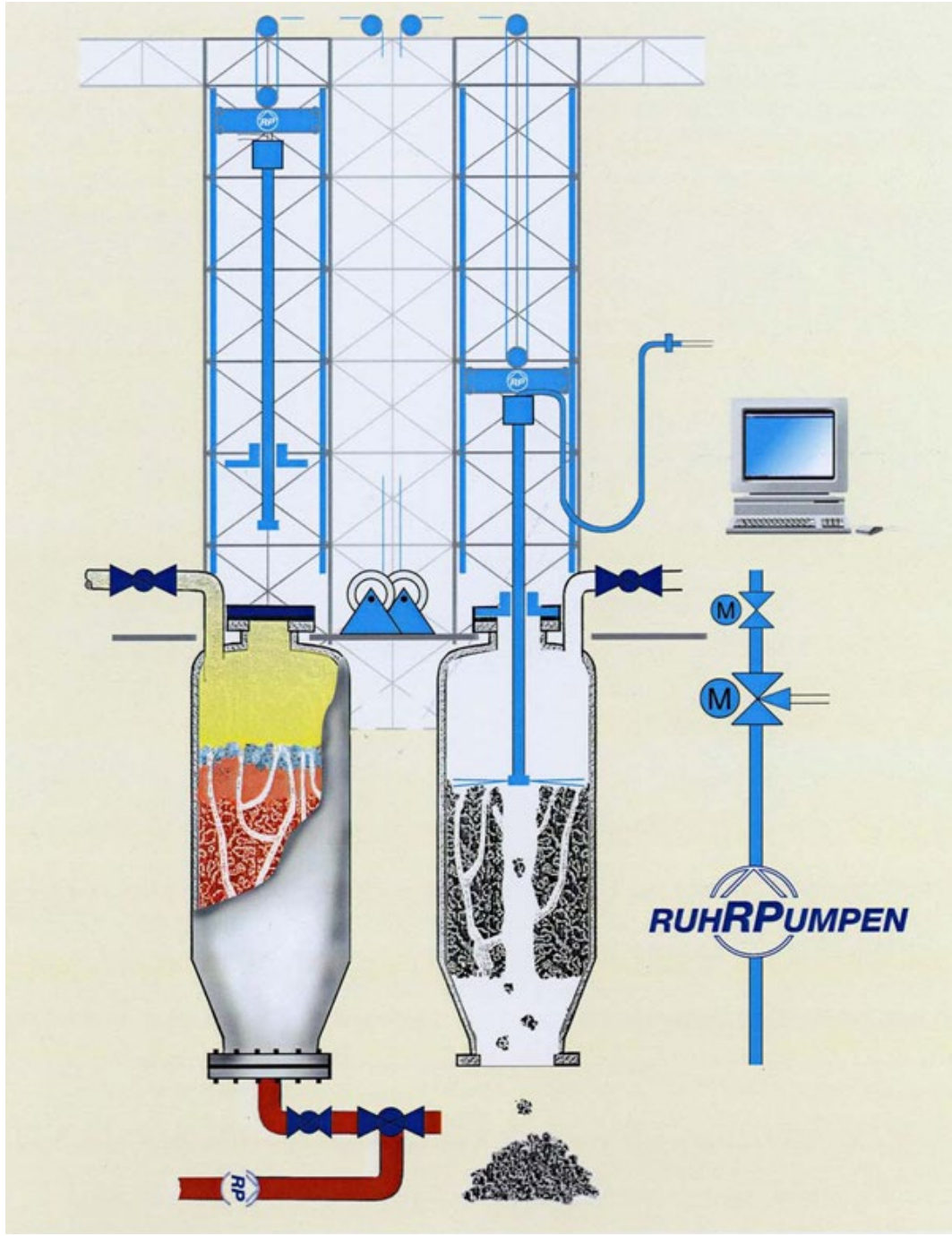


- Delayed Coking
  - Formation of coke from residuum is delayed, occurring in the drum
- Decoking
  - Removal of petroleum coke
- Hydraulic Decoking
  - Removal of coke by hydraulic (water) power

Delayed Coking

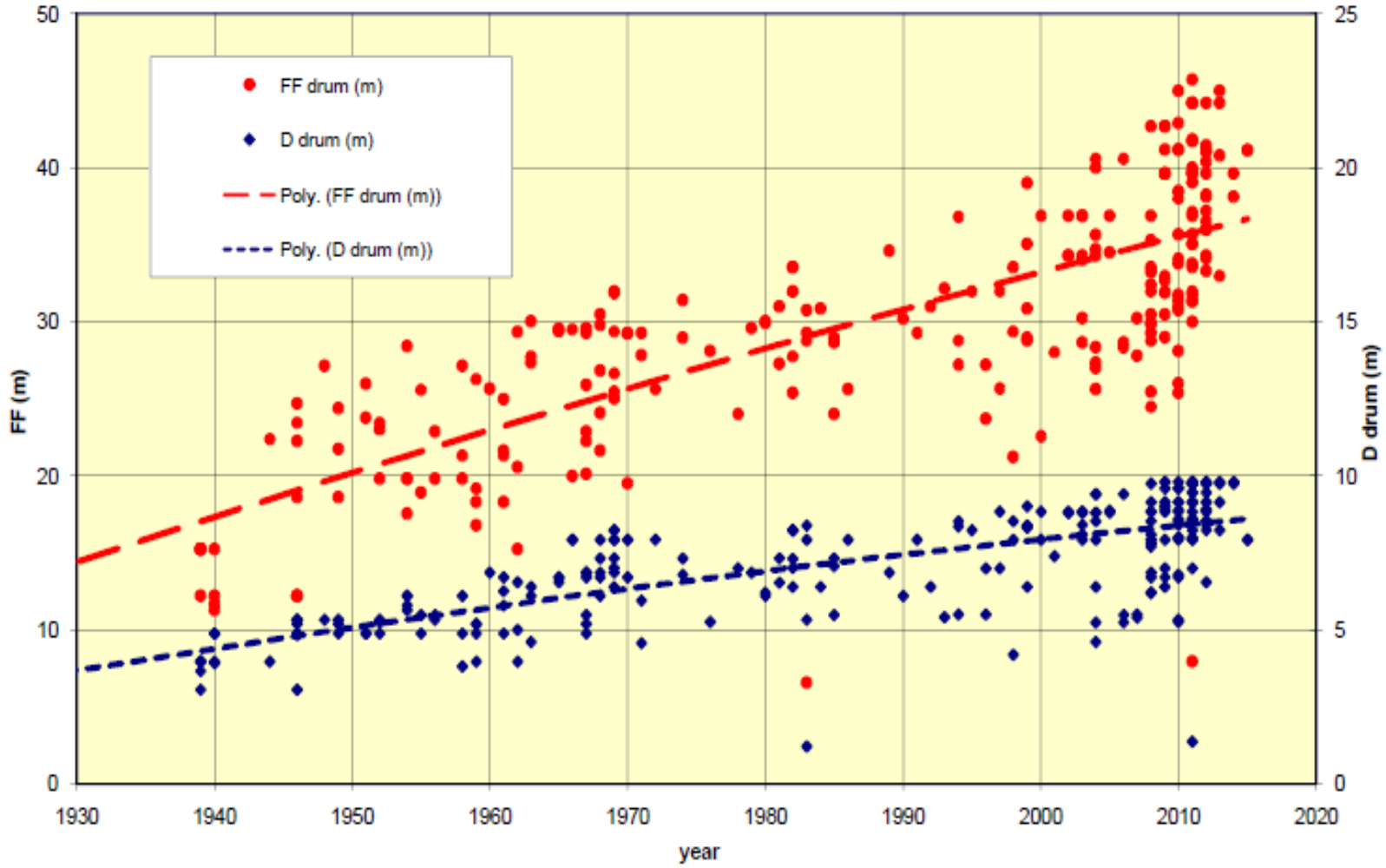
Batch Process

- Decoking Jet Pump
- Lifting System (Drilling / Cutting)
- Control System
  - Operation of System
    - By operator (local or remote)
    - By PLC (Programmable Logic Controller)
  - Protection for
    - Operator
    - Decoking System



Delayed Coking

Trend in Coke Drum Size



Installation References

REFERENCE LIST - DECOKING SYSTEM
February 2023

No.	Constr.	Commissioning	Final Customer			Cutting System Type		Drum No.	Pump No.
			Country	Company	City				
RUNNING									
1	2002	2004	Venezuela	Petroleras Ameriven	San Jose	hyd.	manual	4	1
2	2003	2004	Germany	BP-Gelsenkirchen	Gelsenkirchen	el.	manual / automatic	4	
3	2003	2004	Germany	BP-Gelsenkirchen	Gelsenkirchen	hyd.	manual	4	1
4	2003	2004	Germany	BP-ERE	Lingen	hyd.	manual	2	2
6	2004	2004	China	Jinling	Nanjing	local		2	1
7	2004	2005	Venezuela	Petroleras Ameriven	San Jose	hyd.	manual		1
8	2005	2006	China	Jinling	Nanjing	local		2	1
9	2005	2008	Canada	CNRL	Ft McMurray	hyd./el.	manual	4(6)	2
10	2005	2008	Chile		Concon	hyd.	manual	2	1

Installation References

RUNNING									
11	2005	2005	Germany	BP-ERE	Lingen	hyd.	manual	2	2
12	2006	2008	Spain	BP-Castellon	Castellon	hyd.	manual	2	1
13	2006	2007	USA	Sinclair Oil	Wyoming	hyd.	manual	2	
15	2007	2008	China	Hiuzhou	Hiuzhou	local	manual	4	2
16	2007	2008	USA	Frontier Refinery	Kansas	el.	remote	1	1
17	2007	2008	Germany	OMV	Burghausen	pneumatic /hyd.		2	2
18	2007	2010	Russia	Rosneft	Komsomolsk	el.	manual	2	1
19	2007	2009	Russia	Lukoil	Volgograd	el.	manual	3	1
21	2007	2009	Japan	C-Chem	Kita-Kyushu	el.	manual	2	1
23	2008	2011	India	HMEL-GGSR	Bhatinda	el.	manual	4	2
24	2008	2010	USA	Hunt Refining	Alabama	el.	remote	2	1
25	2009	2011	Norway	StatoilHydro	Mongstad	el.	manual	2	1
26	2009	2010	Argentina	Shell	Buenos Aires	el.	remote	2	1
28	2009	2014	India	MRPL	Mangalore	hyd.	manual	4	2
	2010	2012	Russia	Lukoil	Volgograd	el.	manual	2	2

Installation References

RUNNING									
31	2010	2013	India	IOCL	Paradip	hyd.	manual	4	2
32	2011	2021	Belorussia	Naftan	Novopoletsk	el.	manual	2	1
33	2011	2013	China	PetroChina, Jinzhou	Jinzhou			2	1
34	2013	2016	India	CPCL	Chennai	hyd.	manual/ automatic	2	2
35	2011	2012	Korea	OCI	Seoul	el.	manual	3	1
36	2011	2013	USA	NCRA	Kansas	el.	remote	2	1
37	2013	2016	Russia	Lukoil	Perm	el.	remote/ automatic	4	1
38	2013	2019	Egypt	ERC	Cairo	el.	manual	2	1
39	2013	2016	Russia	JSC Tatneft	Nizhnekamsk	el.	remote/ automatic	4	1
40	2013	2016	Russia	JSC Antipinski	Tyumen	el.	remote	2	1
41	2013	2016	Kazakhstan	Kazmunaigas	Pavlodar	el.	manual	3	1
42	2014	2016	India	IOCL	Barauni	el.	manual/ automatic	2	2
43	2014	2018	Belgium	ExxonMobil	Antwerp	el.	manual/ automatic	4	1
44	2015	2022	Russia	Gaspromneft	Omsk	el.	manual/ automatic	2	1

Installation References

45	2015	2020	Kuwait	KNPC	Kuwait	hyd.	manual/ automatic	4	2
46	2016	2019	Poland	LOTOS	Gdansk	el.	manual/ automatic	2	1
48	2016	2020	India	IOCL	Haldia	el.	manual	2	2
50	2017	2017	Germany	Miro	Karslruhe	hyd.	manual	2	1
51	2018	2018	USA	Chevron	Pascagoula	hyd.	manual	2	
52	2018	2018	Germany	OMV	Burghausen		manual	2	1
54	2018	2022	Russia	Lukoil	Kstovo	el.	remote/ automatic	4	1
56	2019	2021	Russia	JSC Tatneft	Nizhnekamsk	el.	remote/ automatic	4	1
UNDER COMMISSIONING									
47	2016	2023	Venezuela	PDVSA Petropiar	Jose Barcelona	el.	manual	4	1
49	2016	2023	Russia	Bashneft	Ufa	el.	remote	4	1
55	2018	2023	Oman	DRPIC	Duqm	el.	remote/ automatic	4	1
57	2019	2023	Mexico	PEMEX	Paraiso	el.	remote	6	2
58	2020	2023	Croatia	INA - INDUSTRIJA NAFTE	Rijeka	el.	remote	2	1

Installation References

UNDER MANUFACTURING									
59	2020	2023	India	HRRL	Pachpadra	el.	remote	4	2
60	2021	2023	Romania	Petrotel Lukoil	Ploiesti	el.	manual	4	1
61	2022	On Hold	Russia	Slavneft - YANOS	Jaroslawl	el.	manual / automatic	4	1
62	2022	2023	Romania	OMV Petrom	Ploiesti	el.	manual	4	1
63	2022	2024	India	IOCL	Barauni	el.	manual	2	2
64	2022	2024	Romania	Rompetrol	Constanta	el.	manual	4	1

Jet Pump Unit

Decoking Jet Pump Design

- Horizontal, BB5 barrel pump
- Forged steel barrel (Std. C-6)
- Cartridge design – Easy change out
- Radially split casing
- Designed acc. to API 610
- Balance drum
- Sleeve bearings (forced oil)
- Flanges: Top/Top, Side/Top, Side/Side
- In-line impeller design
- Back-to-back impeller design

Jet Pump Unit

Double Case Pump Type BB5

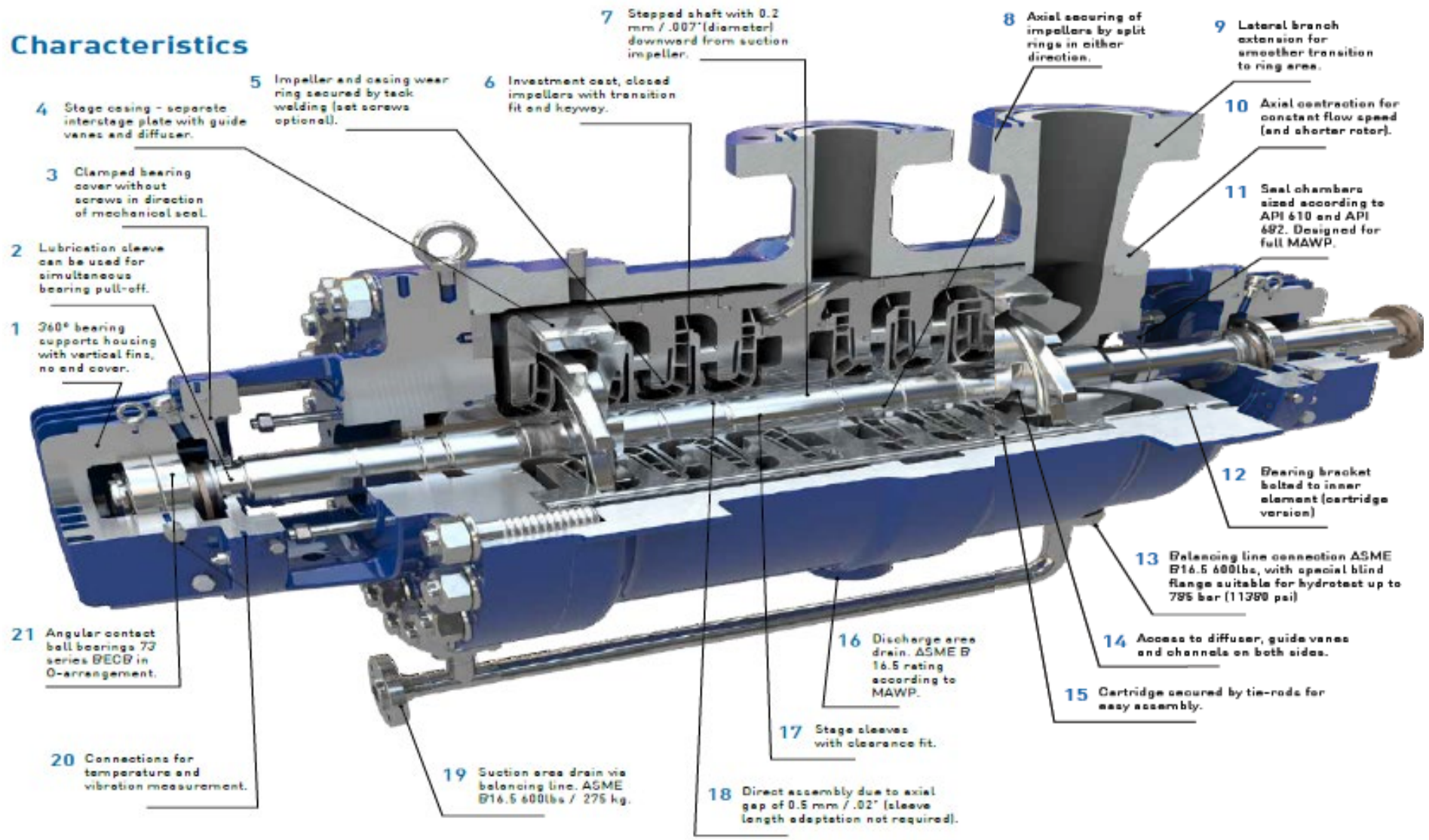
We covered the detailed design and features of BB5 pumps in a previous session (Session 8)

You can download the Video and the Slideshow PDF from our Webpage

Go to www.Ruhrpumpen.com

Follow the top menu link to “RP Short Courses” and find Session 8

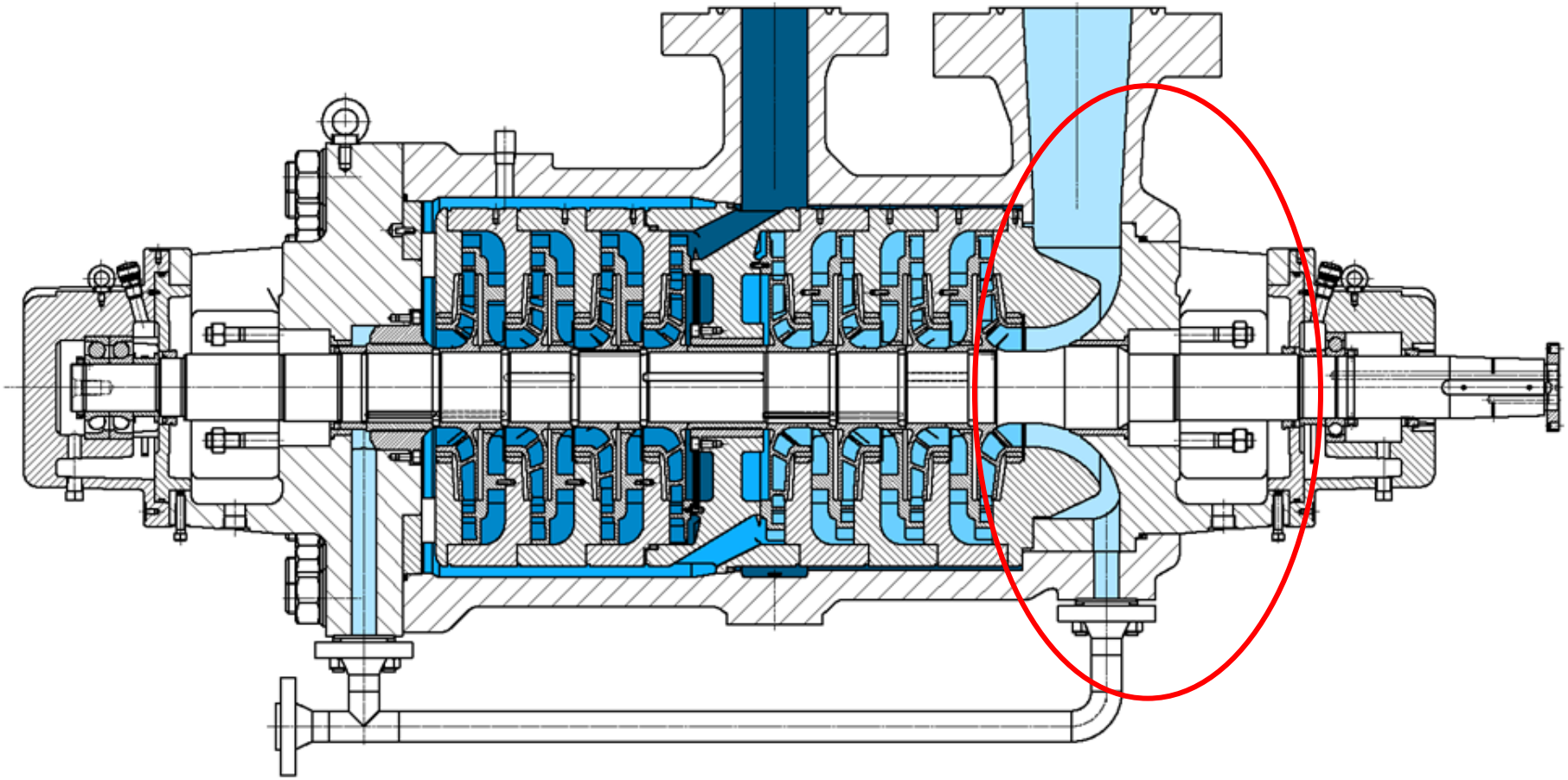
Double Case Pump Type BB5



Double Case Pump BB5

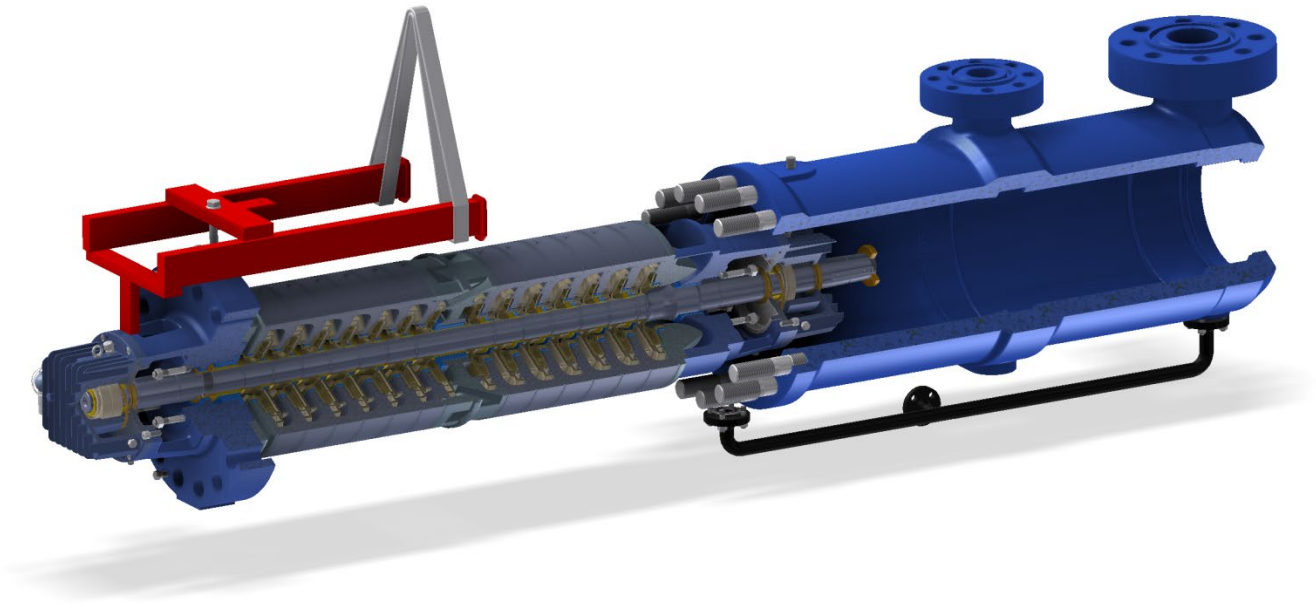
Complete Pullout Design

Separate suction cover, which is mounted on inner element – Advantage
Full pullout design. No disassembly required before cartridge removal



Cartridge Installation / Removal

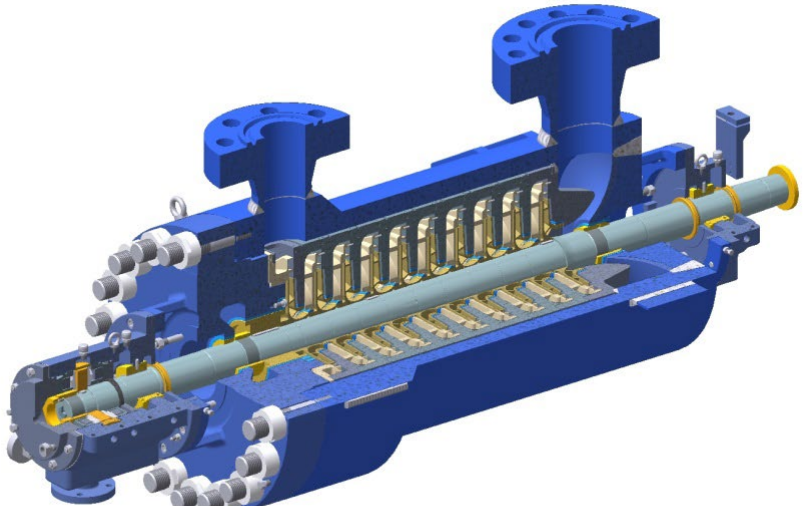
Complete Pullout Design

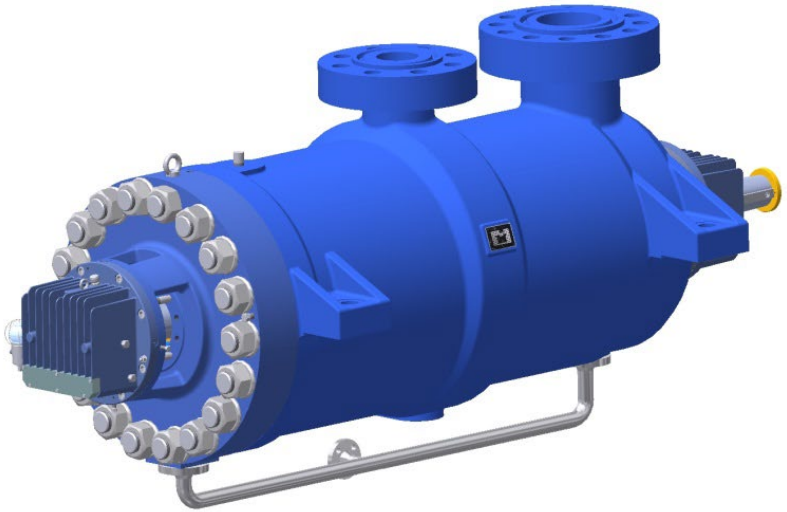


Jet Pump Unit

Decoking Jet Pump Design

- Performance
  - Capacity, up to 350 m3/h (1541 gpm)
  - Head, up to 4000 m (13,123 ft)
  - Pressure, up to 400 bar (5802 psi)
  - Speed, up to 4500 rpm





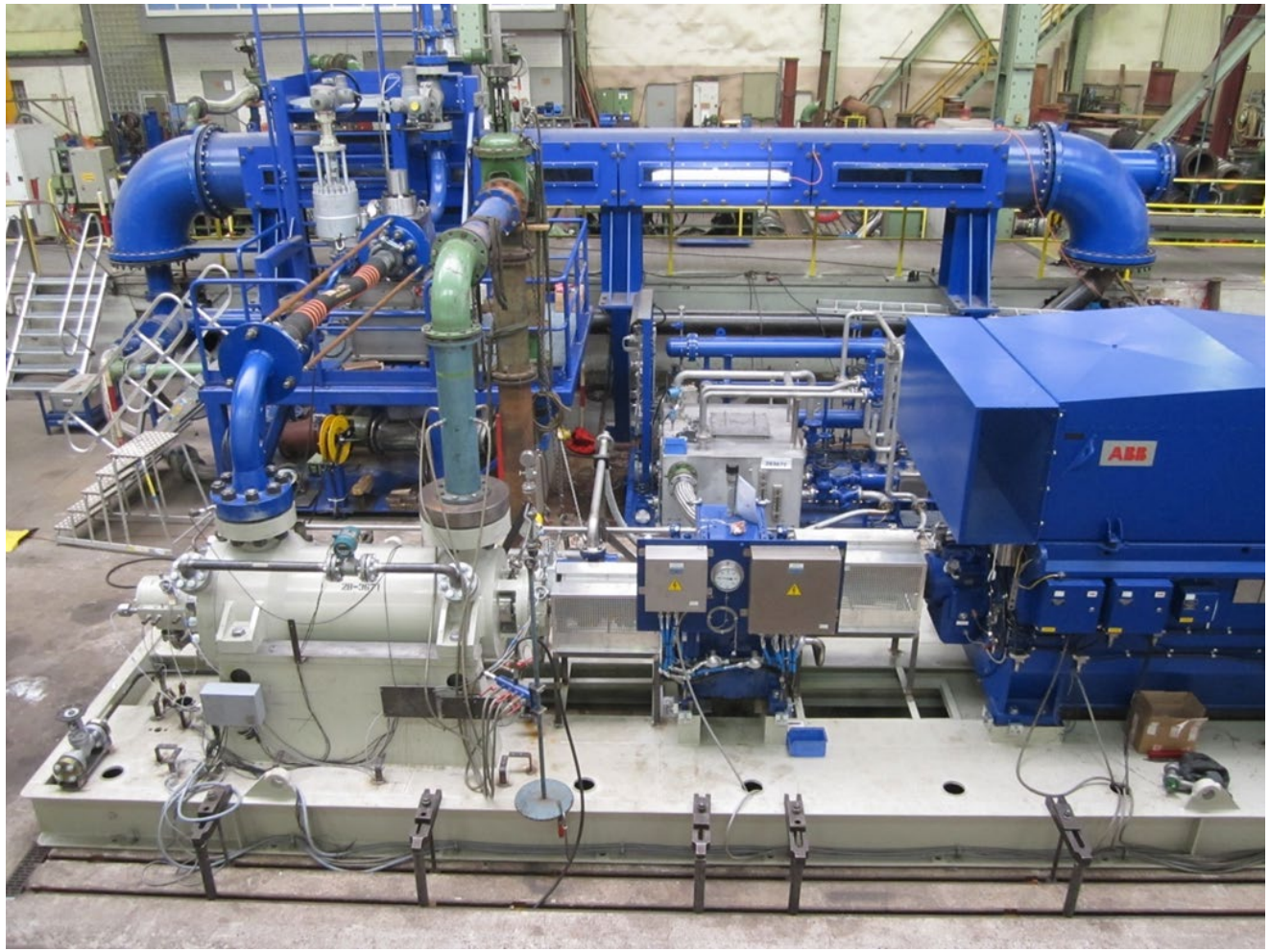
Jet Pump Unit

Decoking Jet Pump Manufacturing

- Horizontal, 10-stage, single suction, BB5 barrel pump
- Ruhrpumpen ADC 6x10
- Hydraulic decoking system
- Performance
  - Capacity 312 m3/h (1374 gpm)
  - Head 3436 m (11,273 ft)
  - Temperature 90 °C (194 °F)
  - Medium: Water with coke fines

Jet Pump Unit

Complete Unit Testing of Jet Pump Skid



- Functional Test
  - Jet pump
  - Motor
  - Lube oil system
  - Decoking Control Valve
  - Cutting Tool (CT)
- API 610, 11th Ed, Sect 6.1.26, …pump and driver shall perform on test stand and permanent foundation within vibration criteria specified in 6.9.3…
- Pump skid on “massive” foundation, not raised up on temporary supports

Jet Pump Unit

Complete Unit Testing of Jet Pump Skid

- Lube oil skid sunken to allow for gravity flow back to oil reservior
- Full-speed Performance Test
- Observation windows for CT
- Spray pattern and force measurement
- Accurately simulates field conditions

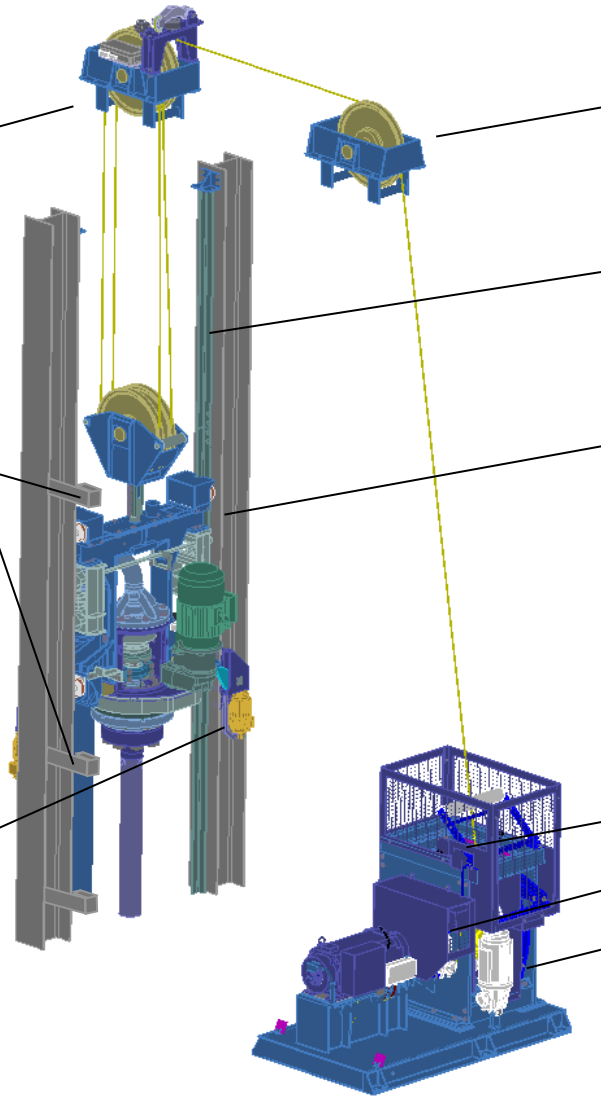
Jet Pump Unit

Decoking Jet Pump in the Field

- Horizontal, 12-stage, single suction, BB5 barrel pump
- Ruhrpumpen ADC 6x12
- Hydraulic decoking system for crude upgrader
- Performance
  - Capacity: 272 m3/h (1198 gpm)
  - Head: 3120 m (10,236 ft)
  - Temperature: 70 °C (158 °F)
  - Motor: 3500 kW (4694 HP)
  - Motor speed: 3560 rpm

Cutting System

Derrick



Double Pulley with
Encoder and Load Cell

Single Pulley

Guide Rails

Position switches Derrick

Crosshead with
Drill Stem Drive (DSD)
and Free Fall Arrestor

Hoist with:

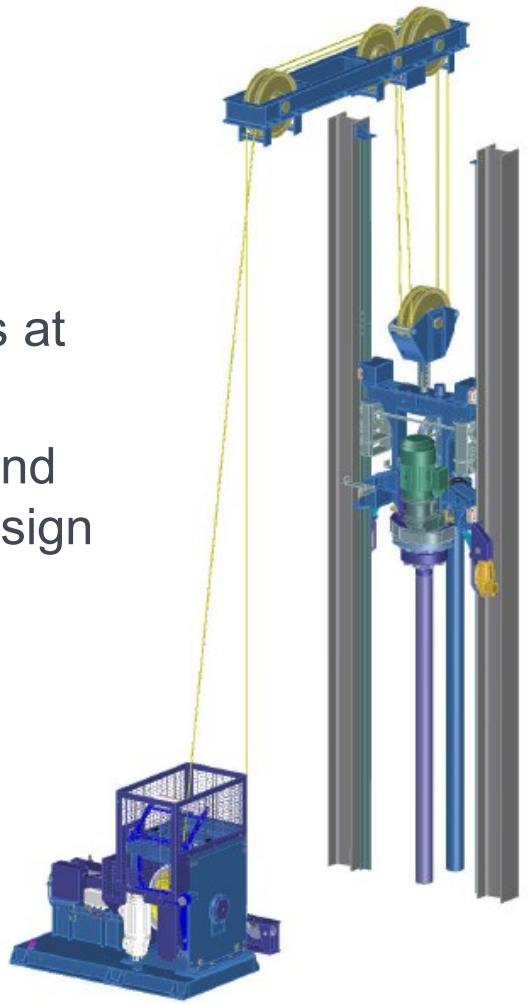
Slack Rope switch
working brake and
safety brake

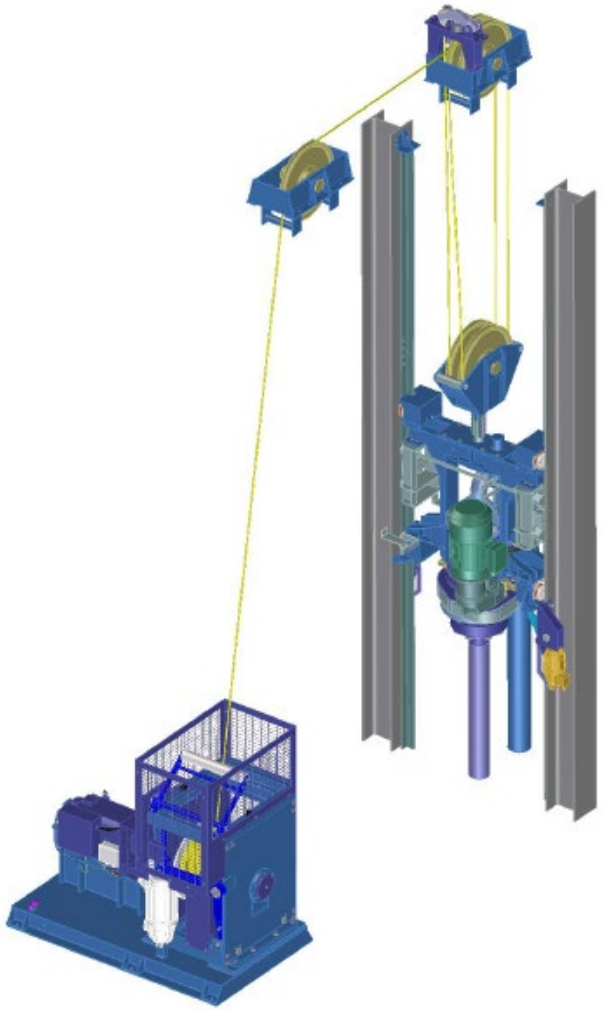
Latching devices, electric

Cutting System

Wire Rope Configurations

- Wire rope terminates at deck
- Bechtel (and others) design

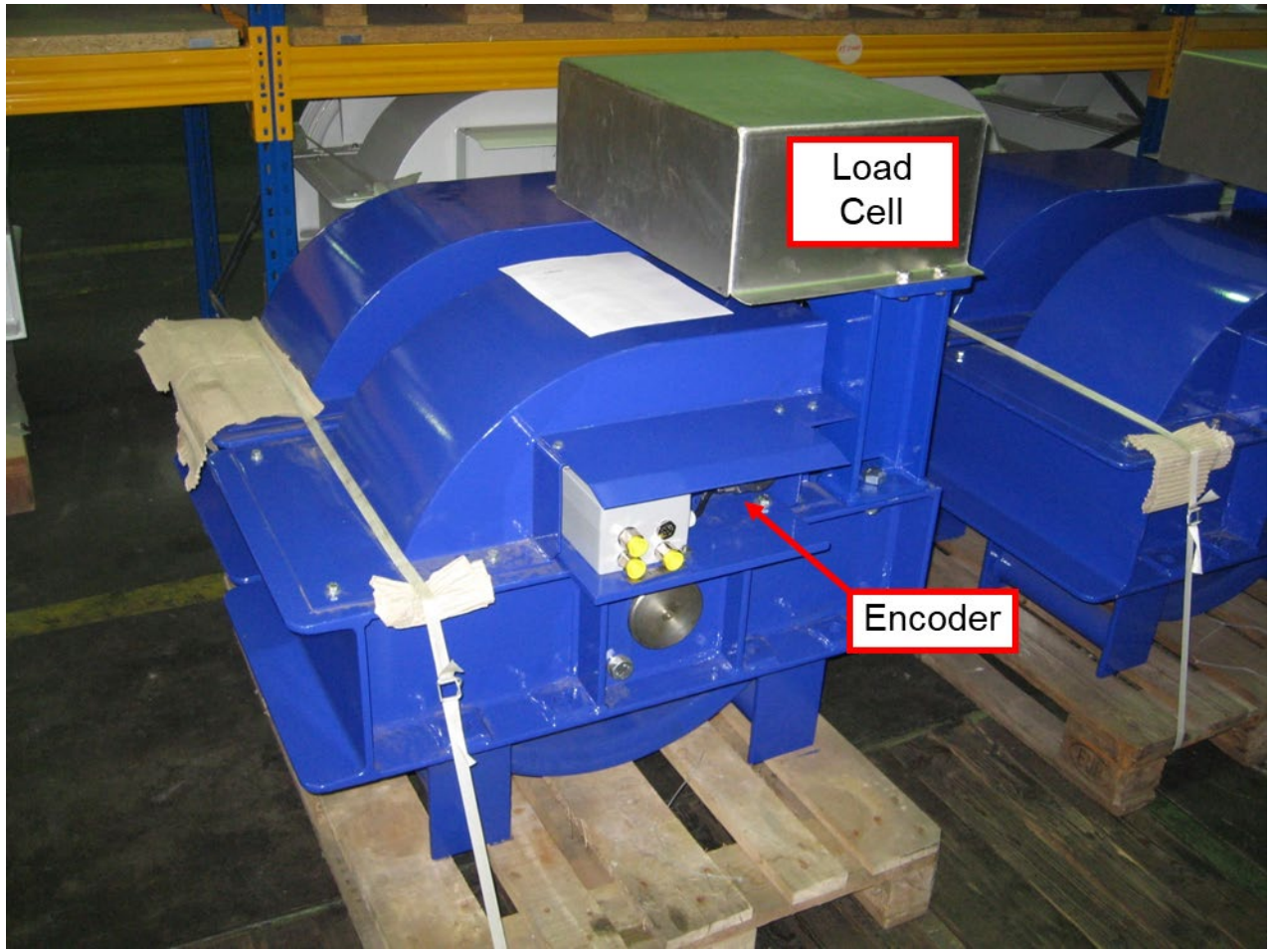




- Wire rope terminates at crown block
- RP prefers this configuration
- Measures loading directly rather than through another pulley

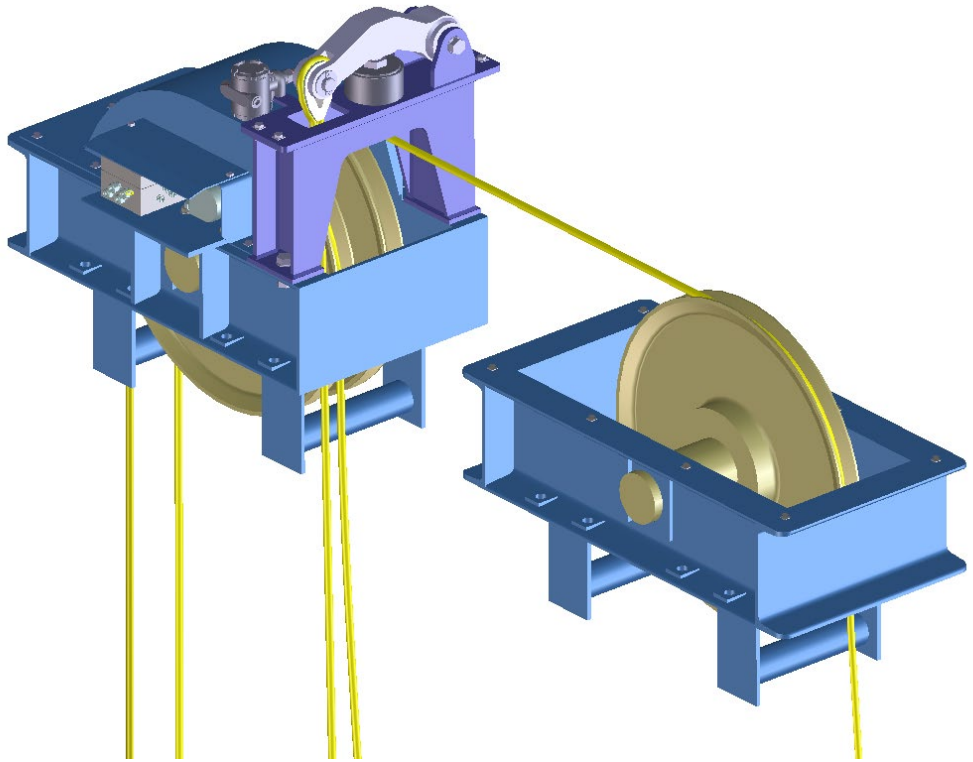
Cutting System

Pulley Block

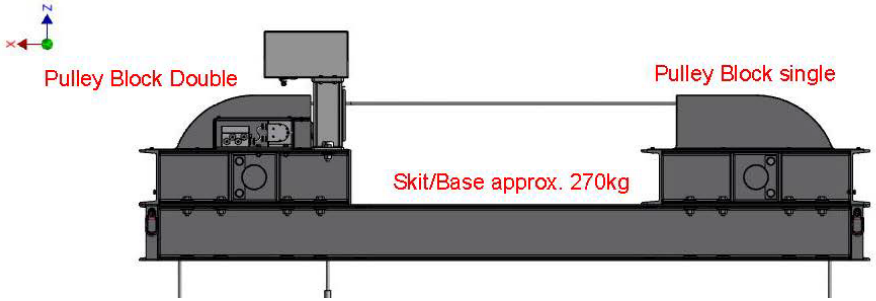


Cutting System

RP Pulley Block Design

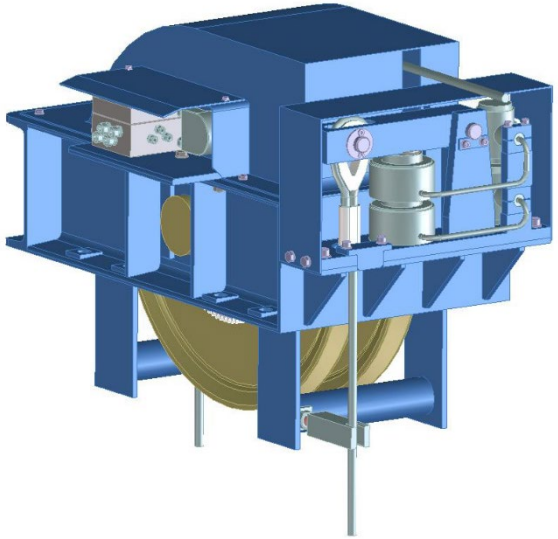


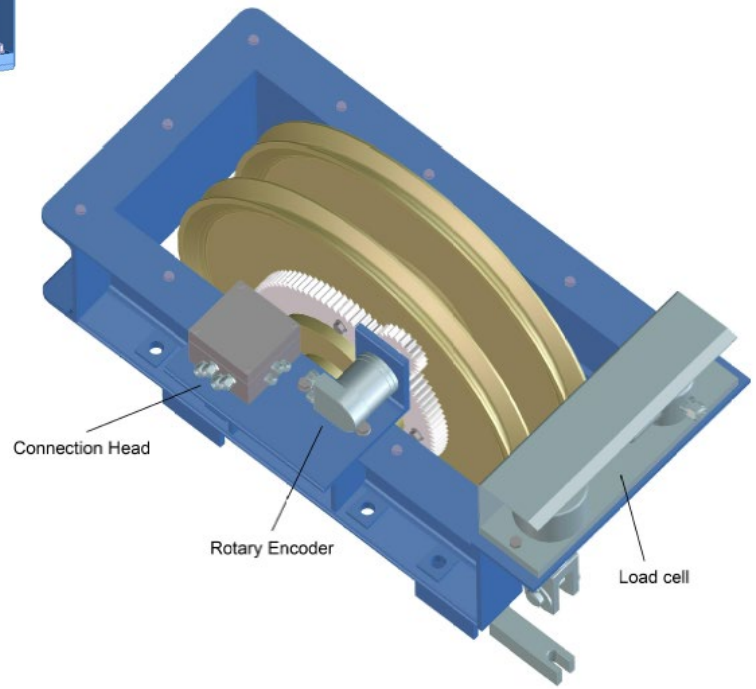
- Large Diameter Sheaves, Ø600mm (24”) dia. pulley
- Loading, 20 tons (20,000 Kg, 44,000 lbs.)
- Wire Rope Load Cell (pull force transmitter, indication at operator panel)
- Crown block subassembly and single pulley block subassembly and may be bolted on a common I-Beam frame supplied by RP (length per Project requirements)
- Safety feature: Double catch bars hold pulley and rope should pulley shaft ever break



Cutting System

RP Pulley Block Design



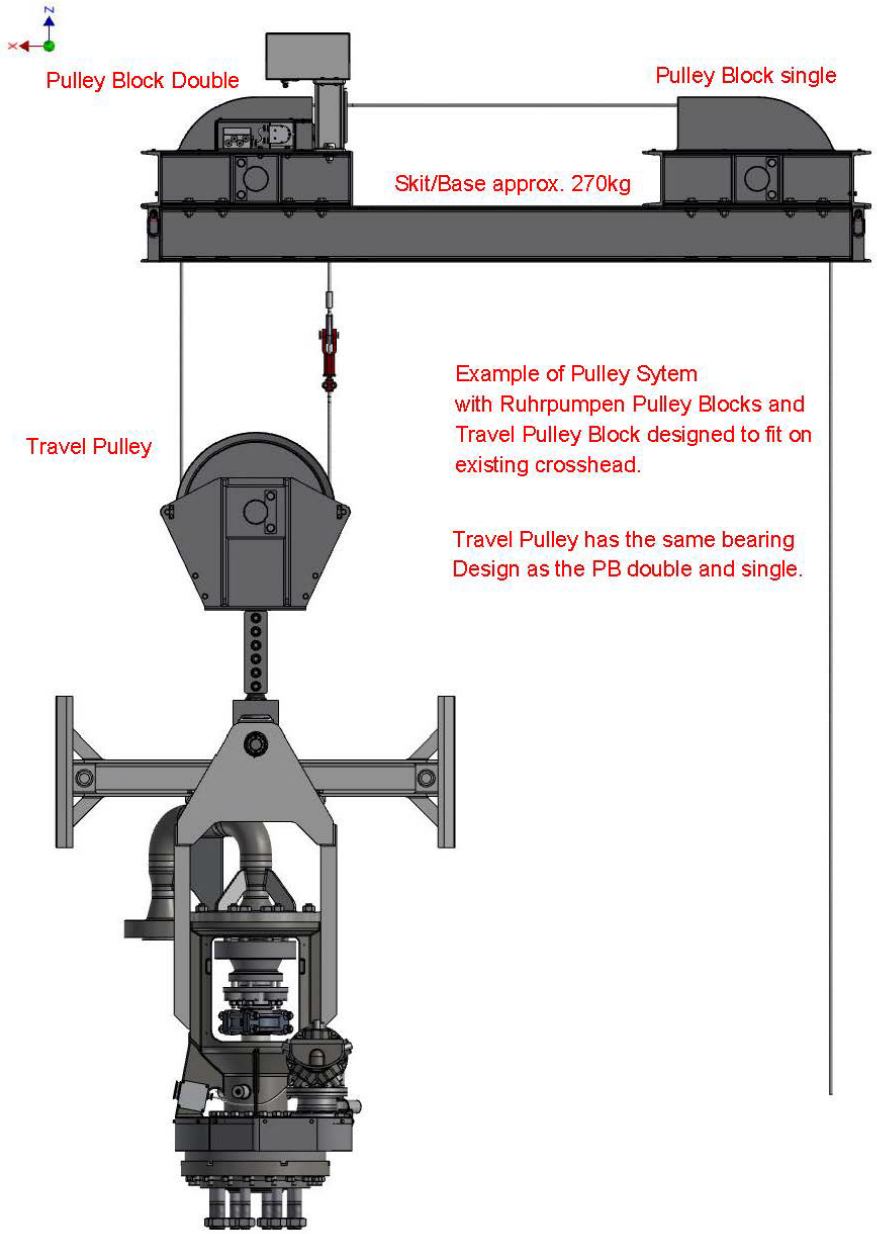


- Drill stem position absolute encoder, Gear driven; Indication at operator panel; Additional information to tower switches
- High accuracy, no slip
- Sheaves (Pulley Wheels) are mechanically captured by protection cap; Safety and keeps out debris
- Maintenance free (permanently sealed bearings)

Cutting System

Retrofit Options

- RP Pulleys (Single, Crown and Travelling) and base frame
- Flowserve Shoe-type Crosshead (using I-beams instead of guide rails)
- RP DSD (drill stem drive)



Cutting System

Hoist

Electrical system

- **Features**
  - 1 VFD set for hoists
    - 1 running, 1 stand by
  - 1 VFD set for DSDs
    - 1 running, 1 stand by
  - VFDs, 1 set per coker,
    - Installed in safe area, or
    - Cutting deck
  - Redundant installation

Hydraulic system

- **Features**
  - Hydraulic power unit
  - 1 hyd. hoist/DSD per drum
  - 1 Operator panel per drum pair
  - Control electric/electronic
  - Integrated in PLC system
  - Measurement of force, tension

Pneumatic system

- **Not recommended**
  - Insufficient power
  - Oil polluted air
  - High noise level
  - Remote / automatic control
    - Not reliable

Cutting System

Hoist

- Drive options
  - Electric motor w/VFD (safe area)
  - Hydraulic via HPU
- Integral gear cartridge
- Pull force: 5,000 Kg (11,000 lbs)
- Mining industry design

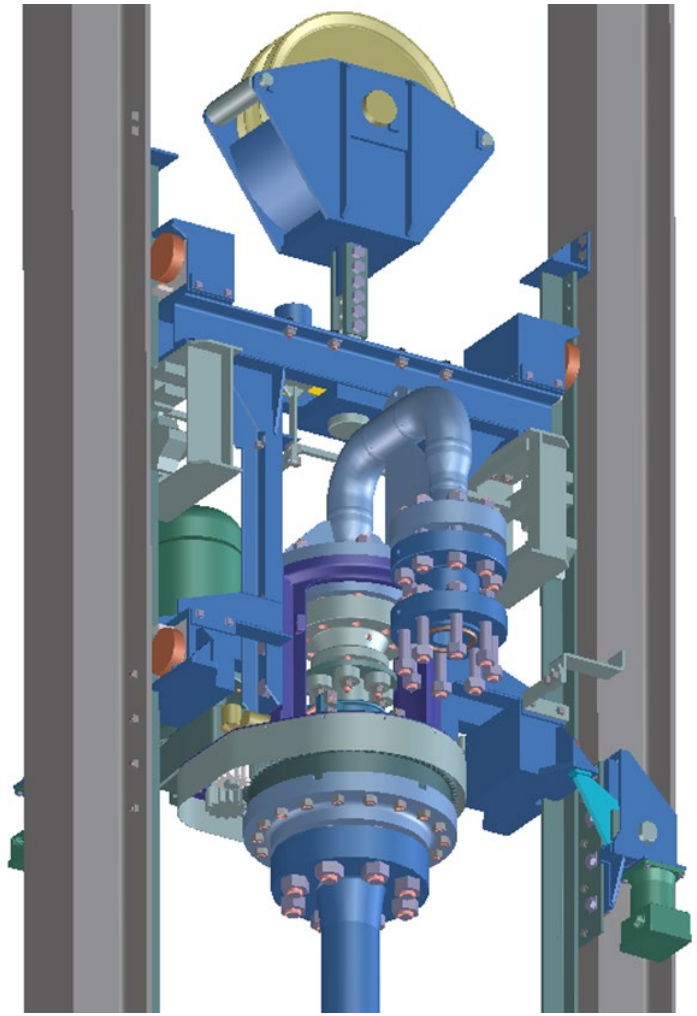
Cutting System

Hoist

- Wire rope
  - Tension measurement via load cell/transmitter
  - Avoids slack rope and overloading
  - Indication at main operator cutting panel

Cutting System

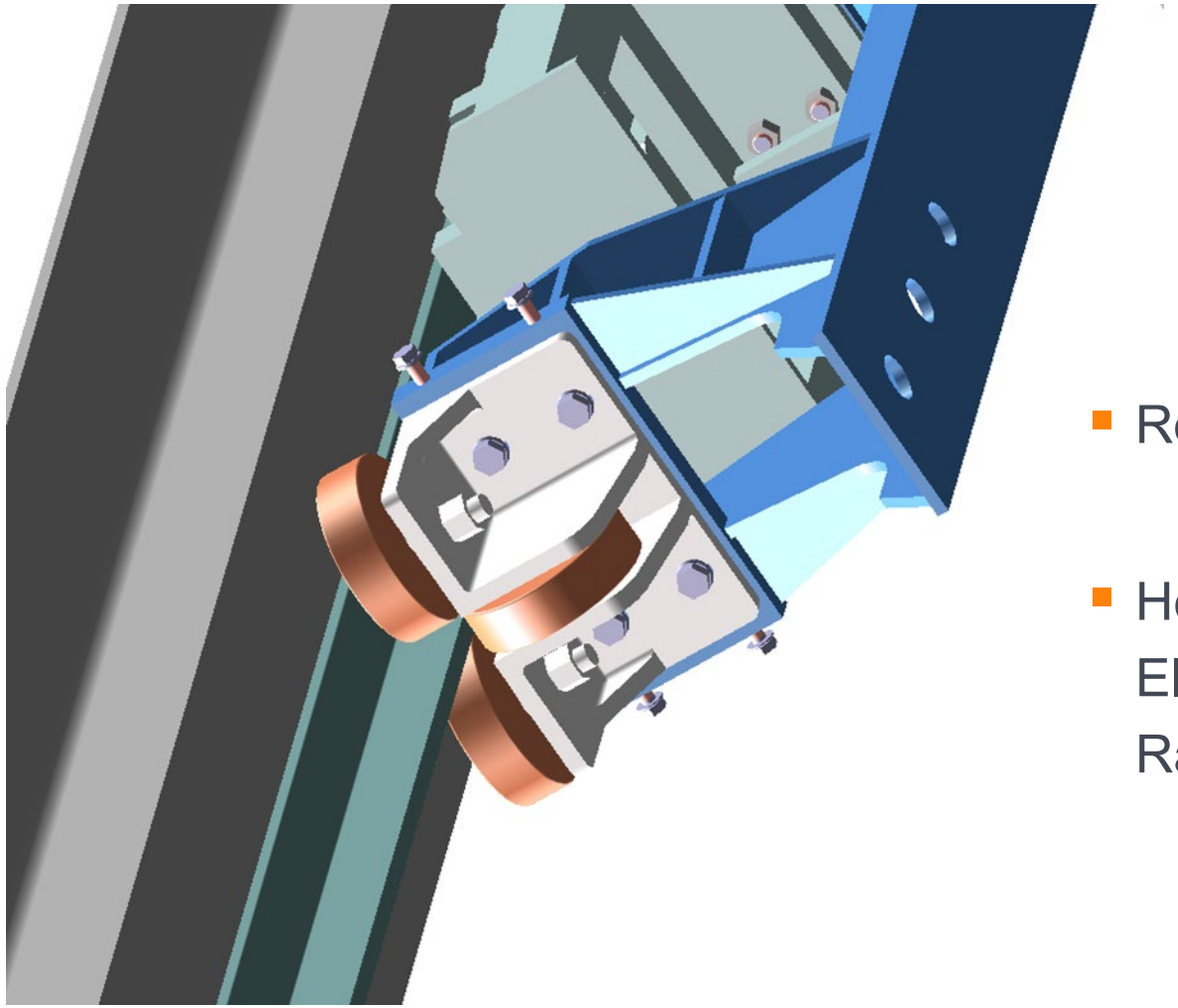
Crosshead with Free Fall Arrestor



- Crosshead
  - 4 guided points
  - 3 wheels each
- Drill stem Drive
  - Electric motor driven
- Free fall arrestor
  - Automatic operation on loss of pull force
  - TüV Approval
- Pulley block
- Gooseneck / Swivel

Cutting System

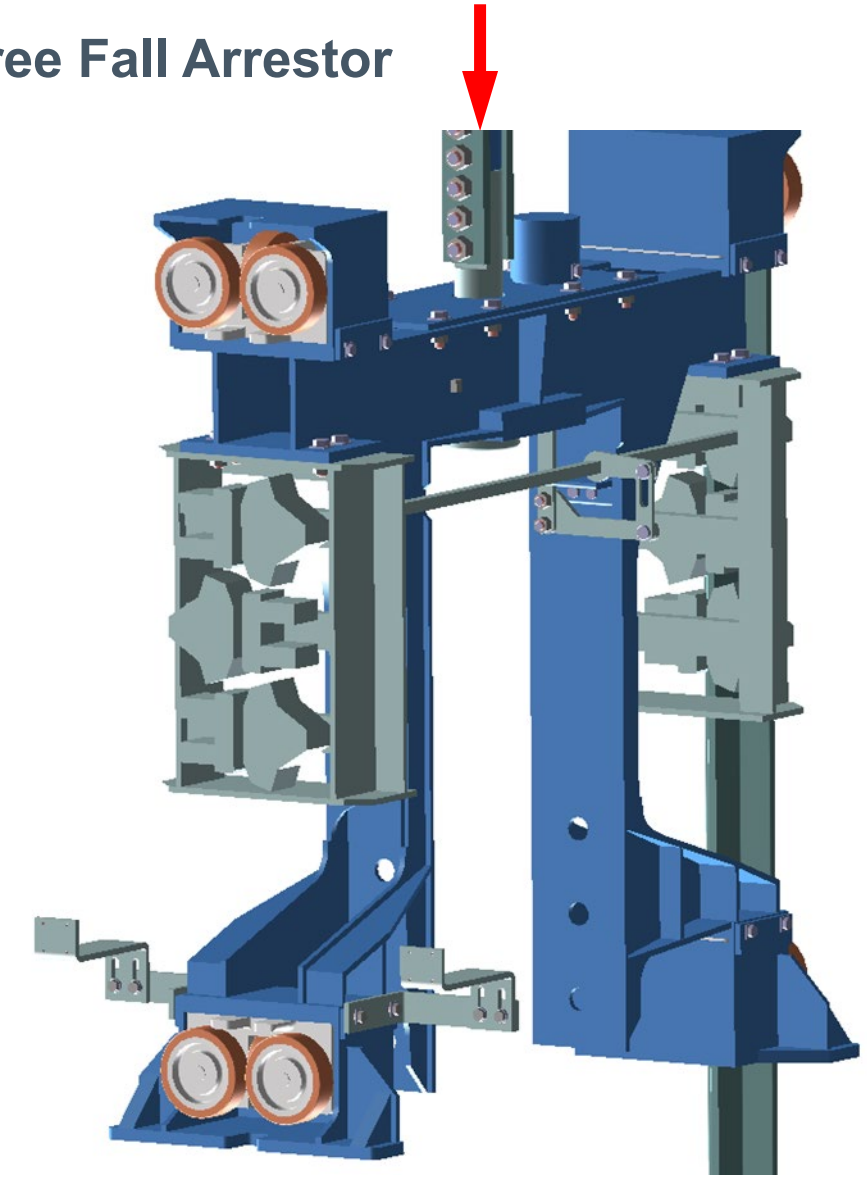
Crosshead with Free Fall Arrestor



- Roller guide
  - 3 wheels
- Heavy-duty Commercial Elevator Industry “T” Rail

Cutting System

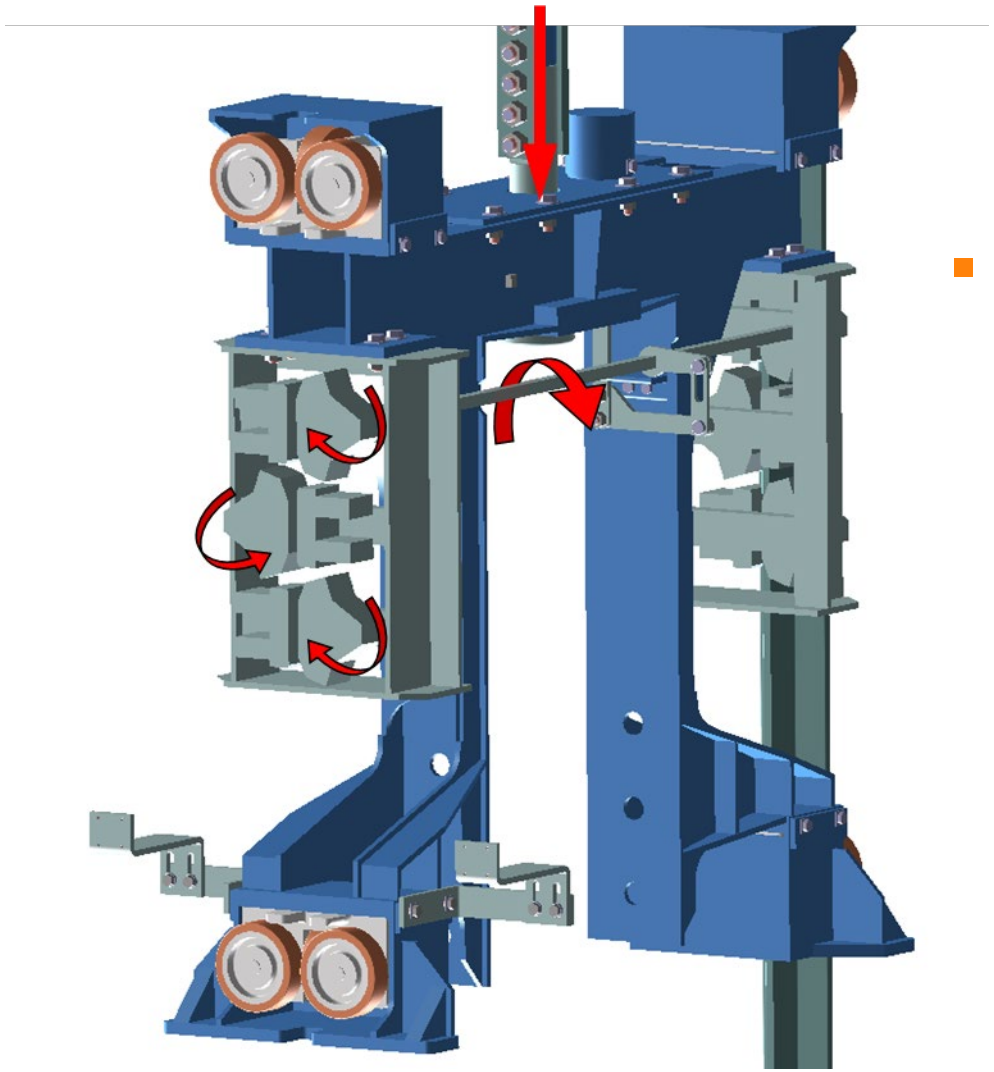
Crosshead with Free Fall Arrestor



- Free fall arrestor
  - Activated as soon as no upward pull force on travelling pulley

Cutting System

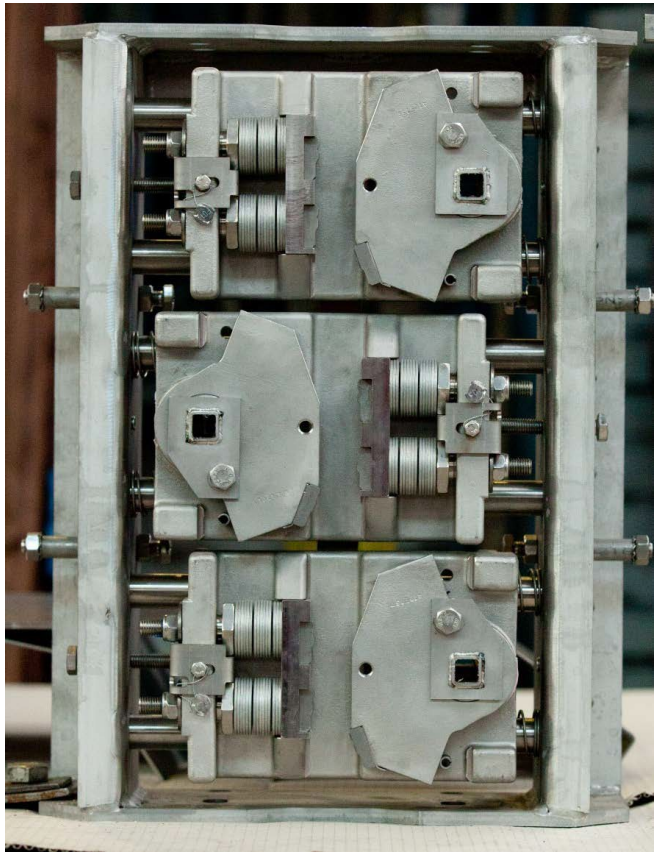
Crosshead with Free Fall Arrestor

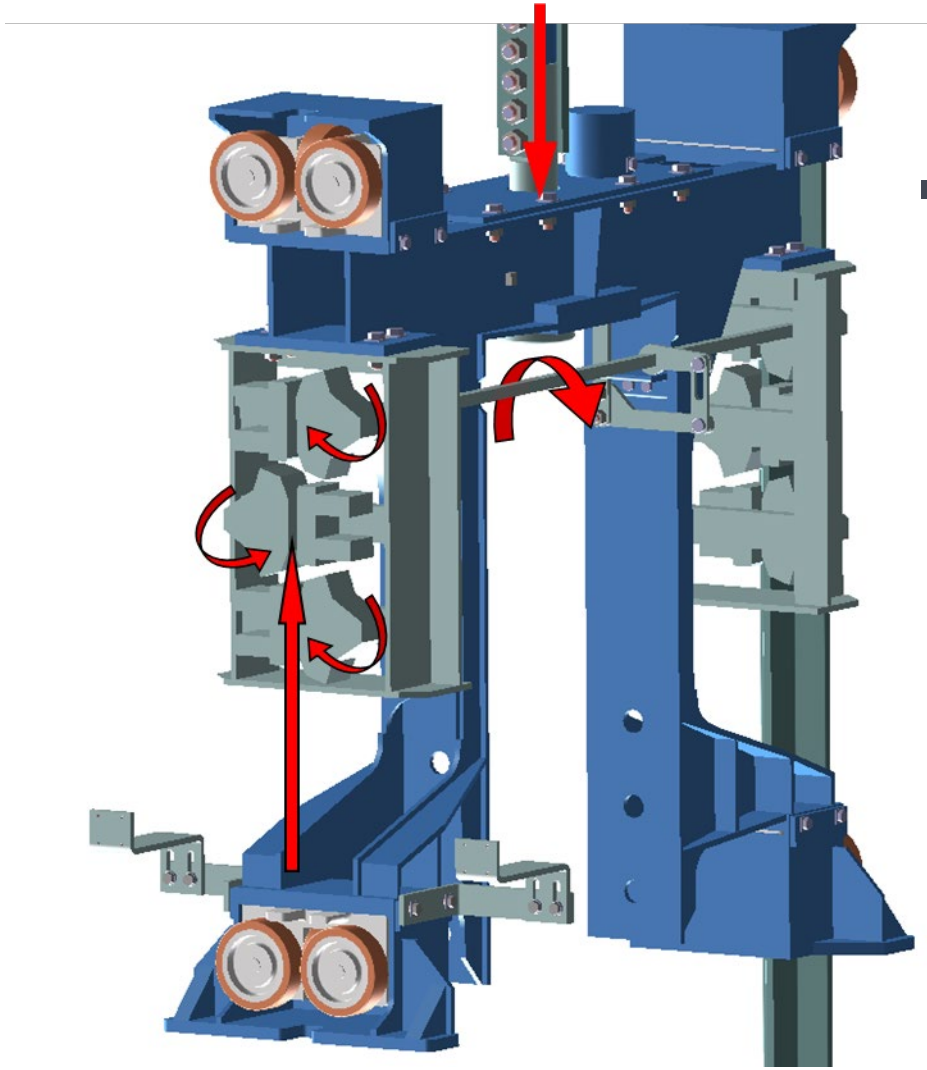


- Free fall arrestor
  - Activated as soon as no upward pull force on travelling pulley
  - Linkage enacts the cams to rotate

Cutting System

Crosshead with Free Fall Arrestor





- Free fall arrestor
  - Tungsten carbide grippers cam into the heavy duty “T” rail
  - Simply “winch up” to reset

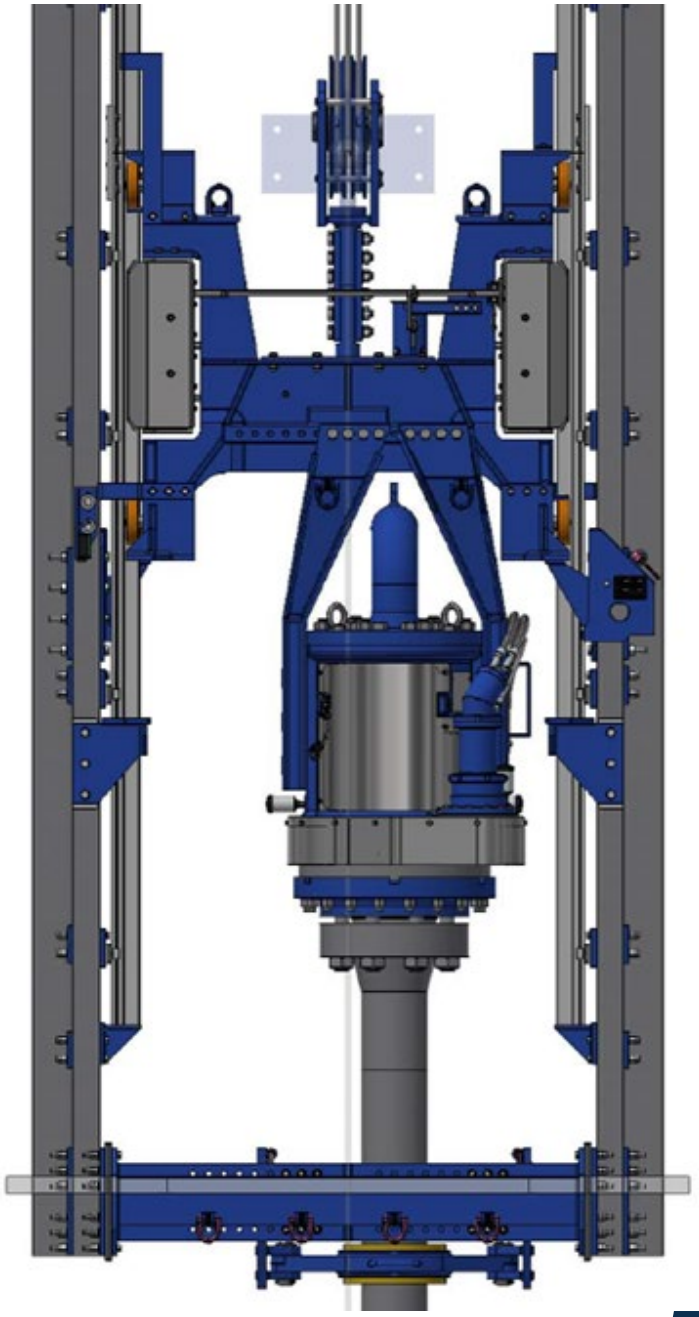
Cutting System

Crosshead with Free Fall Arrestor

- Full-load functional test in shop
- Weight 9500 Kg (20940 lbs)
- Functional test at site available

Cutting System

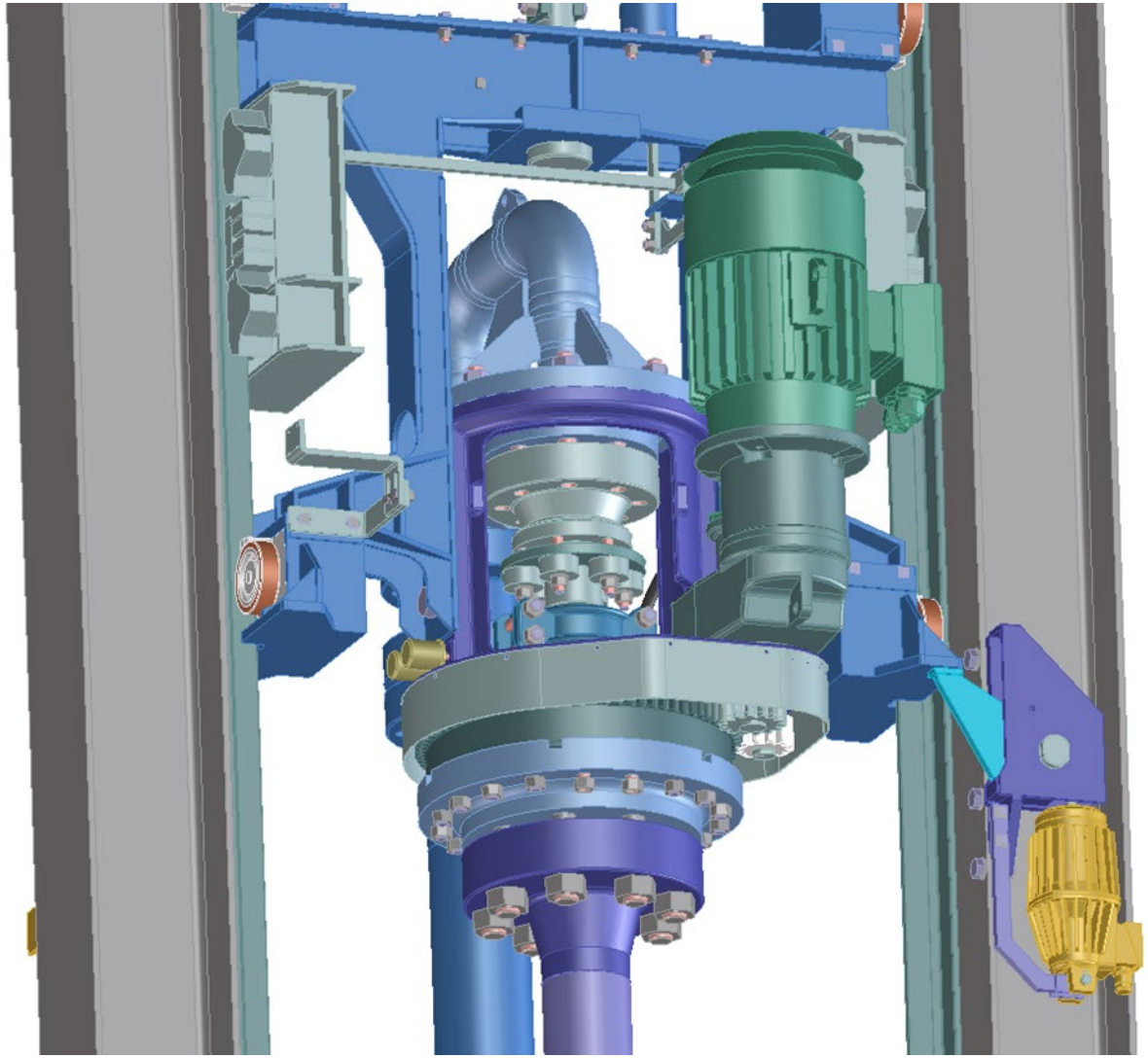
Crosshead with Free Fall Arrestor – Offset Design



Cutting System

Drill Stem Drive

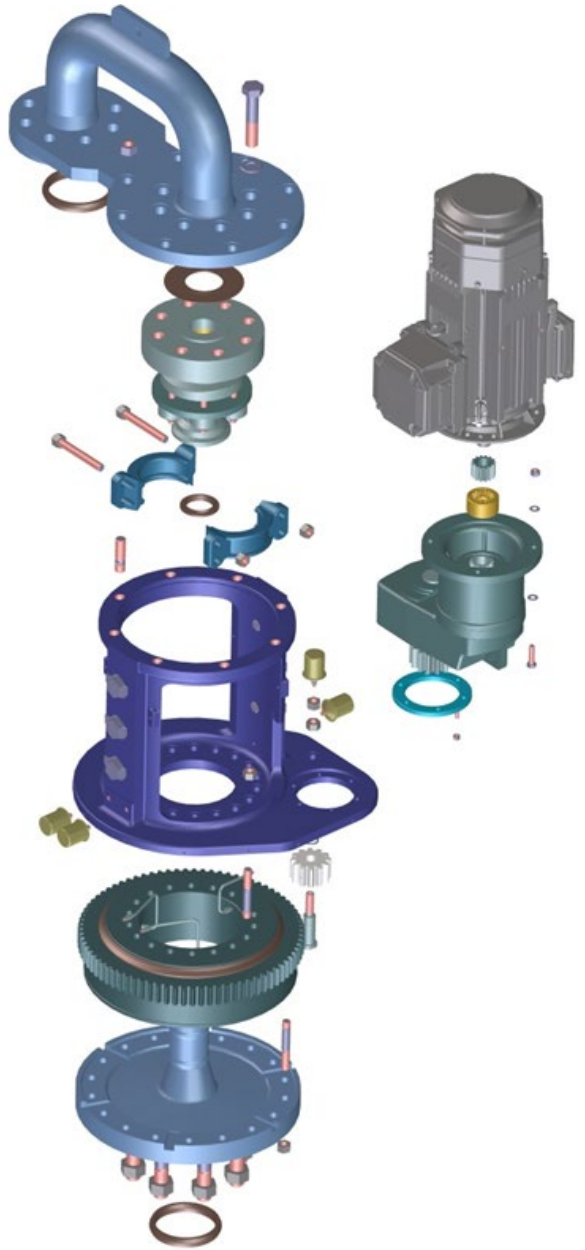
- VFD-driven electric motor
- High load bearing
- Grease lubrication
- Cartridge packing
- Swivel



Cutting System

Drill Stem Drive – Exploded View

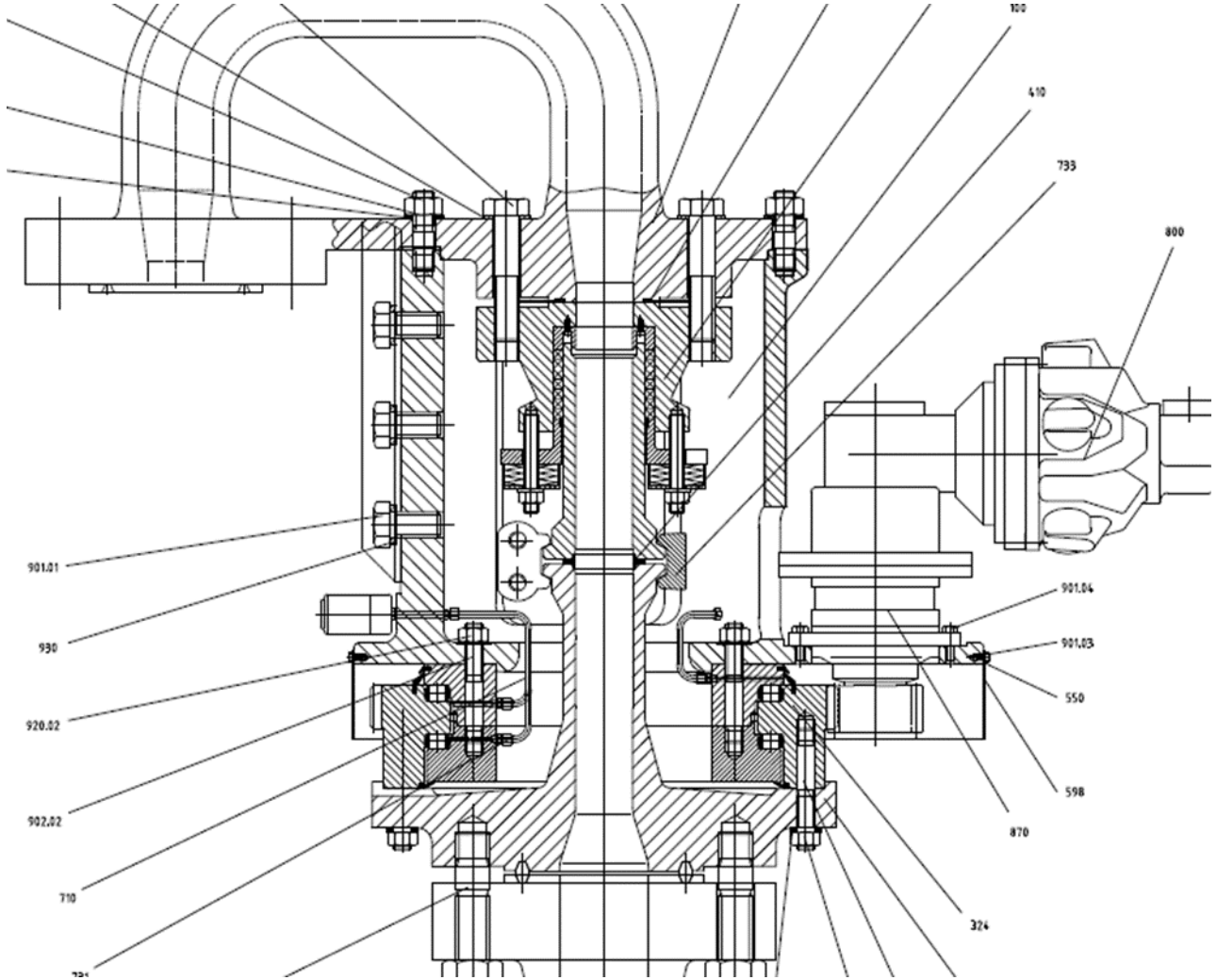
- Drivers: Electric (VFD), Hydraulic, or Pneumatic Motor
- High load slewing ring type bearing
- Automatic greaser eliminates oil reservoir
- Overall cartridge design allows for repairs on the cutting deck
- 4 Sub-Assemblies:
  - Casing and high pressure piping
  - Bearing/gear cartridge
  - Drive unit
  - Seal cartridge



Cutting System

Drill Stem Drive – Cross Section

- Pneumatic motor (shown)
- Max. Loading 65,000 Kg (143,000 lbs.)
- Grease lubrication
- Cartridge packing
- Gooseneck



Cutting System

Drill Stem Drive – Easy Serviceability at Deck Level

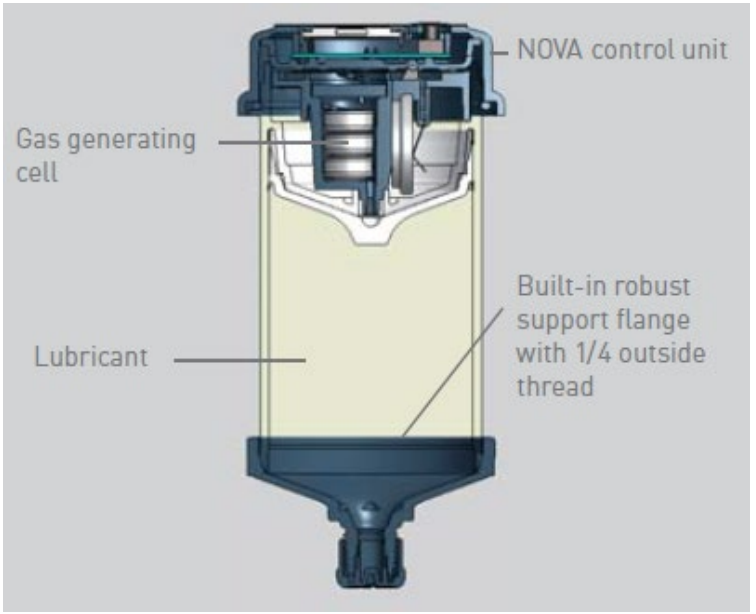
- RP rails allow for safe and quick exchange of the packing seal cartridge

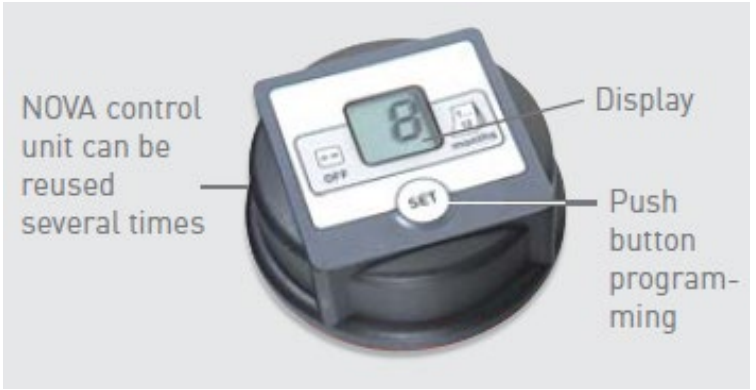
- Deck level exchange of the bearing gear cartridge

Cutting System

Drill Stem Drive – Automatic Greasers

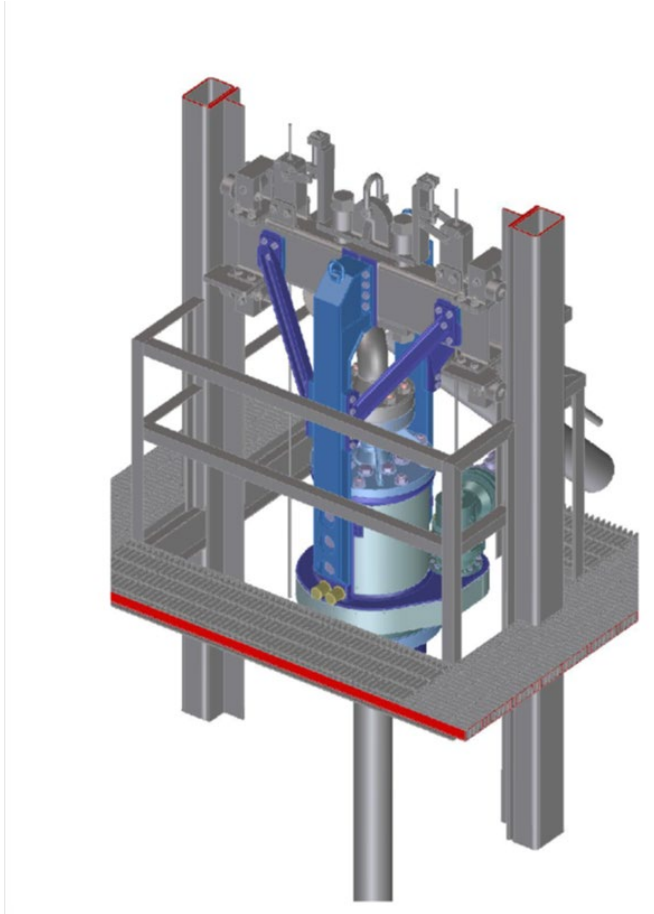
- Single-Point Lubrication System
- Driven by electrochemical reaction via gas generating cell
- Pressure build-up, max. 6 barg (87 psig)
- Holds 130 cm3 (4.4 oz) of lubricant
- Discharge entire amount in 1, 2, 3,…12 months
- Compensates for ambient temperature

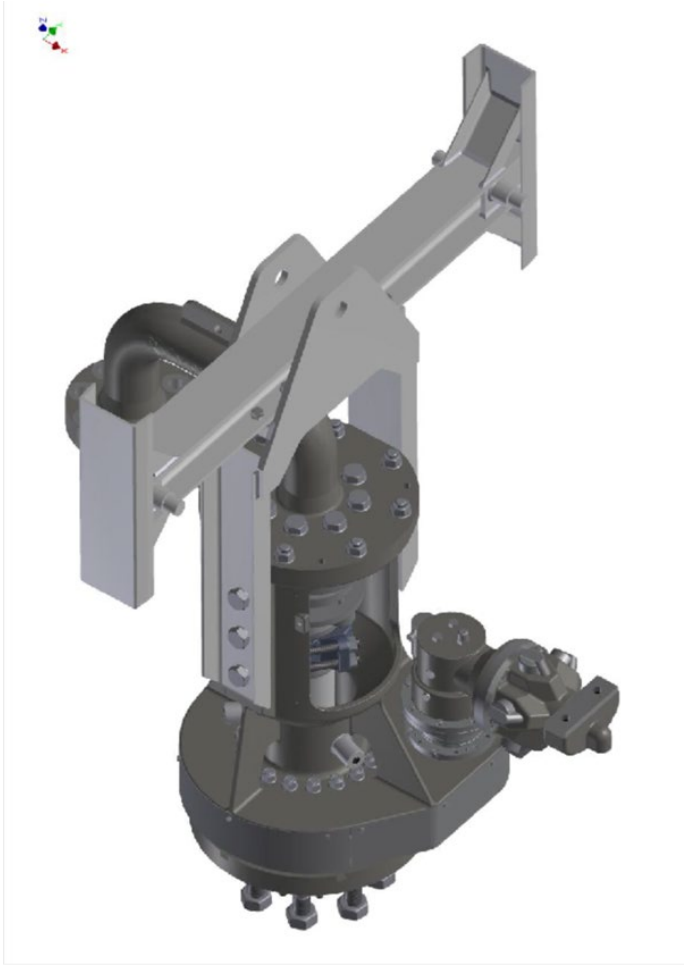


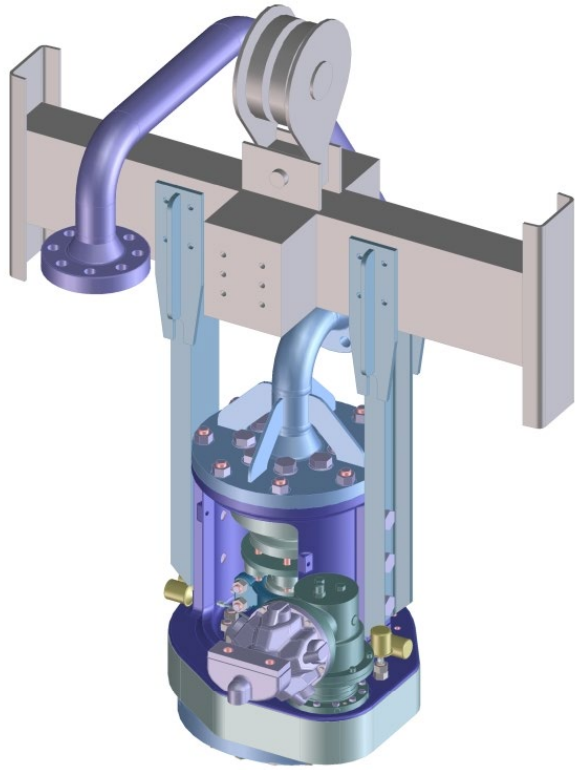


Cutting System

Drill Stem Drive – Adaptable to competitor crossheads



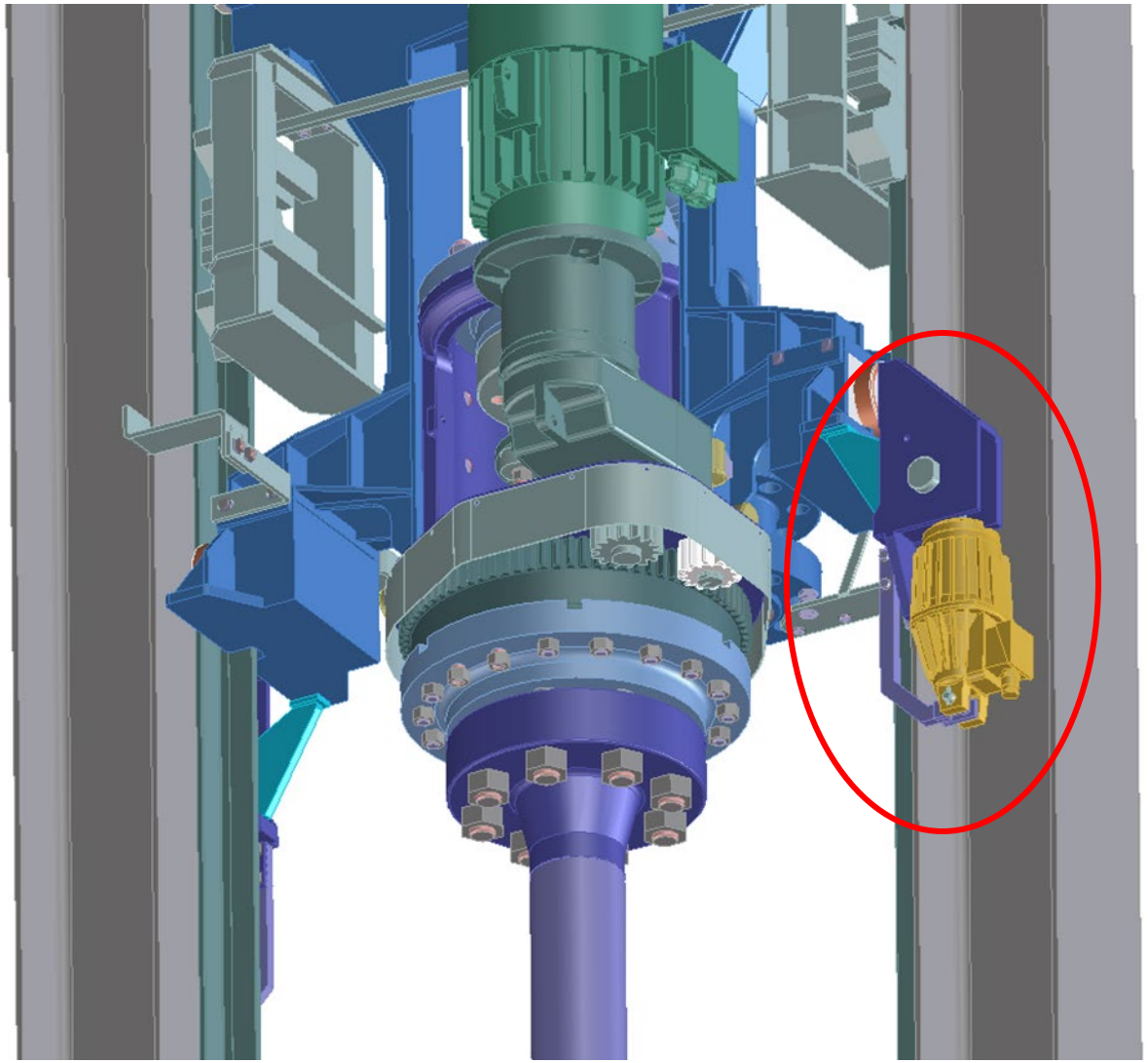




Cutting System

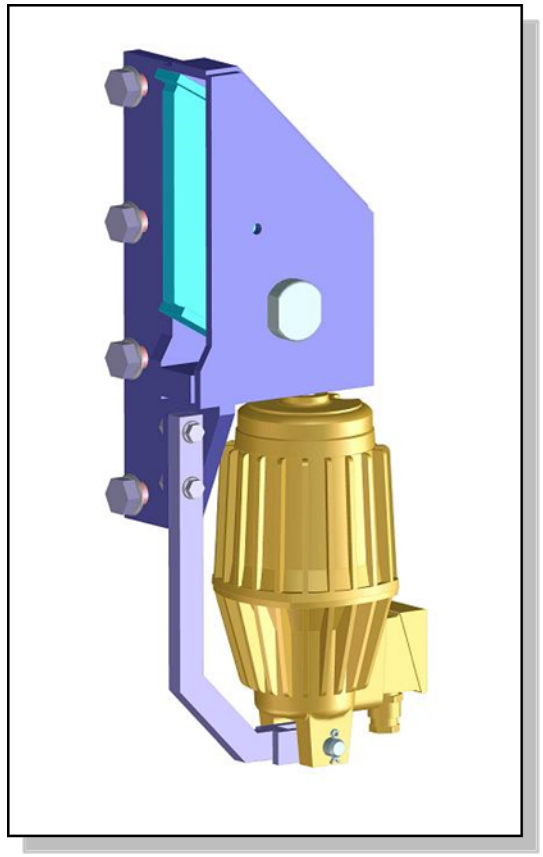
Latching Device

- **Drill Stem Drive**
  - Electric motor
  - High load bearing
  - Grease lubrication
  - Cartridge packing
  - Swivel



Cutting System

Latching Device – Unlatched position

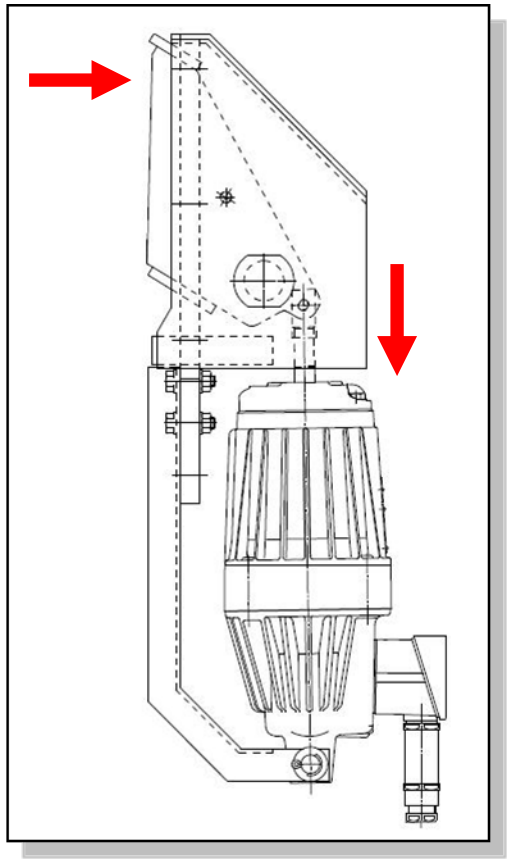


Power deactivated

Electro-hydraulic actuator

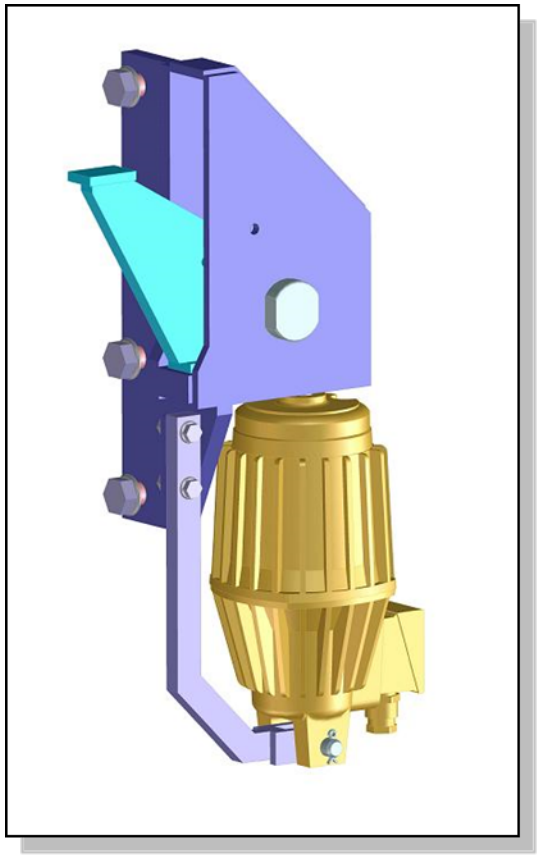
Piston retracted by internal spring

Piston pushed out when powered



Cutting System

Latching Device – Latched position

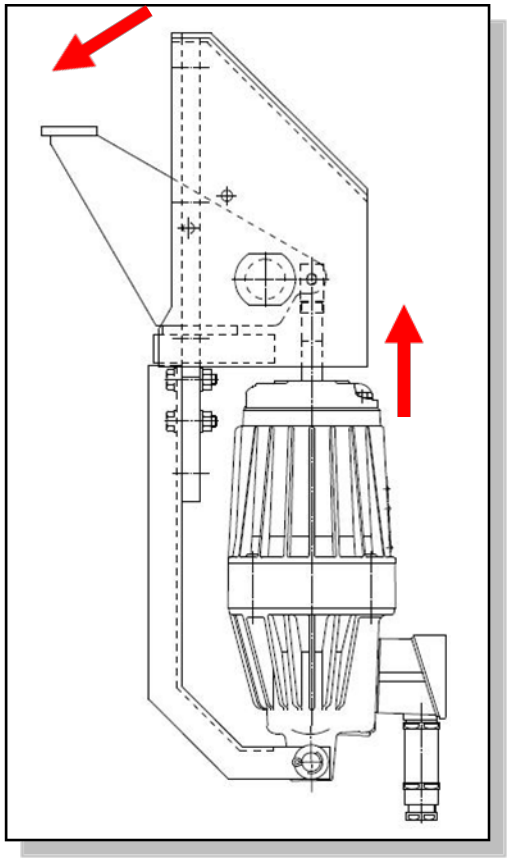


Power activated

Electro-hydraulic actuator

Piston retracted by internal spring

Piston pushed out when powered



Cutting System

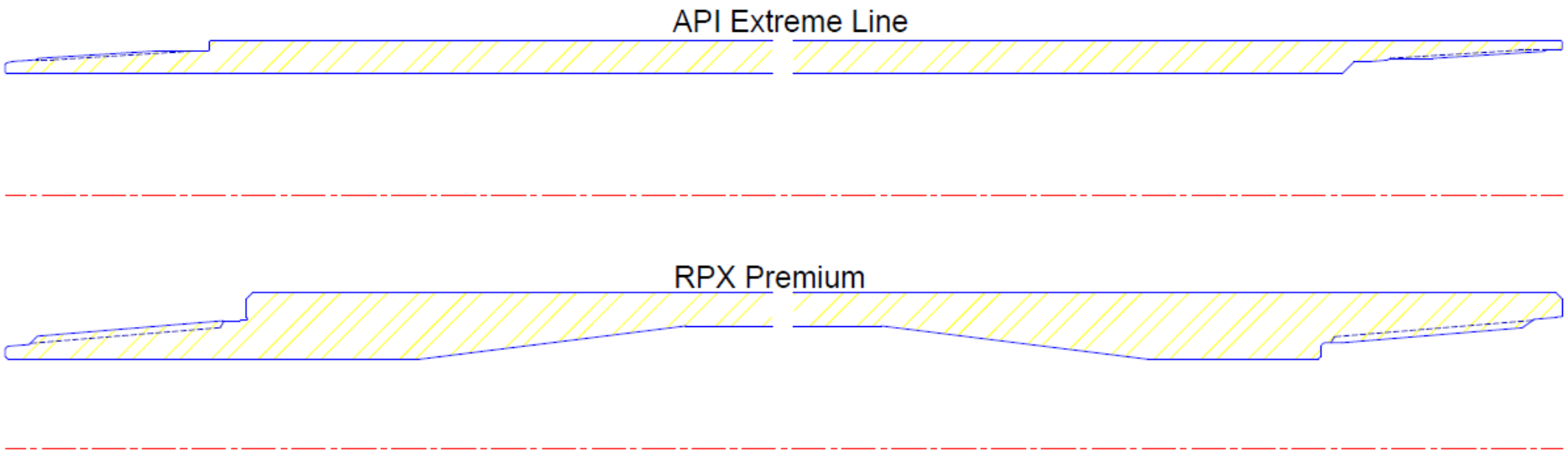
Drill Stem

- History:
- First generation delayed coker drill stem design was welded sections of 6” schedule 160 seamless pipe ASTM-A-106 Grade B.
- In the 1980’s the first threaded drill stem was introduced to the Delayed Coker industry. This new design featured the API Extreme Line casing thread and a material upgrade to 7” OD x ¾” wall AISI / SAE 4140 HT to 29-37Rc.
- Due to the higher demands on the Delayed Coker Unit and in particular the decoking equipment, there have been attempts to solve the weak link in the decoking drill stem, the threaded connection.
- The Swaged Extreme Line or the Coupled (Hydrill MacII) designs still just incorporate a casing thread. These connections were designed for oil well casing installations with no-load static conditions.
- Ruhrpumpen offers the traditional API Extreme Line (per the licensor callout), but also offers the RPX Premium which is a true drilling connection designed for the most severe decoking service.

Cutting System

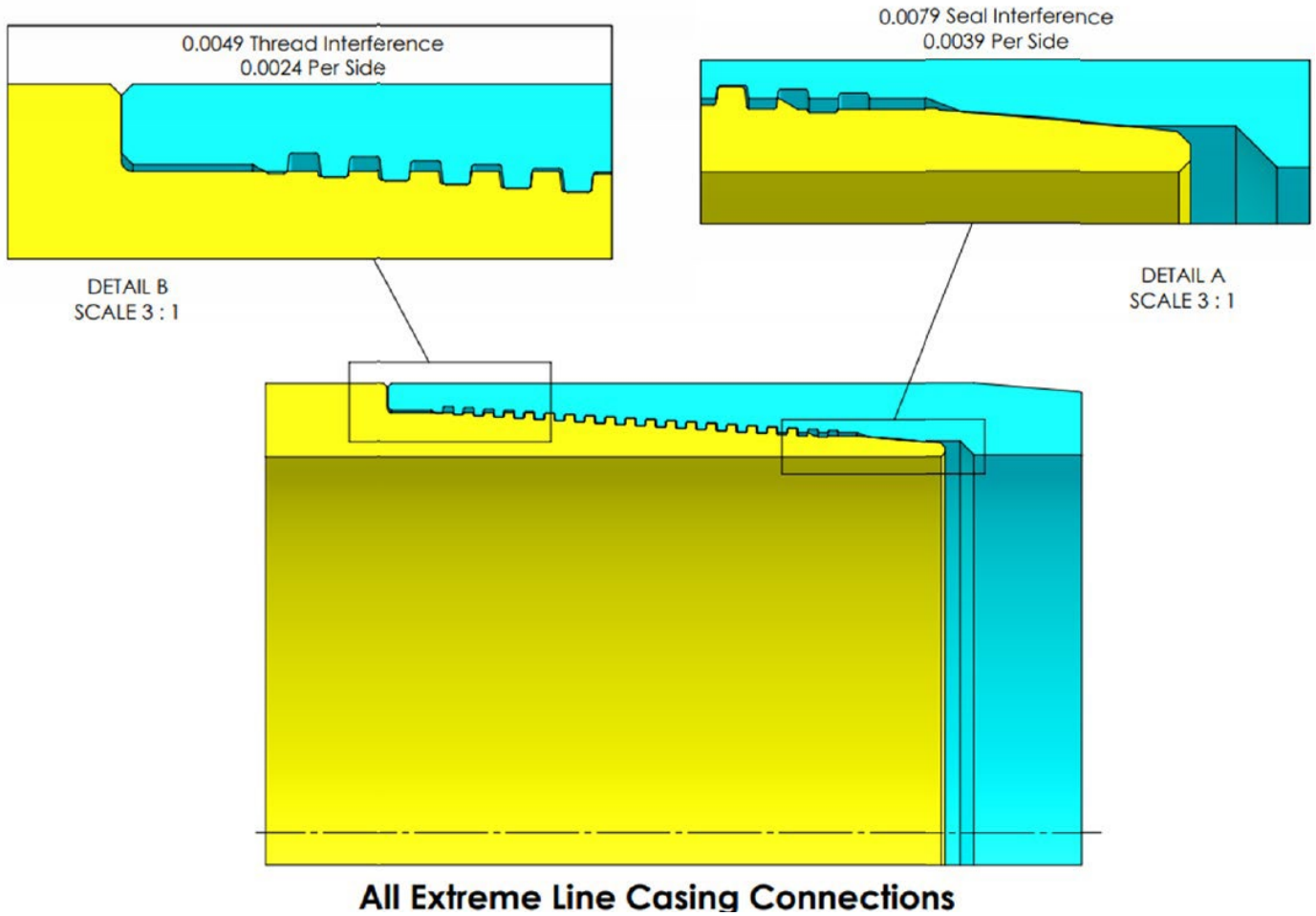
Drill Stem – RPX Premium

- ¾” (19.05 mm) wall thickness vs. RPX with 1.5” (38.1 mm) before machining



Cutting System

Drill Stem – API Extreme Line Casing



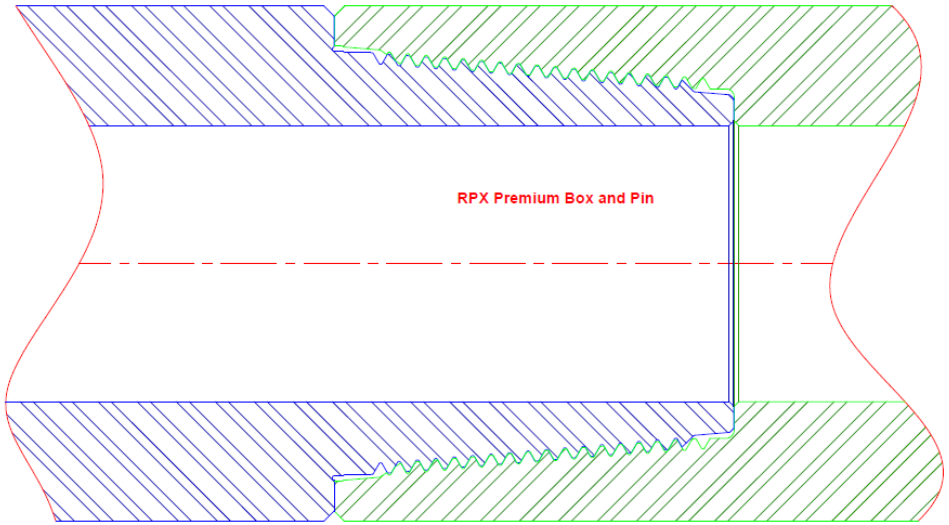
All Extreme Line Casing Connections

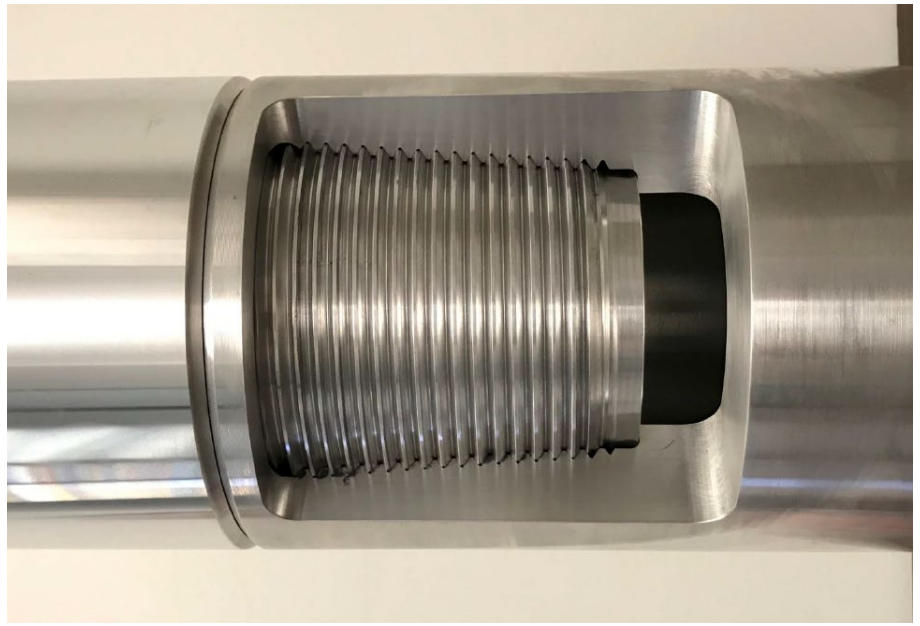
- No Internal Shoulder Seal
- Low thread engagement
- Low Torque (weak connection)
- Easy to Over-Torque

Cutting System

Drill Stem – RPX Premium

- The RPX Premium has a double shoulder, outside and inside, to seal the threads off from water
- The double shoulder is also what gives it extra strength
- V-shaped threads w/radiused roots, larger pitch and steeper pitch angle all contribute to a superior thread





Cutting System

Drill Stem – Comparison

- Comparing the specs side by side, the drill stem connection tensile yield of the RPX Premium threading is more than 2X that of the Extreme Line threading

Side by Side Comparison

	RPX Premium 7"™				7 5/8 Extreme Line			
Tube OD Nom	7.000	in	177,80	mm	8.000	in	203,20	mm
Tube Wall Nom	0.750	in	19,05	mm	0.750	in	19,05	mm
Tube ID Nom	5.500	in	139,70	mm	6.500	in	165,10	mm
Tube Grade (ref)	TSC110-HDS				P110			
Tube SMYS	110,000	psi	758	Mpa	110,000	psi	758	Mpa
Tube Upset Type	Internal (IU)				Non Upset (NU)			
Tube External Pressure Capacity (Collapse)[5]	21,046	psi	145	MPa	18,691	psi	129	MPa
Tube Internal Pressure Capacity[5]	20,625	psi	142	MPa	18,047	psi	124	MPa
Tube Torsional Strength[3]	220,456	ft-lbs	298 899	Nm	299,998	ft-lbs	406 743	Nm
Tube Tensile Strength[5]	1,619,884	lbs	734 767	kg	1,879,065	lbs	852 330	kg
Tube Charpy Impact Absorbed-Energy	40	ft-lbs	54	J	28	ft-lbs	38	J
Product Weight[2]	1,141	lbs	517	kg	1,329	lbs	603	kg
Product Internal Volume Capacity[2]	28	gal	105	l	39	gal	147	l
Connection Type	RPX Premium 7"™				7 5/8 Extreme Line			
Connection OD	7.000	in	177,80	mm	8.000	in	203,20	mm
Connection ID	4.000	in	101,60	mm	6.504	in	165,20	mm
Connection Drift Diameter[6]	3.875	in	98,43	mm	6.375	in	161,93	mm
Connection SMYS	130,000	psi	896	Mpa	110,000	psi	758	Mpa
Connection Torsional Strength[1]	79,420	ft-lbs	107 670	Nm		ft-lbs		Nm
Connection Tensile Yield[4]	1,371,200	lbs	621 900	kg	597,932	lbs	271 218	kg
Make-Up Torque Min[1]	35,740	ft-lbs	48 450	Nm	5,679	ft-lbs	7 700	Nm
Recommended Make-Up Torque[1]	47,650	ft-lbs	64 600	Nm	5,900	ft-lbs	7 999	Nm

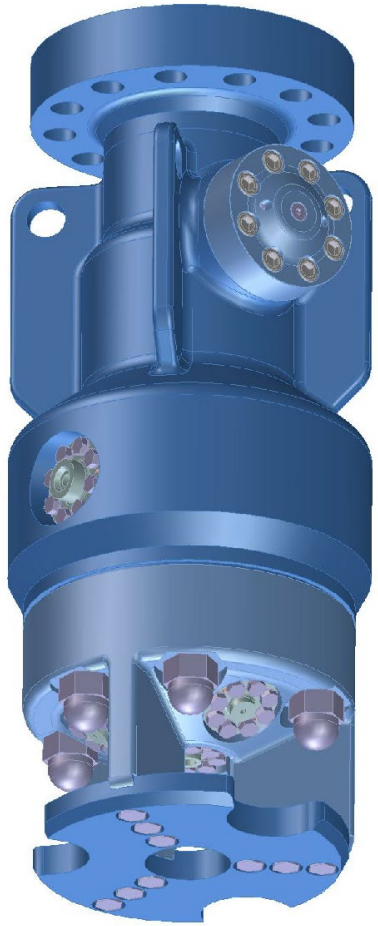
Side by Side Connection Comparison 2020 04 15.xlsx MSG

Cutting System

Drill Stem – RPX Premium

Cutting System

Cutting Tool (Drilling / Cutting)

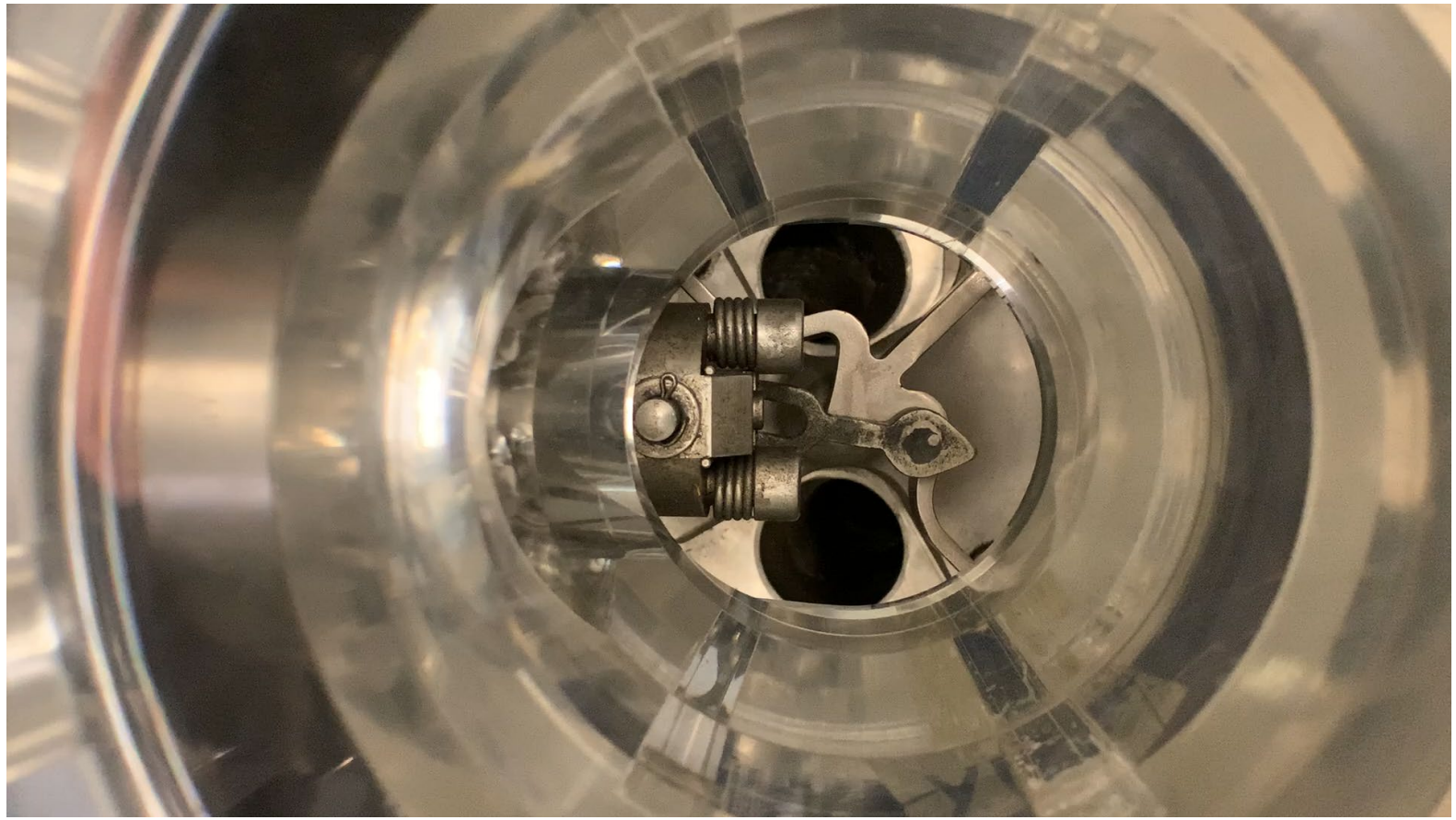


- Basic Design
  - Slim tool, OD 13.7” (350 mm), minimizes getting stuck in pilot
  - Direct bolt-in replacement of existing
  - Nozzles are recessed to prevent shearing off
  - Nozzles can be replaced on the deck
- Switching devices
  - No oil to change
  - Automatic / manual (emergency)
  - At the top of the tool

Cutting System

Cutting Tool (Drilling / Cutting) - Animation

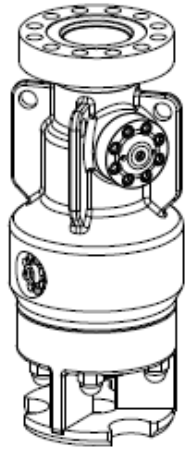
- Autoswitch Cartridge Operation
  - Extends with water pressure reduced
  - Retracts with water pressure applied



Cutting System

Cutting Tool (Drilling / Cutting)

- Ball-shape Valves
  - Double coating system
  - No seals required (lower maintenance)
  - Pressure operated
- Nozzles – Drilling
  - 1 strong center, 3 peripheral nozzles
- Nozzles – Cutting
  - 0°, or 10° upwards, both nozzles
- No oil needed for internal parts



Cutting System

Cutting Tool (Drilling / Cutting)

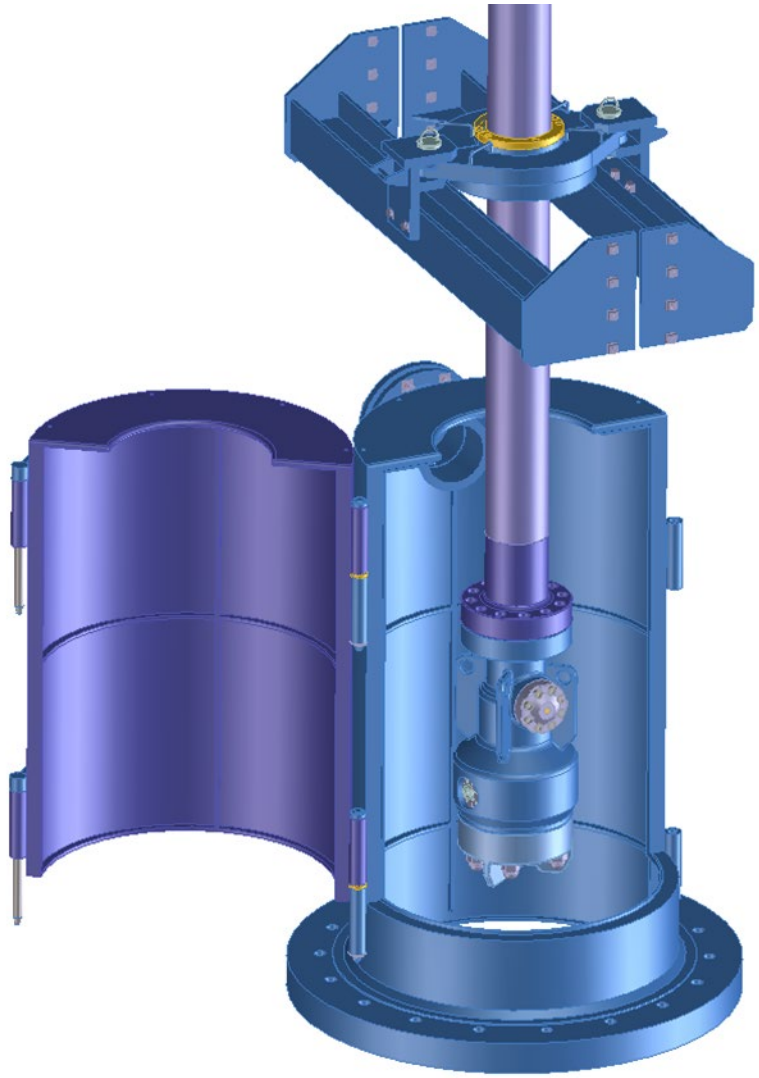
Each automatic cutting tool leaving the factory is been tested on our test bed.

Functional test and static pressure test (7700psi).

Cutting System

Guide Device and Tool Enclosure

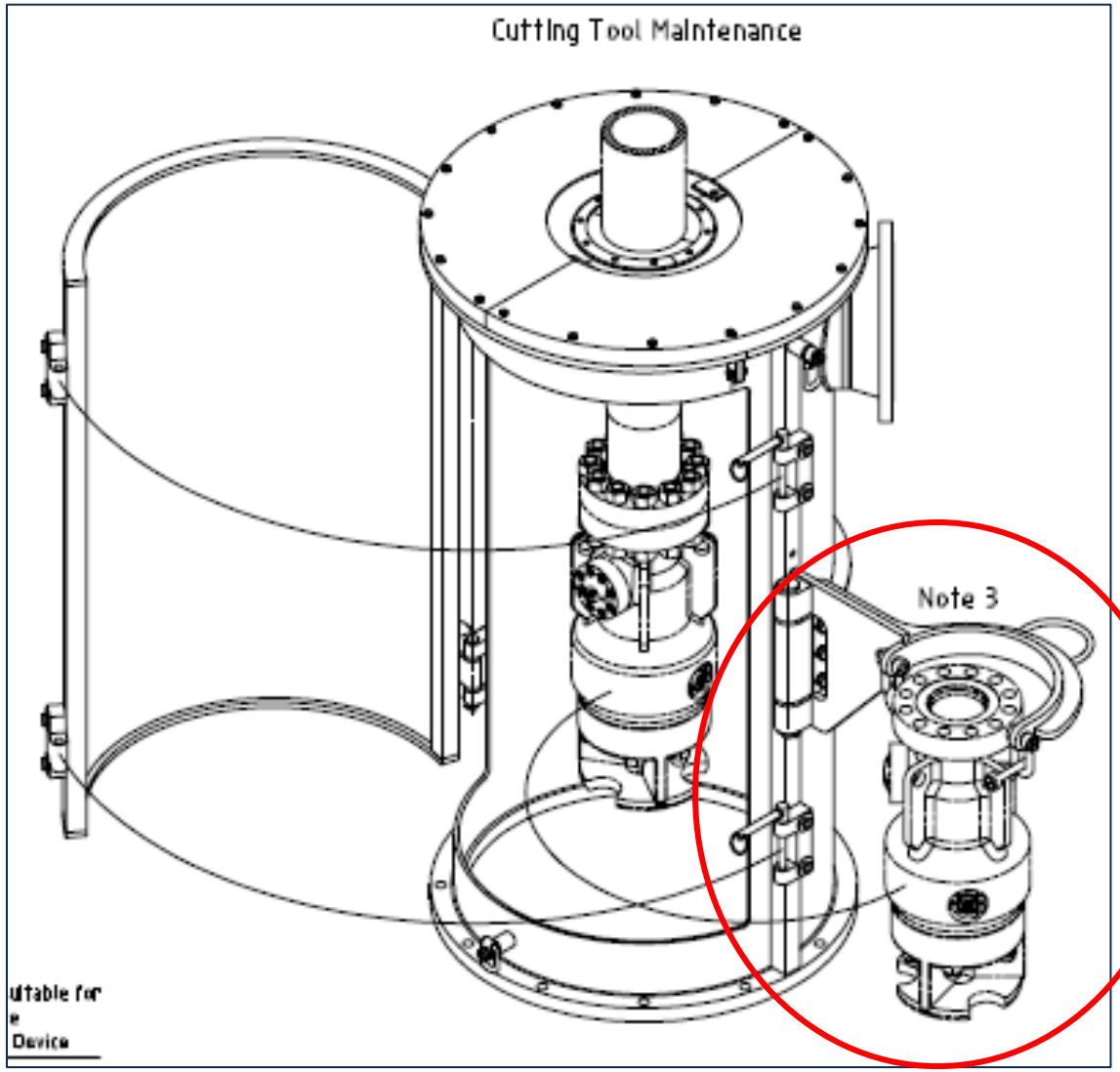
- Guide Device
  - Centers the rotating drill stem
- Tool Enclosure
  - Fixed; Used when TUD is installed
  - Provides safety when the tool is outside of the drum
  - Large door provided easy access to the cutting tool



Cutting System

Guide Device and Tool Enclosure

- Closed top design; (2) removable pieces for easy installation, but meant to be fixed during operation
- 30” or 36” size
- Fixed; Bolted onto TUD (Top Unheading Device)
- 12” ASME B16.5 150# RF vent flange; Piping leads to coke pit
- Cutting Tool Carrier holds tool, and swivels out for easy tool maintenance
- Glide disc for extra sealing and drill stem misalignment



Decoking Control Valve

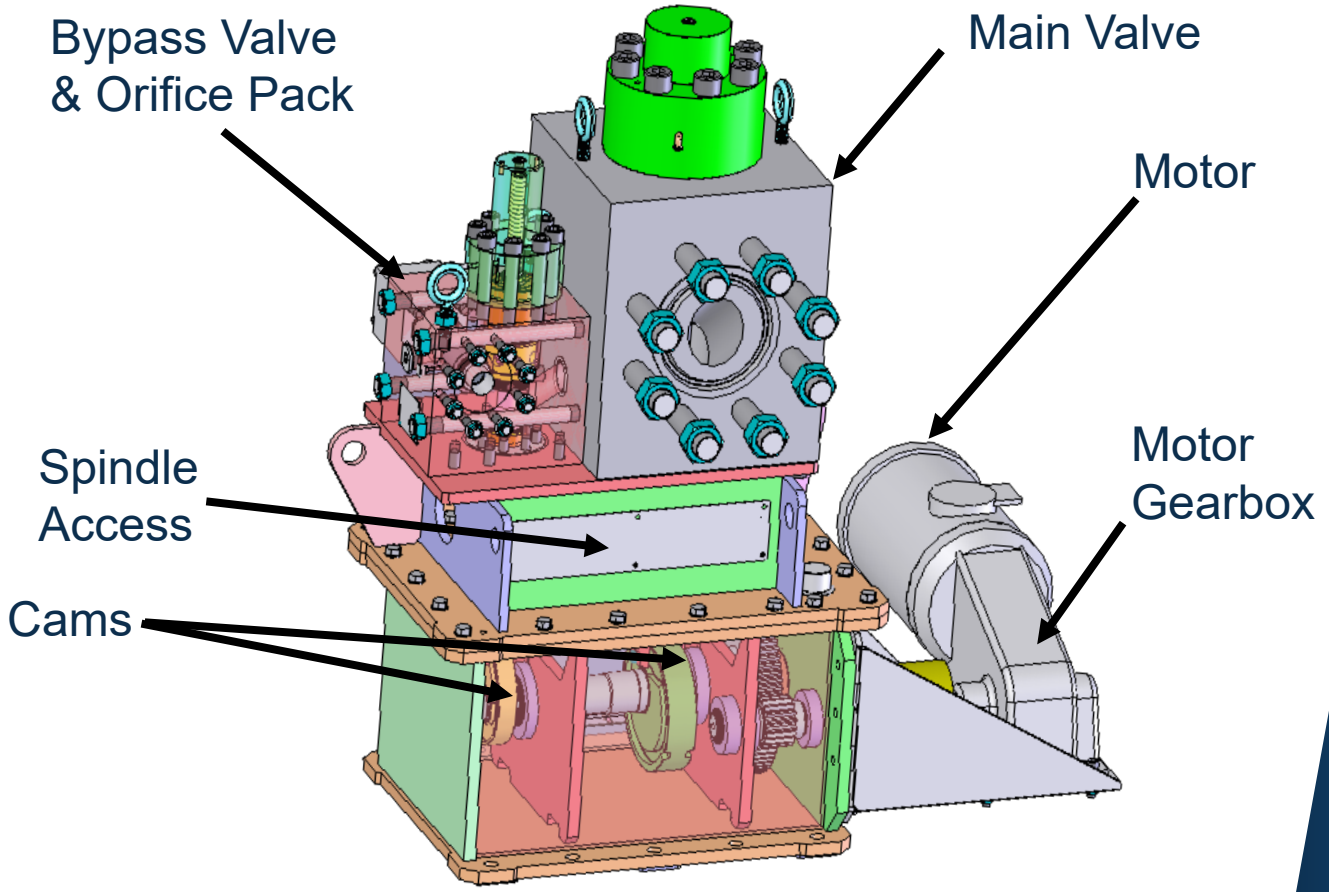
Technical Data

- Nordberg/Elwood proven design
- Current standard sizes, 8”x8”x3”, or 6”x6”x3”
- MAWP, 415 barg (6019 psig)
- Max. Flow, 450 m^3/hr (1981 gpm)
- Max. Temp, 100 °C

Decoking Control Valve

Features and Benefits

- Motor-driven cam controlled spindle lift valve system
- Drivetrain (cams, gears, shafts and bushings) runs immersed in an oil bath and is virtually maintenance-free
- Heavy duty robust design; Lower velocities of moving parts lead to greater MTBF

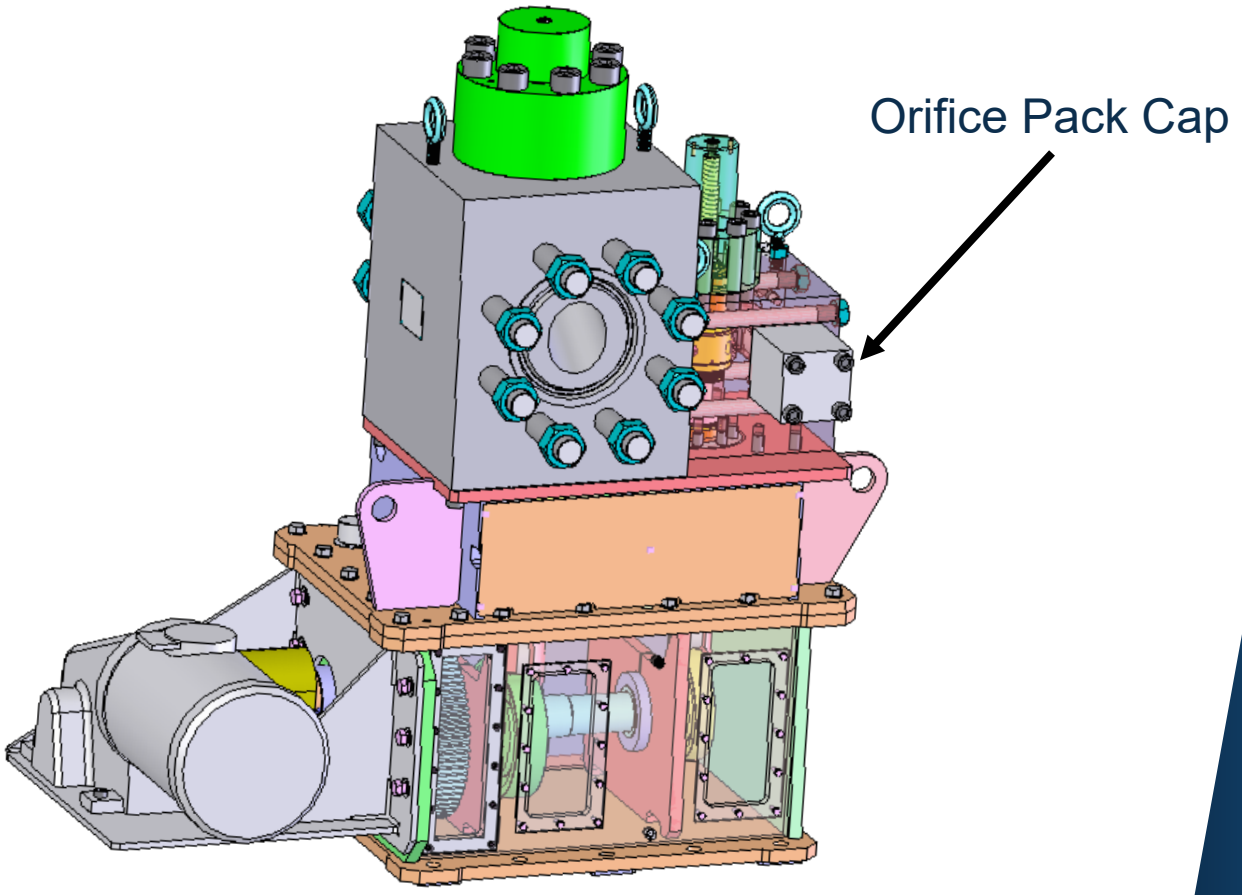


(Main Valve Inlet-Side View)

Decoking Control Valve

Features and Benefits

- Per Licensor requirement, the decoking system is designed for decoking particles to be <1/8” (<3 mm)
- Non-clogging valve design; Able to safely pass coke fines up to 5 mm diameter
- Easy access for maintenance at grade level

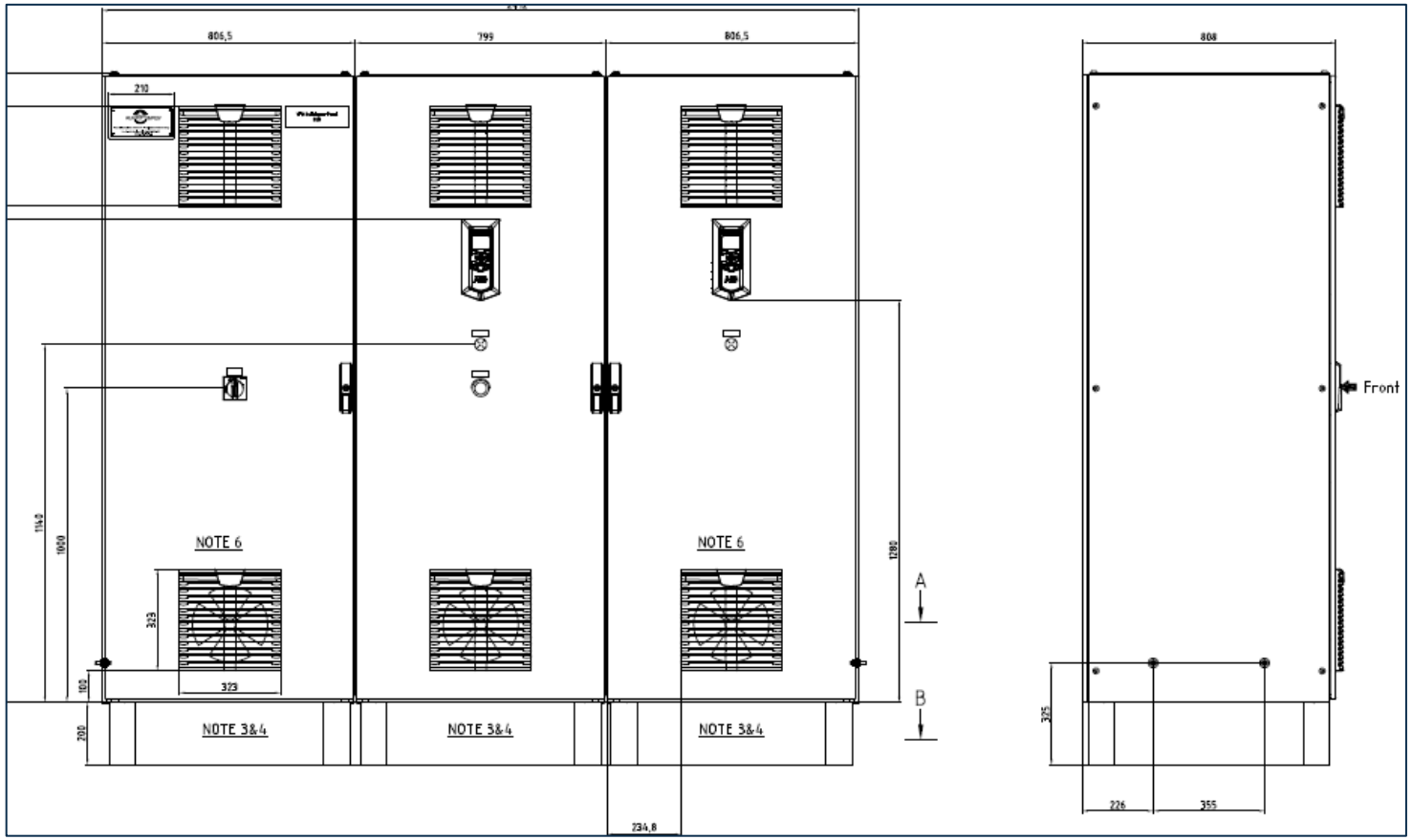


(Main Valve Outlet-Side View)

Control System

RP Control Philosophy

- PLC Panel
  - Intended to be in a safe area
- VFD Panel
  - Intended to be in a safe area
  - Within 250m distance from Hoist and DSD motors



Control System

RP Control Philosophy

- VFD Panel
  - Located at the Deck (Ex/Hazardous area)
  - To meet the 250m max. distance from Hoist and DSD motors
  - Customized SS panels
  - Purged instrument air (provides cooling)

Control System

RP Control Philosophy

- PCP (Pump Control Panel)
  - Operates Pump & LOS
  - Condition monitoring (MMS)
  - Located in hazardous area
  - Equipment in panel is Ex d or IS (HMI, buttons, switches, lamps)
  - Not a “Z” purged panel
  - Suitable IP rating

Control System

RP Control Philosophy

- LCP (Local Control Panel)
  - Operator Panel
  - Deck Level – Hazardous area
  - Equipment in panel is Ex d or IS (HMI, buttons, switches, lamps)
  - Not a “Z” purged panel
  - Panel is generally Non-Ex

Control System

Operator Shelter (typical)

Control System

Operator Panel (Local, at cutting deck)

- Local Operator Panel
- Cutting Deck Level
- Operation of:
  - Decoking Control Valve
  - Isolation Valve
  - Hoist
  - Drill Stem Drive
- Interactive P&ID on HMI

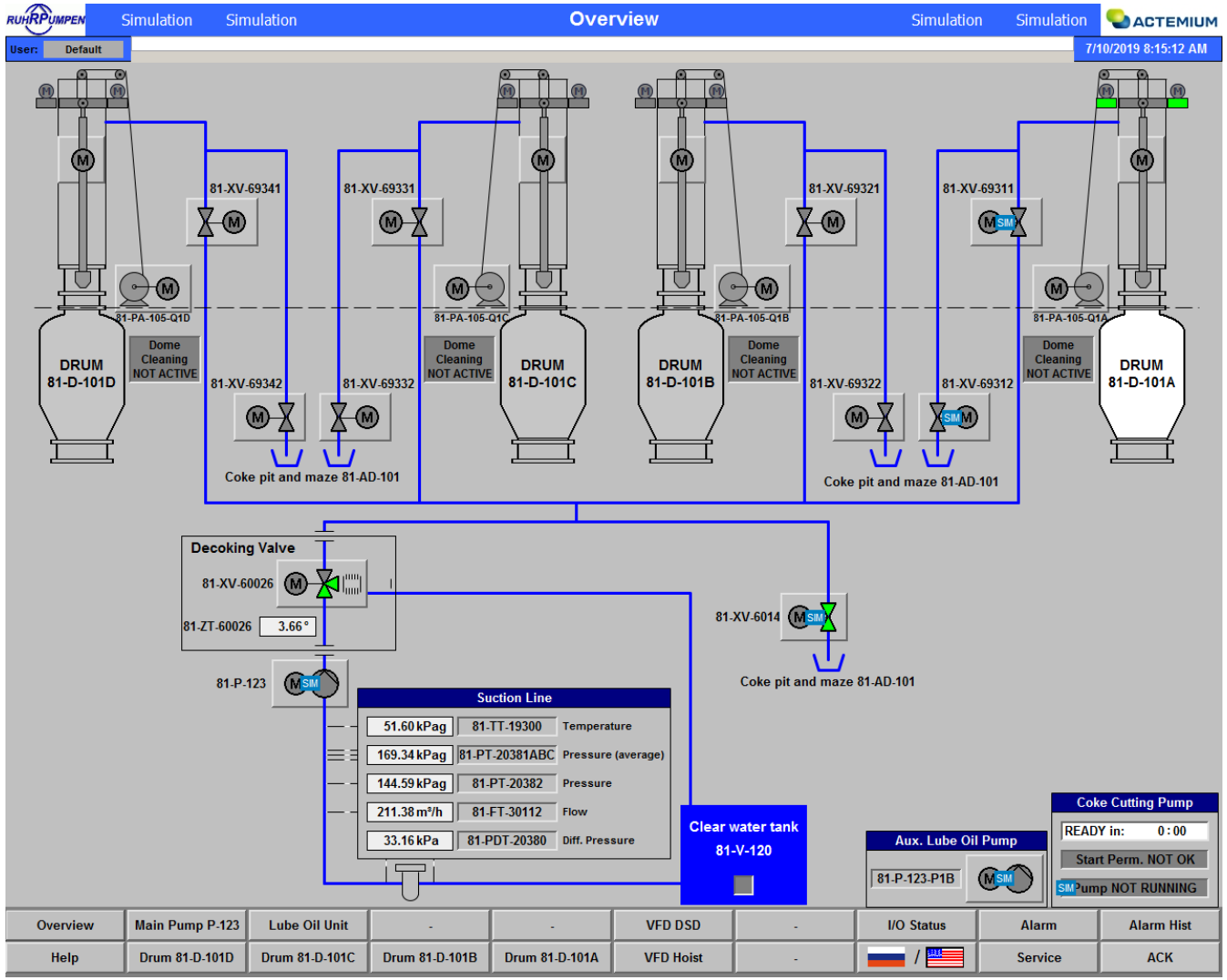
Control System

Operator Panel (Remote, at grade)

- Remote installation
- Grade Level
- Option of having Video Monitoring System (PTZ cameras at hoist, bottom chute, top of drum)

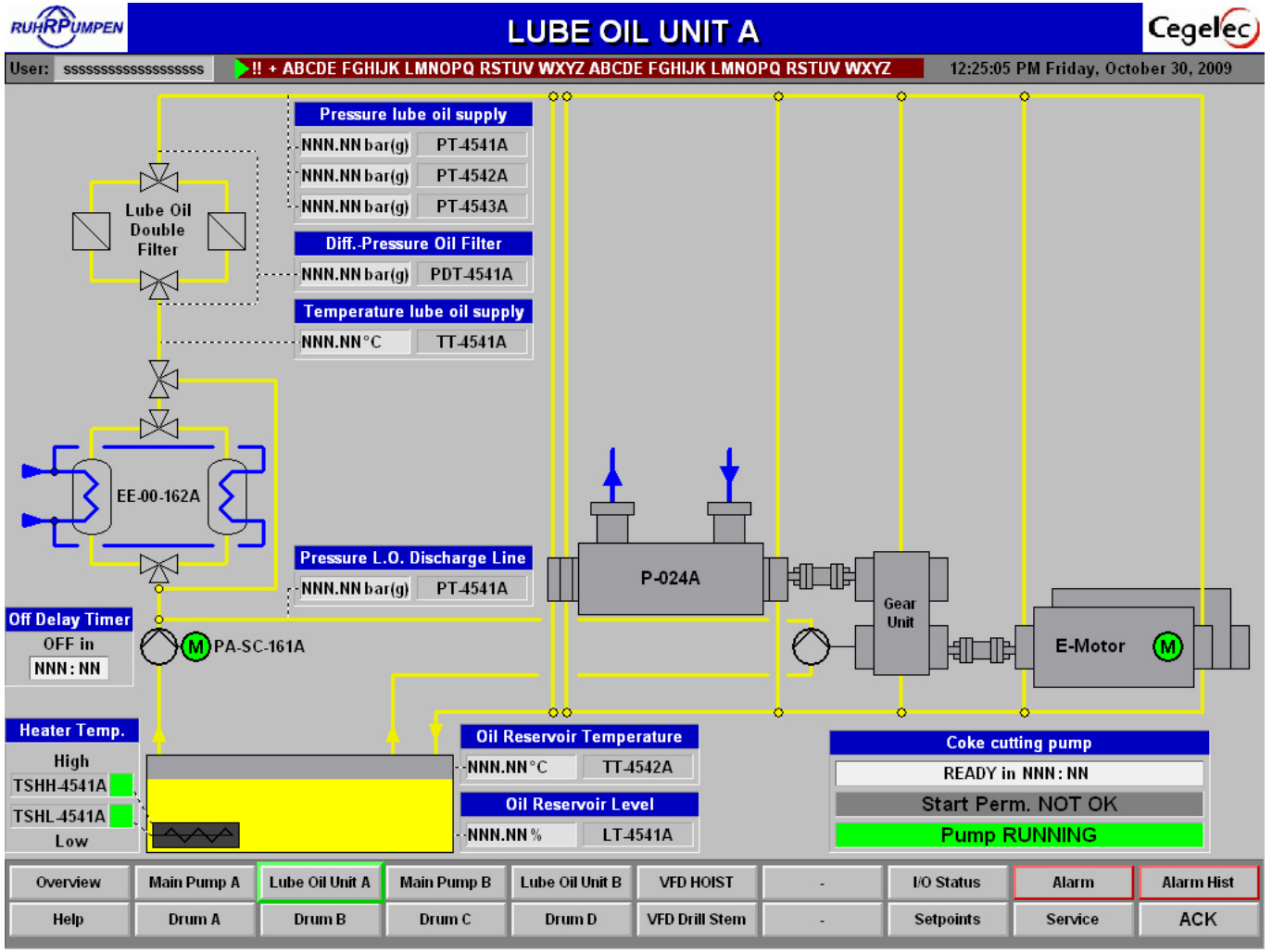
Control System

Control and Process Visualisation



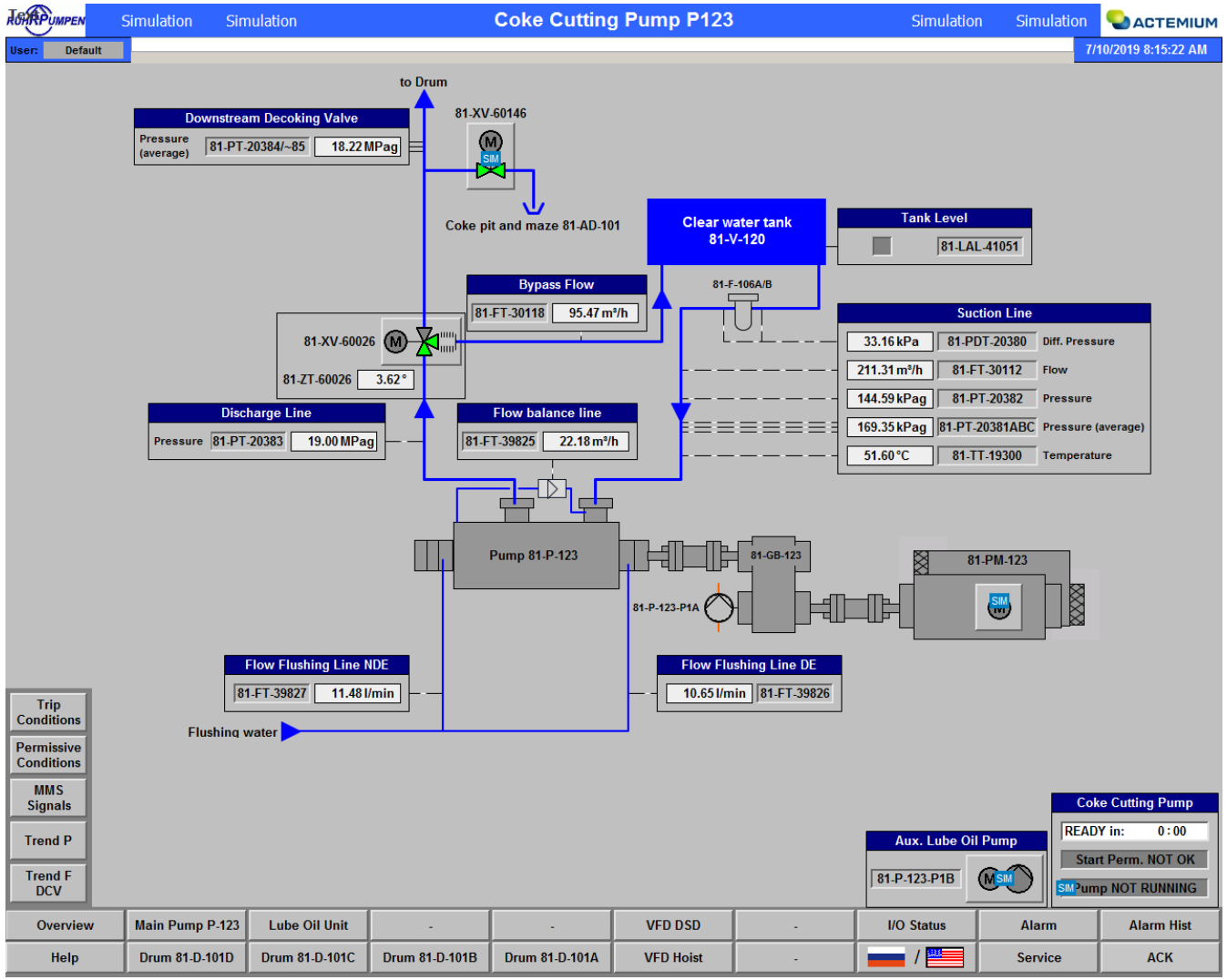
Control System

Control and Process Visualisation



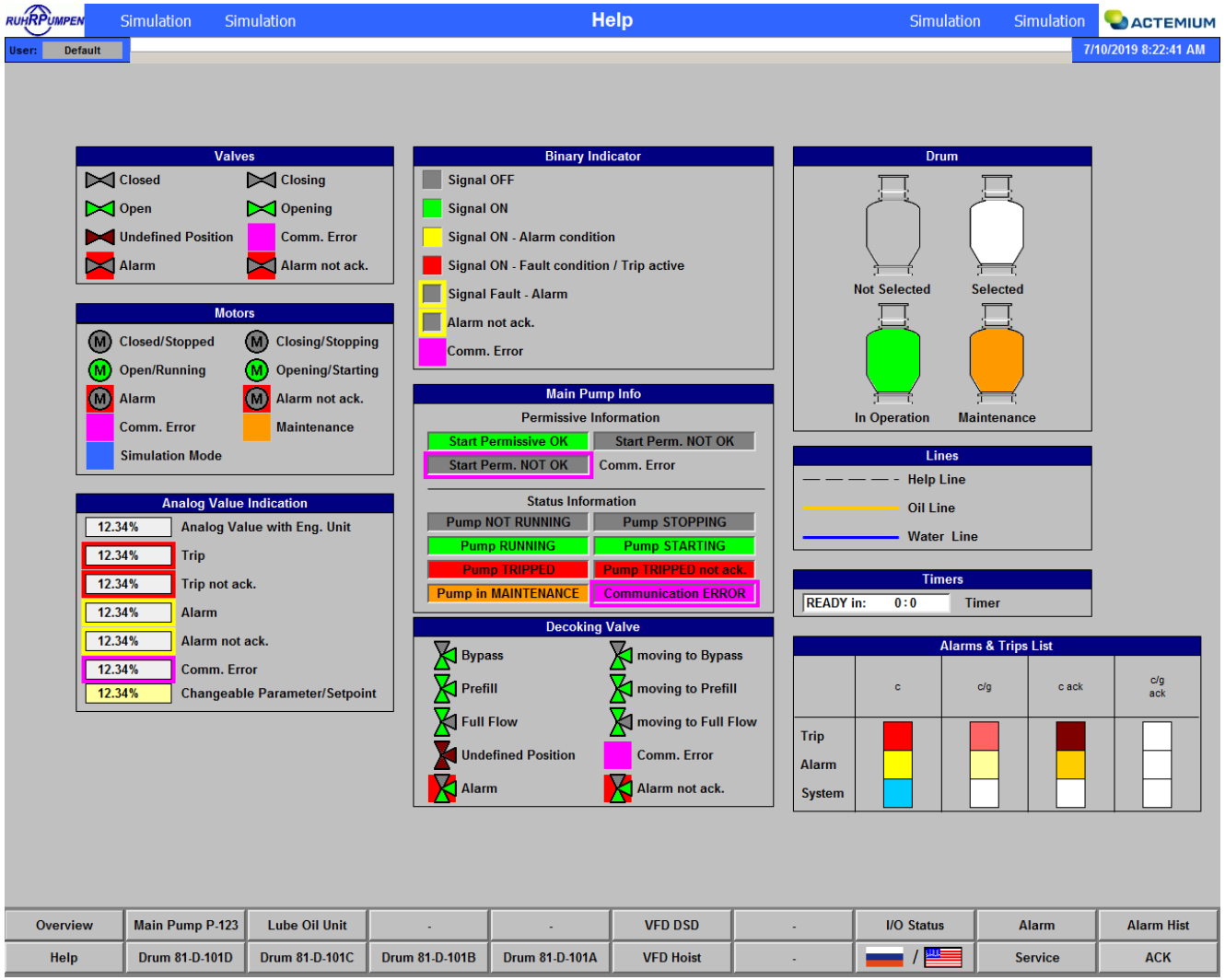
Control System

Control and Process Visualisation



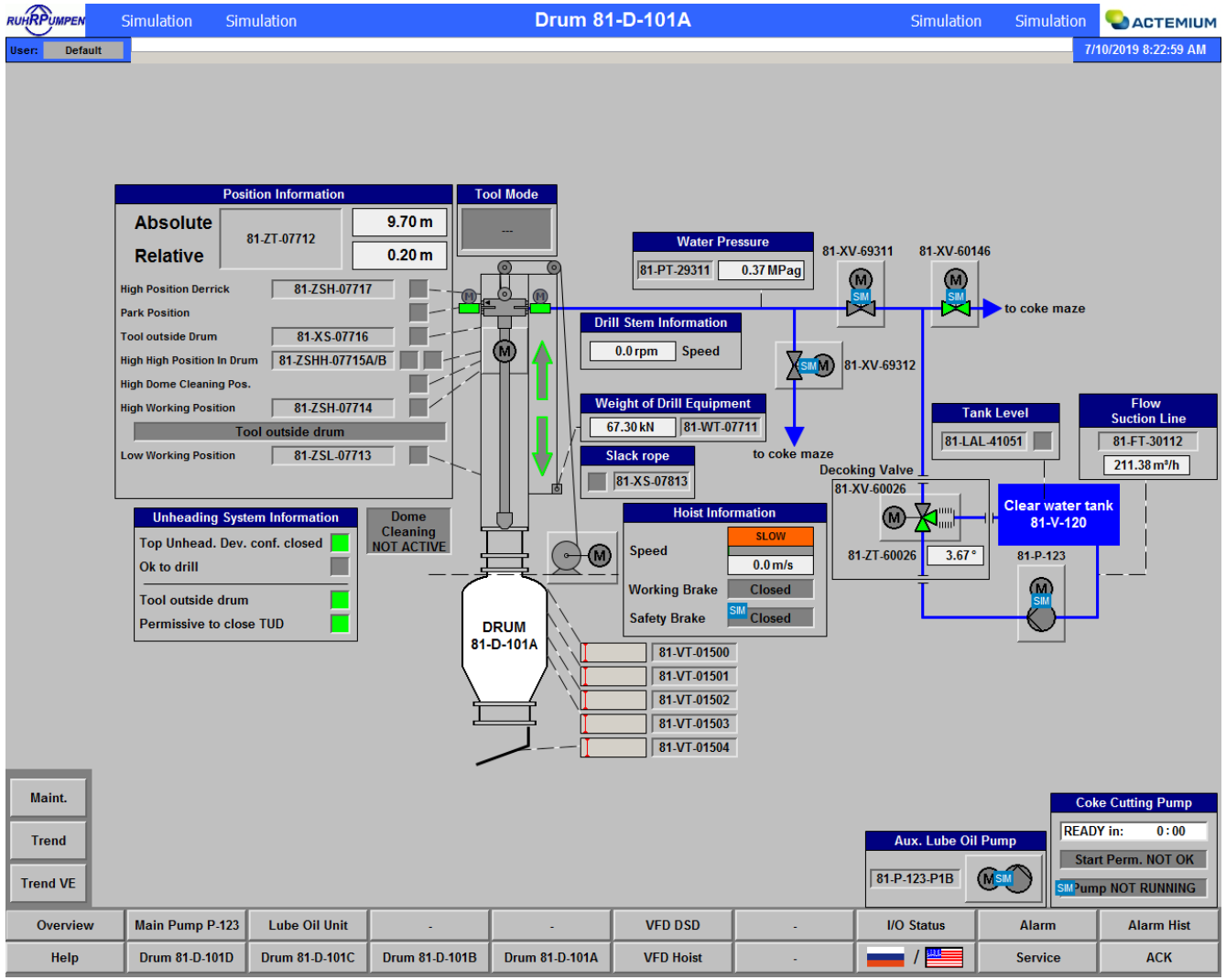
Control System

Control and Process Visualisation



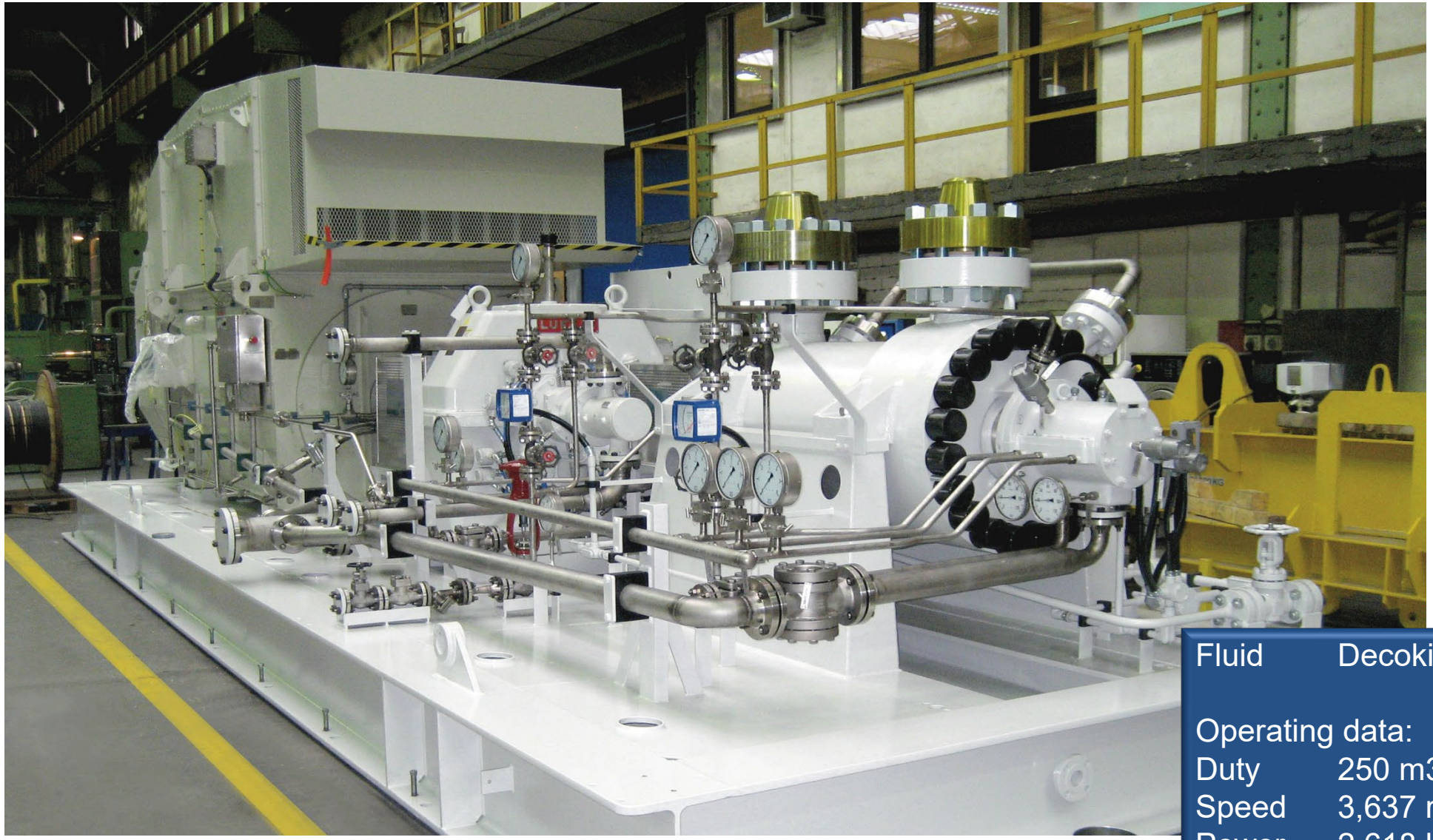
Control System

Control and Process Visualisation



A LINE 8x6x15 10 stage (BB5)

RUHRPUMPEN



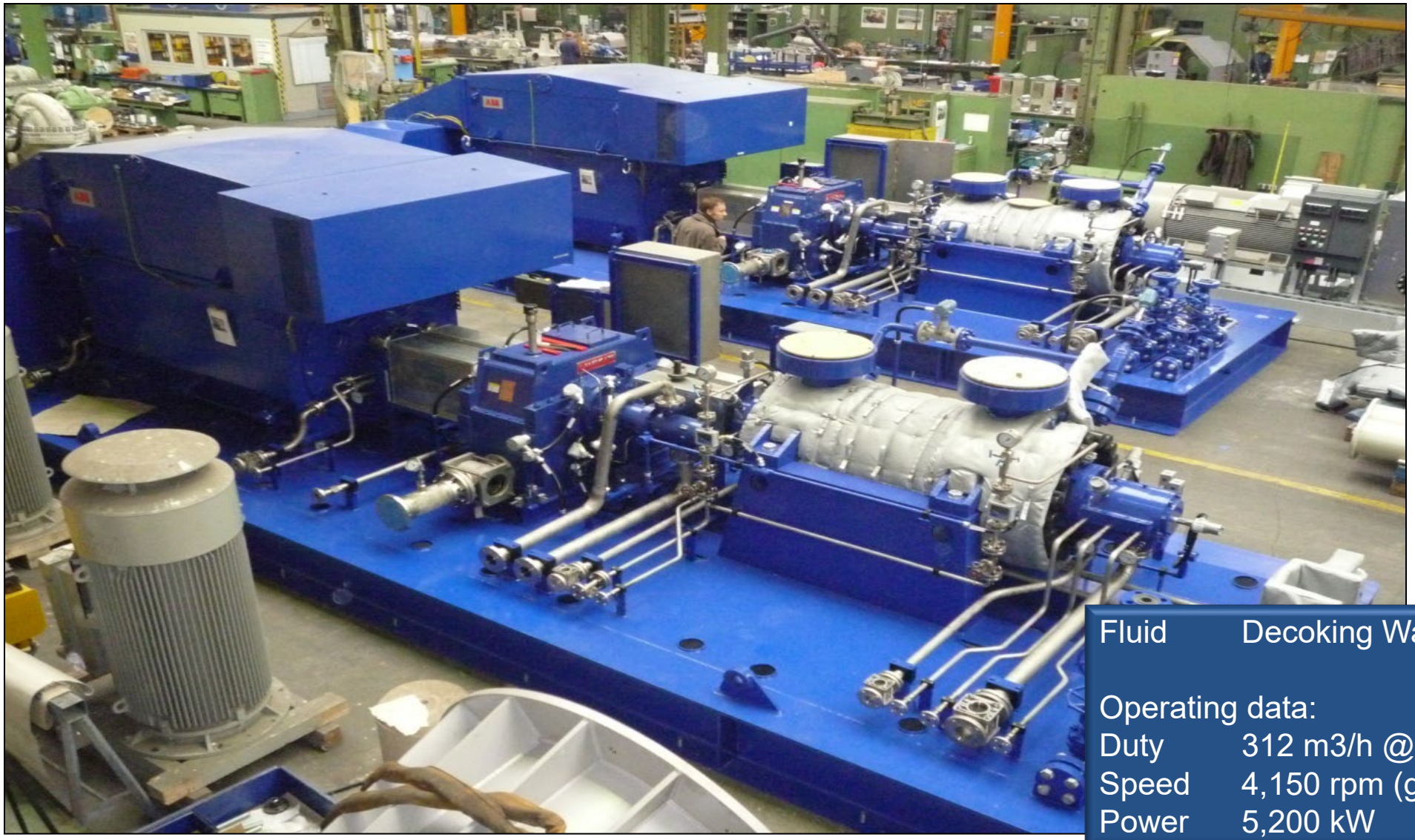
Fluid	Decoking Water
Operating data:	
Duty	250 m3/h @ 2,745 m
Speed	3,637 rpm
Power	2,618 kW

A LINE 8” BB5

3.2 MW HV Motor / API 614 Lube oil system / Control valves
Capacity 312m³/h / Head : 3587 m / Speed 2900 rpm
Pumped liquid : Water + abrasive solids liquid temperature 75 °C

A6” 10 stage (BB5)

RUHRPUMPEN



Fluid	Decoking Water
Operating data:	
Duty	312 m3/h @ 3,436 m
Speed	4,150 rpm (gear box)
Power	5,200 kW

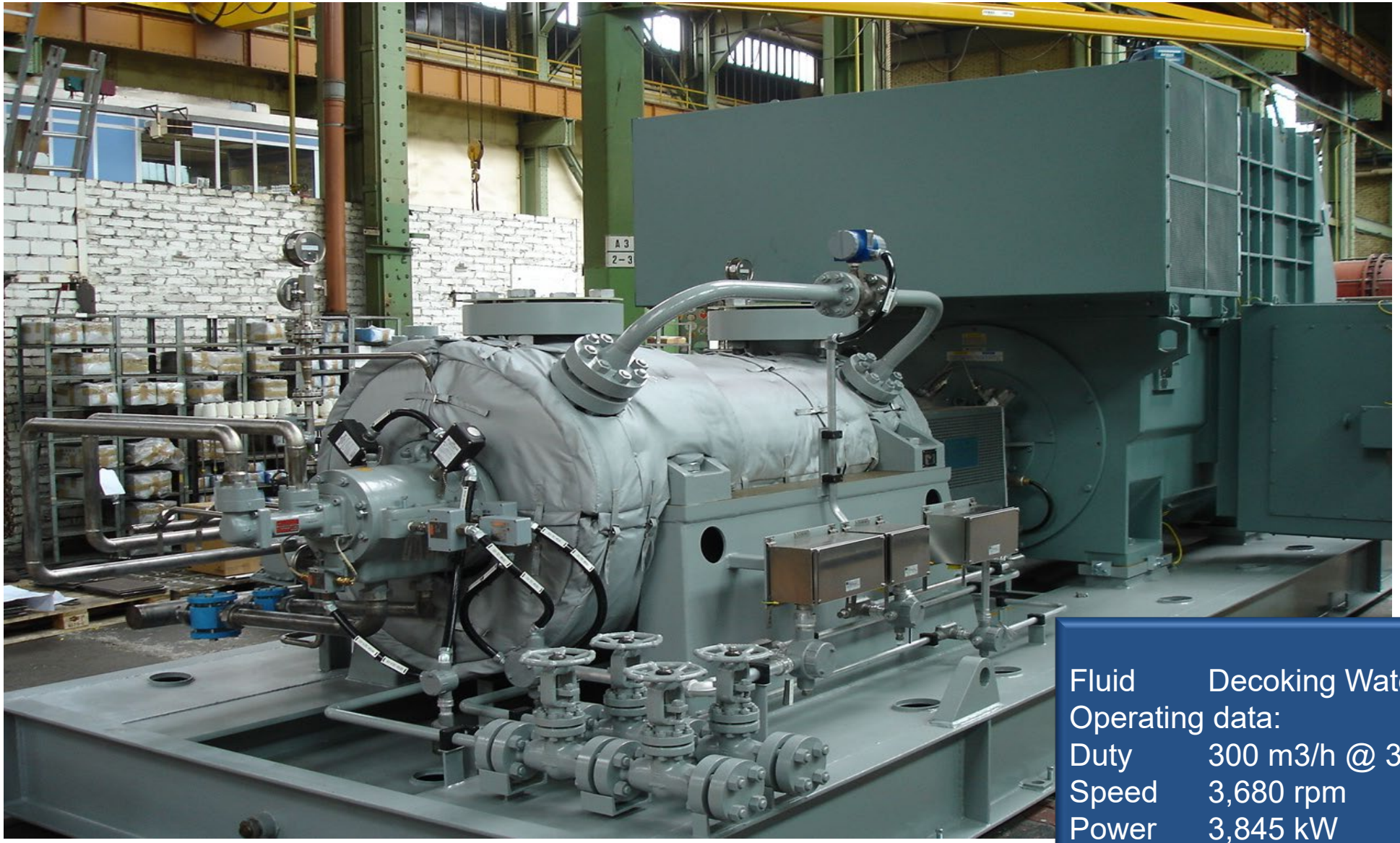
A LINE 8x6x15.5

3.2 MW HV Motor / API 614 Lube oil system / Control valves
Capacity 272 m³/h / Head : 2850 m / Speed 2900 rpm
Pumped liquid : Water + abrasive solids liquid temperature 70 °C

Shown on string test test in RP factory :
Full speed / load 3.2MW motor 2980 RPM

A6” 12 stage (BB5)

RUHRPUMPEN



Fluid	Decoking Water
Operating data:	
Duty	300 m3/h @ 3,300 m
Speed	3,680 rpm
Power	3,845 kW

Coming Attractions ☺

"Pumps for the Desalination Market"

Thur 27th April – 08.00 (UK GMT+1) (Eastern Hemisphere) & 17.00 (UK GMT+1) (Western Hemisphere)

Aimed at Process and Mechanical Engineers and Consultant Engineers who specify pumping equipment as well as Applications & Sales Engineers selecting and quoting them.

This short course will look at the various pumps used in the Desalination Market worldwide

Future sessions :

– Magnetic Drive Pumps for the Chemical Process and API Industries (Thursday 25th May)

- Cryogenic Pumps (Thursday 22nd June (to be confirmed)