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Coke Cutting Systems for Cokers in Cold Areas

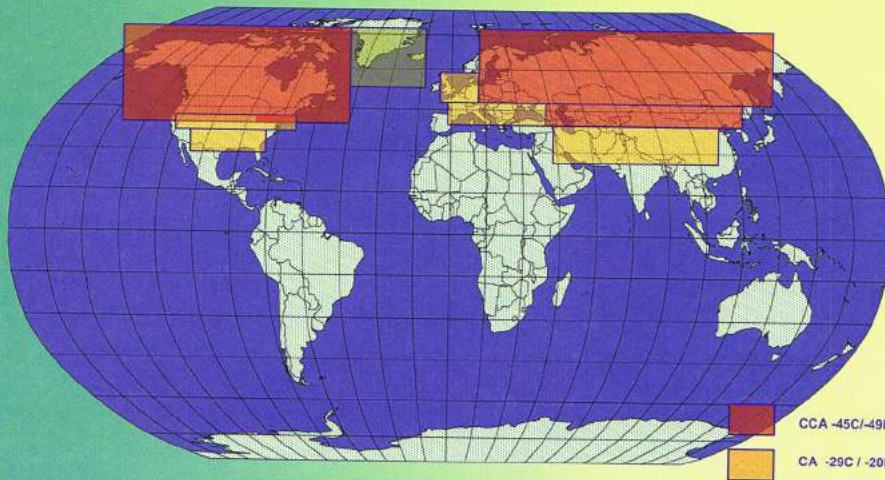
Coking.com Safety Seminar
Calgary 17th – 20th September 2007

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RUHRPUMPEN



Area definition



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Decoking Systems in Cold Areas

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

The requirements are summarized as

a) Ambient conditions

- temperature ranges from +35°C / 95+°F to -50°C/-59°F
- sun, wind, rain, snow, ice, dust, humidity

b) Refinery conditions

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

c) Company specification

- specification of final user, contractor, licensor

d) Local codes and standards

- CSA, ABSA
- GOSGORTECHNADSOR
- 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.

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Decoking Systems in Cold Areas

RUHRPUMPEN classifies the Decoking systems into 3 classes

- **Class I.** area in warm temperatures
 - T design > 0°C/ °F
- **Class II.** area in medium temperatures Cold Area

- Mech equipment	Tdesign >-29°C/-20°F	CA
- Instruments	Tdesign >-29°C/-20°F	CA
- **Class III.** area in low temperatures Cold Cold Area

- Mech equipment	Tdesign >-45°C/-49°F	CCA
- Instruments	Tdesign >-50°C/-58°F	CCA

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Decoking Systems in Cold Areas

Version A, North America CCA		Mech. equipment	Instruments	Comments / Special requirements
		Material acc. ASTM / DIN	UL, FM, Canada. CSA	Canada:Water temp > 65°C, ABSA required
Pump area	Pump house heated, hazardous	Material group II	Temp class II, ex	Local Building codes have to be met
Cutting deck	Sheltered, heated, hazardous	Material group II	Temp class II, ex	
Derrick	Open Hazardous / safe (upper part)	Material group III	Temp class III, Ex / non ex	
Control room	Control house, safe		Temp class I, Non ex	

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Decoking Systems in Cold Areas

Version B, North America CCA		Mech. equipment	Instruments	Comments / Special requirements
		Material acc. ASTM / DIN	UL, FM, Canada. CSA	Canada:Water temp > 65°C, ABSA required
Pump area	Pump Shelter unheated, Hazardous	Material group III	Temp class II, ex	No Local Building code
Cutting deck	Sheltered, unheated, hazardous	Material group III	Temp class II, ex	
Derrick	Open Hazardous / safe (upper part)	Material group III	Temp class III, Ex / non ex	
Control room	Control house, safe		Temp class I, Non ex	

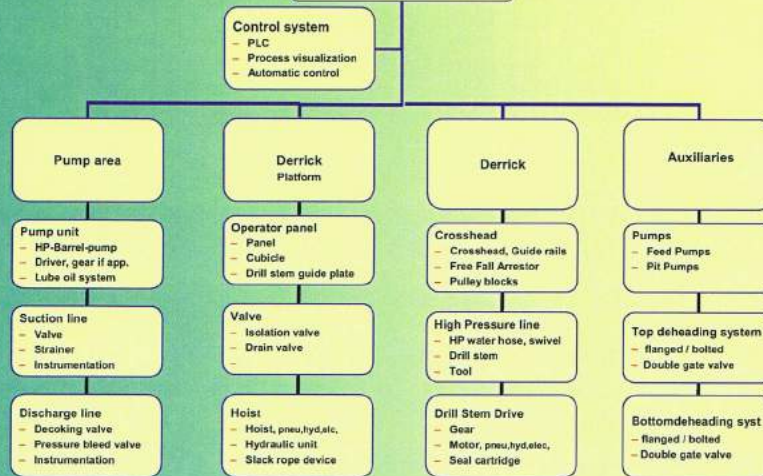
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Decoking Systems in Cold Areas

Version C, Europe CCA		Mech. equipment	Instruments	Comments / Special requirements
		Material acc. DIN	ATEX	Russia: ROSGORTEKNAD SOR
Pump area	Pump house heated, safe	Material group II	Temp class II, Non ex	
Cutting deck	Sheltered, unheated, hazardous	Material group III	Temp class II, ex	
Derrick	Open Hazardous / safe (upper part)	Material group III	Temp class III, Ex / non ex	
Control room	Control house, safe		Temp class I, Non ex	

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RUHRPUMPEN Hydraulic-Decoking-System



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Jet Pump



Jet Pump

- Motor
- Lube oil system
- Decoking Control valve

Capacity 272 m³/h
 1200 gpm

Head 3120 m
 4500 psi

Speed 3600 rpm

Temperature 65 °C

Medium Water with
 coke fines

Installation
 CCA, pumphouse
 Material Class II

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Jet Pump



Performance test

(RP-test field)
 Full speed

Functional test:
 (50 Hz)

- Jet Pump
- Motor
- Lube oil system
- Decoking Control valve

Capacity 272 m³/h
 Head 3120 m

Speed 3600 rpm

Temperature 70 °C

Medium Water with
 coke fines

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Decoking Control Valve

- **Design, rev 2005**
 - Motor driven cam controlled spindle lift valve
 - Heavy duty design
 - Internal bypass orifice, non clogging type
- **Operation, range**
 - exact positioning and smooth operation
 - Pressure 415 bar (6 000 psi)
 - Flow 6x3 450 m³/h (2 000 gpm)
- **Control**
 - Encoder with position visualisation
 - Limit switch at main piston
- **Material**

CCA	material class II or III
CA	material class II

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Decoking Control Valve



Operation

Version 2005

- **Pressure** 300 bar
4 500 psi

(design 6000 psi)

- **Flow, type 6x3** 272 m³/h
1.200 gpm

(design 2000 psi)

Installation

- CCA, pumphouse
- Material Class II

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Cutting system: hoist and DSD

RUHRPUMPEN offers 3 version

- **Temp Class I.**
 - Hydraulic or electric driven Hoists
 - Hydraulic or electric driven Drill Stem Drives (DSD)
- **Class II.**
 - Hydraulic or electric driven Hoists
 - Hydraulic or **electrical** driven Drill Stem Drives
- **Class III.**
 - Hydraulic or **electric** driven hoists
 - **Electrical** driven Drill Stem Drives

Cutting system: Hoist and DSD

Hydraulic system

- **Features**
 - Hydraulic power unit HPU
 - Redundant m-p
 - Designed for hoist and DSD operation
 - Hyd. Driven hoist
 - Hyd driven DSD

Electrical system

- **Features**
 - VFD for hoists and DSD
 - Redundant
 - Installed in safe area
 - Or on cutting deck (DSD)
 - Motor + breaks explosion proof

- 1 Operator panel (3 sections) per drum pair
- Control electric/electronic for manual, remote / automatic operation
- Integrated in PLC / DCS system
- Measurement of force, tension, RPM of Drill Stem
- Measurement of Tool position, Tool mode



Hydraulic unit



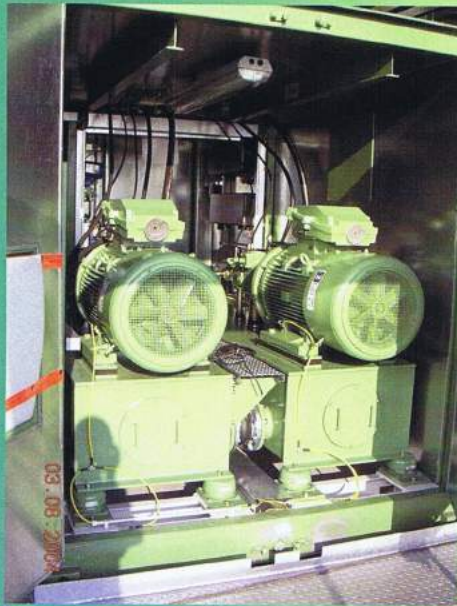
HPU

- Hoist
- Drill Stem Drive
- Top deheading
(Optional)
- Bottom deheading
(Optional)

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Hydraulic unit



- Driver
 - Electric motor
Power 60 kW
- Hydraulic Pump
 - Triple pump
 - Redundant inst.
- Hydraulic oil
 - Non flammable

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Hoist, block and rope

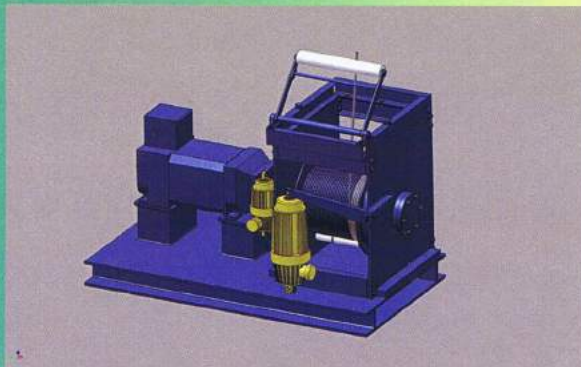


- **Hoist with integral cartridge gear**
 - drum with grooves
 - Pull force 4,5 t
 - slack rope indicator
 - locks the hoist
- **Rope**
 - measurement of tension in the rope
 - indication at the operator panel
 - avoiding of overload
- **Material class II**

17.03.2006

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Hoist, block and rope



- **Hoist with integral cartridge gear**
 - drum with grooves
 - Pull force 4,5 t
 - slack rope indicator
- **Break**
 - 2 Elect/hyd breaks
 - 1 motor break
 - Overload protection
- **Material class III, CCA**
- **Explosion proof**

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Hoist, block and rope



- **Hoist, electrical driven, cartridge gear**
 - Pull force $F_{max} = 4,5 \text{ t}$
 - slack rope device
- **Rope**
 - measurement of tension in the rope
 - indication at the operator panel
 - avoiding of overload
- **Variable Frequency Converter**
 - Installed in safe area
- Material class II CA
- Explosion proof

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Crosshead w DSD



- Drill Stem Drive
 - hydraulic driven
- Free fall Arrestor
- Pulley Block
- Gooseneck / Swivel

Material class II, CA

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Drill Stem Drive

- **Drill Stem Drive**
 - Motor
hydraulic, elect., pneum.
 - High load bearing
 - Grease lubrication
 - Cartridge packing
 - Swivel
- Material class III for CCA

Patent available

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Drill Stem Drive

- **Drill Stem Drive**
 - Electric motor
 - High load bearing
 - Grease lubrication
 - Cartridge packing
 - Swivel
 - Standard version
(down to -20°C)
- **Variable Frequency Converter VFC**
 - At Cutting deck, or
 - At safe area

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Crosshead with FFA

- **Drill Stem Drive**
 - Electric motor
 - High load bearing
 - Grease lubrication
 - Cartridge packing
 - Swivel
- **Variable Frequency Converter VFD**
 - At Cutting deck, or
 - At safe area
- **Material Class III**
- **Explosion proof**

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HP - Water Hose



- **HP - Hose**
 - Flange 4" 2500 # RTJ
 - 4" ID
 - 6" OD
 - Min design T -45°C/-49°F
 - Water Temperature
 - 1°C to +120°C
- **Material class III**
due to integrated electrical heattracing

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RP - Cutting Tool

Basic design

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

- **Switching devices**

- Manual / Automated
- At the top of the tool

- **Valves**

- Ballshape valves
- No seals
- Pressure operated

- **Nozzles, cutting**

- 0° or 10° up both cutting nozzles

- **Nozzles, drilling**

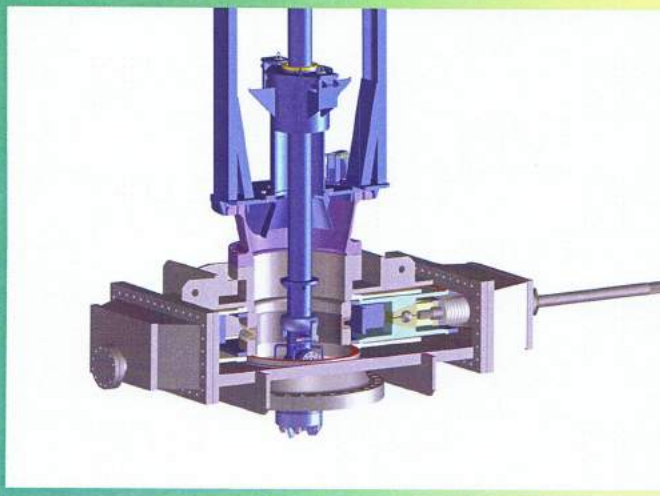
- 1 strong centre nozzle
- 3 periphery nozzles

Patent available

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RP – Tool with Top deheading valve

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Top - deheading

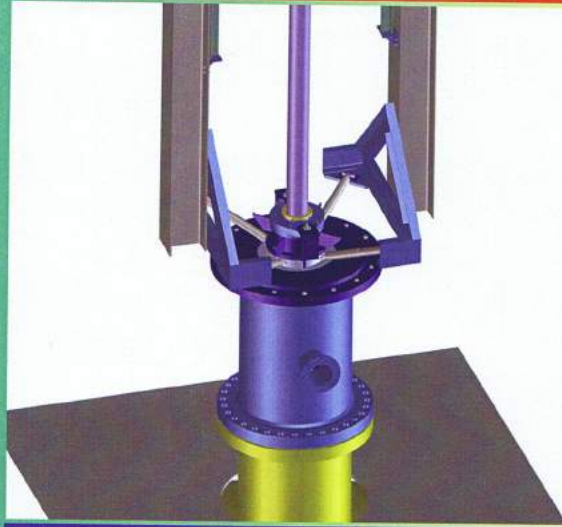
- with Z&J double gate and purge valve

- Tool in working mode

- Size
36", 30", 24"

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RP – Top deheading



Top - deheading

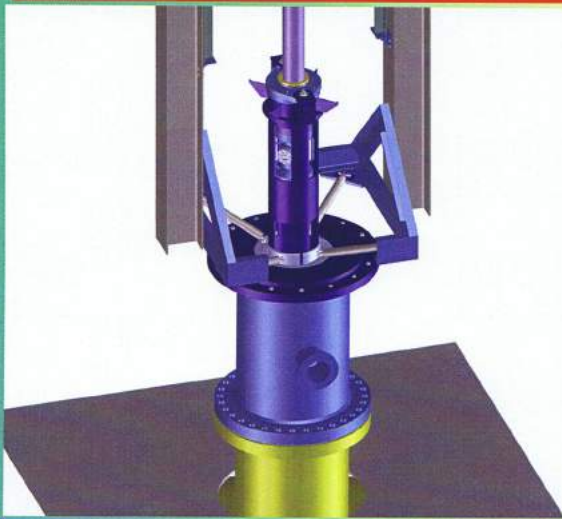
Guide plate ver3

- floating dome
 - Horizontal/ vertical
- opening for venting
- 8" vent connection

Patent pending

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RP – Top deheading



Top - deheading

Guide plate ver3

- floating dome
 - Horizontal/ vertical
- opening for venting
- 8" vent connection

Patent pending

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RP - Top deheading



RP-system
with

- ZJ 36" top valve
- Guideplate
- Dome
- Operatorhouse

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Control system



Operator cubicle

- Operation in
 - heated
 - prewired
 - Fire resistend material
 - Safety glass
 - Round and top view

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Control system



Local Operator panel

Operator deck

- Operation of
 - Decoking valve
 - Isolation valve
 - Hoist
 - Drill stem drive
- Interactive P&ID

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Operator shelter, Canada



Deep temp version

- Fire safe material
 - (T30 / T60)
- Safety glass
- Heated
- prewired

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Control system

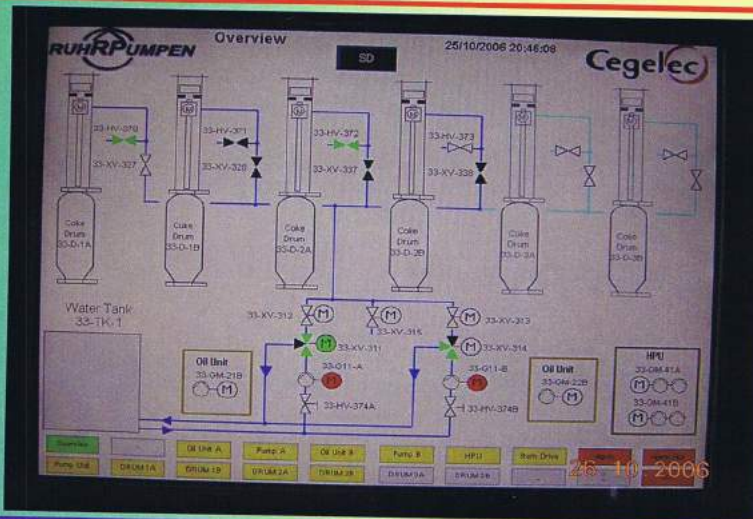


- Local Operator panel
- Operator deck

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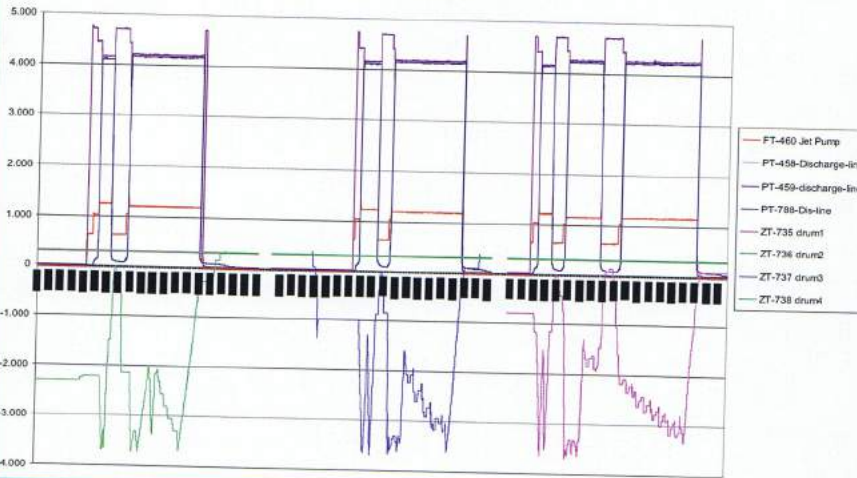
Control and process visualisation



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Control and process visualisation

14/15-02-2005



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Ruhrpumpen – References, systems

Year	company	CA/CCA	drums	scope	type
2001	Petroleras Ameriven, Venezuela		4 x 29'	complete cutting system, hydraulic cutting system, electric semi automated top deheading semi automated bottom deheading	new
2002	BP-Gelsenkirchen, Germany	CA	4 x 26'		revamp
2003	BP - Lingen, Germany	CA	2 x 17'	cutting system, hydraulic 36" top deheading valves semi-automated bottom dh	new
2004	Jinling, China	CA	2 x 31'	Jet Pump and decoking Valve	new
2005	CNRL, Canada	CCA	4 x 30'	complete cutting system cutting system 30" top deheading valves semi-automated bottom dh	new
2005	ENERCON, Chile		2 x 29'		new
2005	BP-Lingen, Germany	CA	2 x 17'		revamp
2006	BP Castellon, Spain		2 x 25'	complete cutting system 30' top deheading valves cutting system	new
2006	Sinclair Oil, USA	CA	2 x 26'	Jet Pump and DC-valve	revamp
2006	Sinopec, CNOOC, China		4 x 32'		new
2007	Suncor, Canada	CCA	6 x 32'	cutting system	new
2007	Frontier, CB&I, USA	CA	2 x 26'	cutting system	revamp/new
2007	OMV, Germany	CA	2 x 26'	Jet Pump and Decoking valve	revamp

CA Cold Area, CCA Very Cold Area

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Petroleras Ameriven

**Hamaca
Venezuela**

Licencor: FW

Contractor: Fluor
Inelectra

- Order: 2001-04
- Start up: 2004-10

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BP – ERE, Germany

**BP - ERE
Germany**

Licencor: FW

Contractor:
BP, EDL-Germany

Scope:
Cutting system
Top deheading, ZJ automatic
Bottom deheading, semi-automatic

Order: 2003-12
Start up: 2004-10

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TPIT for CNRL Canada



**Horizon Oil
Sands
Canada**

**Licencor:
ABB**

**Contractor:
Technip Italy**

**Order 2005
Start up 2008, planed**

Material class III, CCA

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Bantrel for suncor, Can



**Suncor, Voyageur
Canada**

Licencor: ConocoPhillips

Contractor: Bantrel, Calgary

**Scope:
-Cutting system, 2 pumps, 6x32' drums**

**-Order: 2006-12
-Start up: 2011, planed**

Material class III, CCA

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THANKS FOR YOUR

ATTENTION

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Notes page