2026 TRENCHLESS MOROCCO

DERNIÈRES TENDANCES EN MATIÈRE DE MICROTUNNELS ET D'APPLICATIONS DE REJETS MARINS

RAPHAEL SISTERMANS, HERRENKNECHT AG

Organised by WESTRADE GROUP LTD

Sponsored by CAPEP Travaux Publics; EUROHINCA EuroHinca Maroc, S.A.R.L.; JBP combining strength

Supported by FSTT; GATT; iSTT International Society For Trenchless Technology; UKSTT

Chinese Partner 百斯特展览 Best Int'l Expo

Official Media Partner TRENCHLESS WORKS

HERRENKNECHT AG

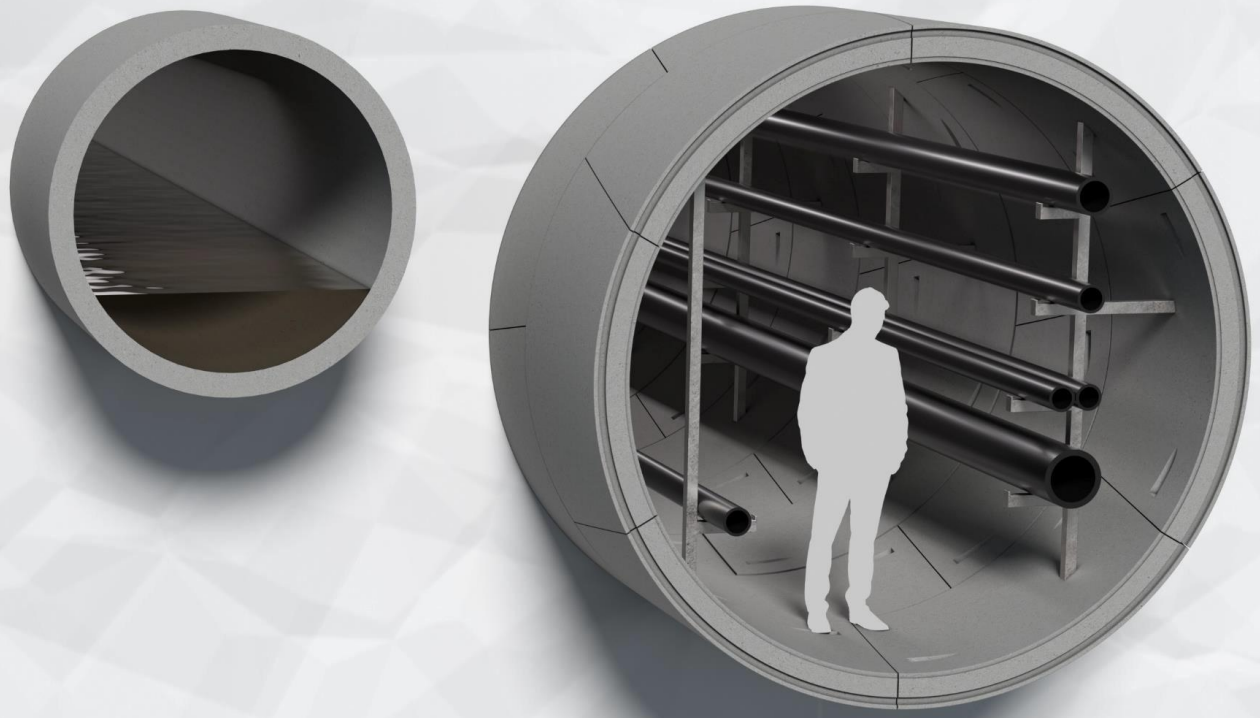
HERRENKNECHT UTILITY TUNNELLING

Rabat 10.02.2026

Raphaël Sistermans

HERRENKNECHT AG

- HDD – Horizontal Directional Drilling
- Pipe Jacking – Micro Tunnelling
- Direct Pipe



HERRENKNECHT

Strongly rooted in the location of Schwanau since almost 50 years

Around 2,400 employees work in Schwanau and 5,400 employees worldwide

Our long-term and sustainable thinking is reflected in our support of education, environment and society

Key figures

HERRENKNECHT GROUP

1.288

Revenue
2024 in million euros

1.473

Incoming orders
2024 in million euros

EMPLOYEES WORLDWIDE

5.490

Employees
at the end of 2024

**incl. temporary workers*

215

Trainees
at the end of 2024

Key figures

HERRENKNECHT HISTORY

1977	1977 to 1987	1988 to 1997	1998 to 2007	2008 to 2017	2023

An Idea.

Develop technologies & expand market shares.

Grow and develop. In all areas.

Lead the market & open up to Asia.

Things are moving forward everywhere! E.g. at the Gotthard Base Tunnel.

Being part of the next underground milestones.

Mechanized solutions

HERRENKNECHT GROUP APPLICATIONS FIELDS

Sustainable Underground Structures

HERRENKNECHT GROUP MARKET SEGMENTS

WATER

- Sewage infrastructure
- Water supply
- Desalination
- Flooding infrastructure
- Storage and reservoirs

ENERGY

- Transportation of oil, gas and hydrogen
- Development drilling
- Hydroelectric power
- Offshore Wind
- Geothermal energy
- District heating/geothermal energy
- Energy storage
- Power lines

TRANSPORT AND MOBILITY

- Road
- Railway
- Metro
- Passenger transport
- Cargo

SUPER-SAFE UNDERGROUND STRUCTURES

- Safe storage facilities, e.g. castor storage
- Safe underground facilities, e.g. for research purposes

MINING AND RAW MATERIAL

- Vertical access or production shafts
- Ventilation shafts
- Access ramps and transport infrastructure
- Tunnel infrastructure

Utility Tunnelling | Reference Projects

HERRENKNECHT EQUIPMENT IN AFRICA

Morocco
Various sewage + desalination projects

Algeria
Various sewage + desalination projects

Senegal
Various sewage + desalination projects

Ivory Coast
Drainage+ Pipeline projects

Ghana
Seawater intake Power Plant (KIPP)

Equatorial Guinea
Sewer Project Bata WWTP

Lybia
Benghazi sewage project

Egypt
Various traffic and utility projects

Tanzania
Sewer Project Dar Es Salaam

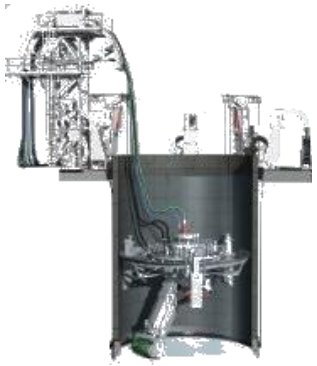
La Réunion
Water transfer tunnel

Madagascar
Water Pipeline Project

South Africa
Various sewer and traffic projects

Business Unit Utility Tunnelling

UT PRODUCT PORTFOLIO



Crucial for selection of appropriate machine concept

GEOTECHNICAL DATA

PRESTUDY

GROUND CONDITIONS

&

HYDROLOGY

DESIGN AND PLANNING OF…

- ✓ tunnel alignment (overburden, gradient, curves,…)
- ✓ groundwater handling
- ✓ tunnel face support
- ✓ face support medium
- ✓ soil bearing capacity
- ✓ soil conditioning
- ✓ handling of boulders
- ✓ soil disposal

SELECTION

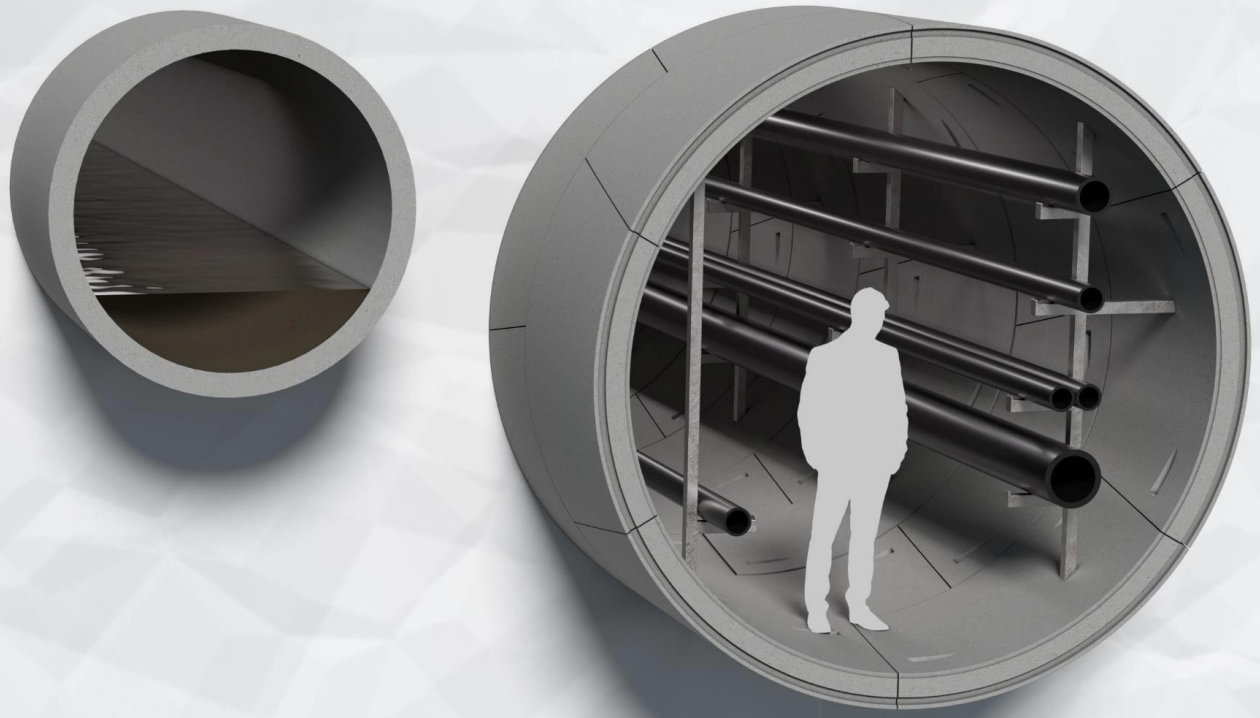
TUNNELLING TECHNOLOGY

&

MACHINE CONCEPT

HERRENKNECHT AG

- Herrenknecht AG
-
- Pipe Jacking – Micro Tunnelling
- Direct Pipe



HERRENKNECHT AG

HDD

HORIZONTAL DIRECTIONAL DRILLING

RIG TYPES STANDARD

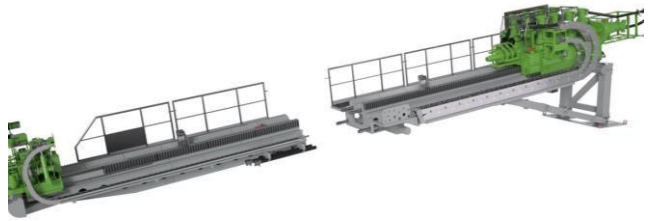
Compact Rigs CK

- Pullforce: **45-100 tons**
- Small and compact design
- Onboard control cabin & pump

Trailer Rigs T

- Pullforce: **200 – 500 tons**
- High flexibility, Transport by truck
- No crane needed for Rig

Modular Rigs M



- Pullforce: **400 – 500 tons**
- Can be disassembled into 2 modules for transport

1000 kN | 2000 kN | 3000 kN | 4000 kN | 5000 kN

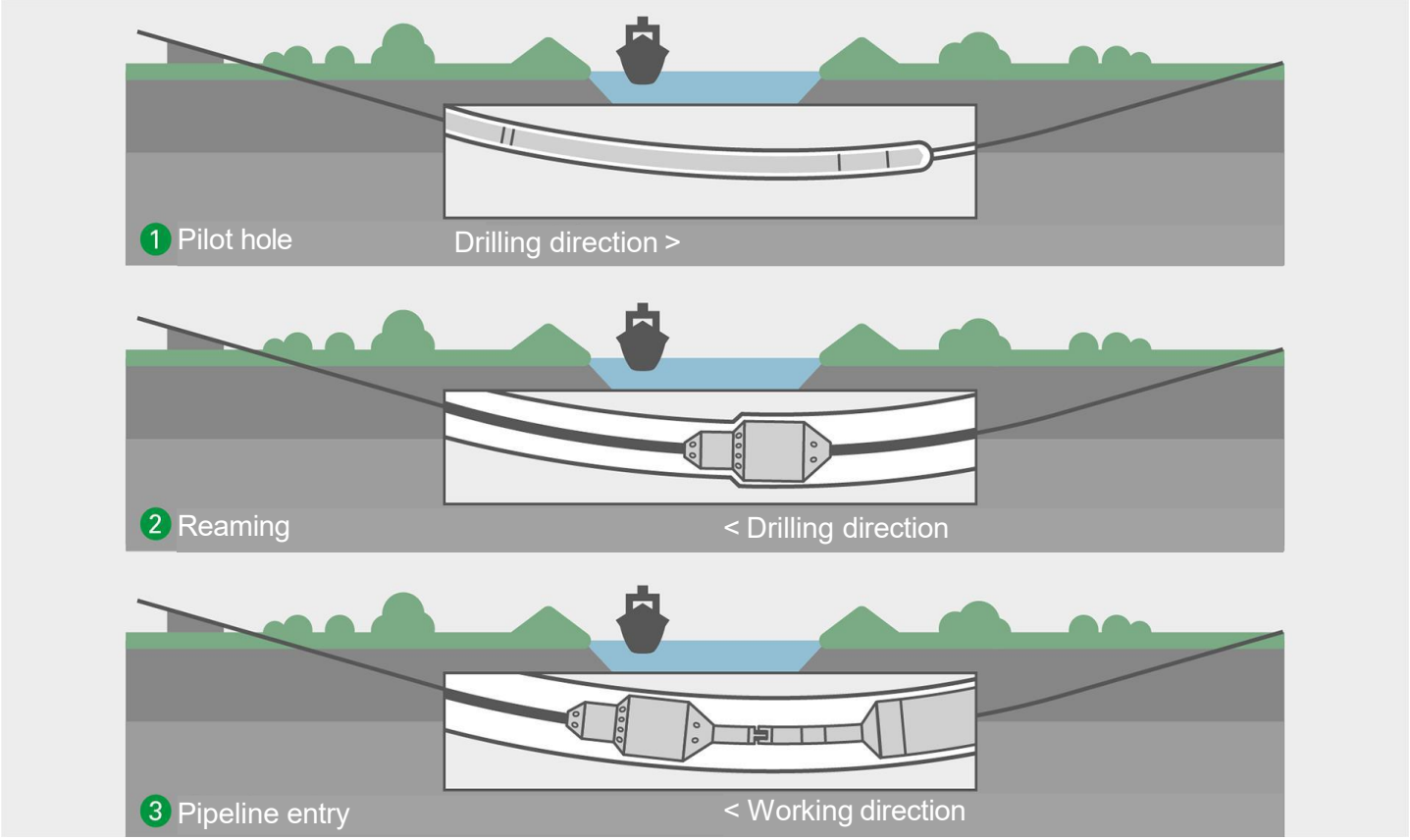
Crawler Rigs C

- Pullforce: **100 – 300 tons**
- Autonomous transport, unloading and positioning
- For all terrain conditions

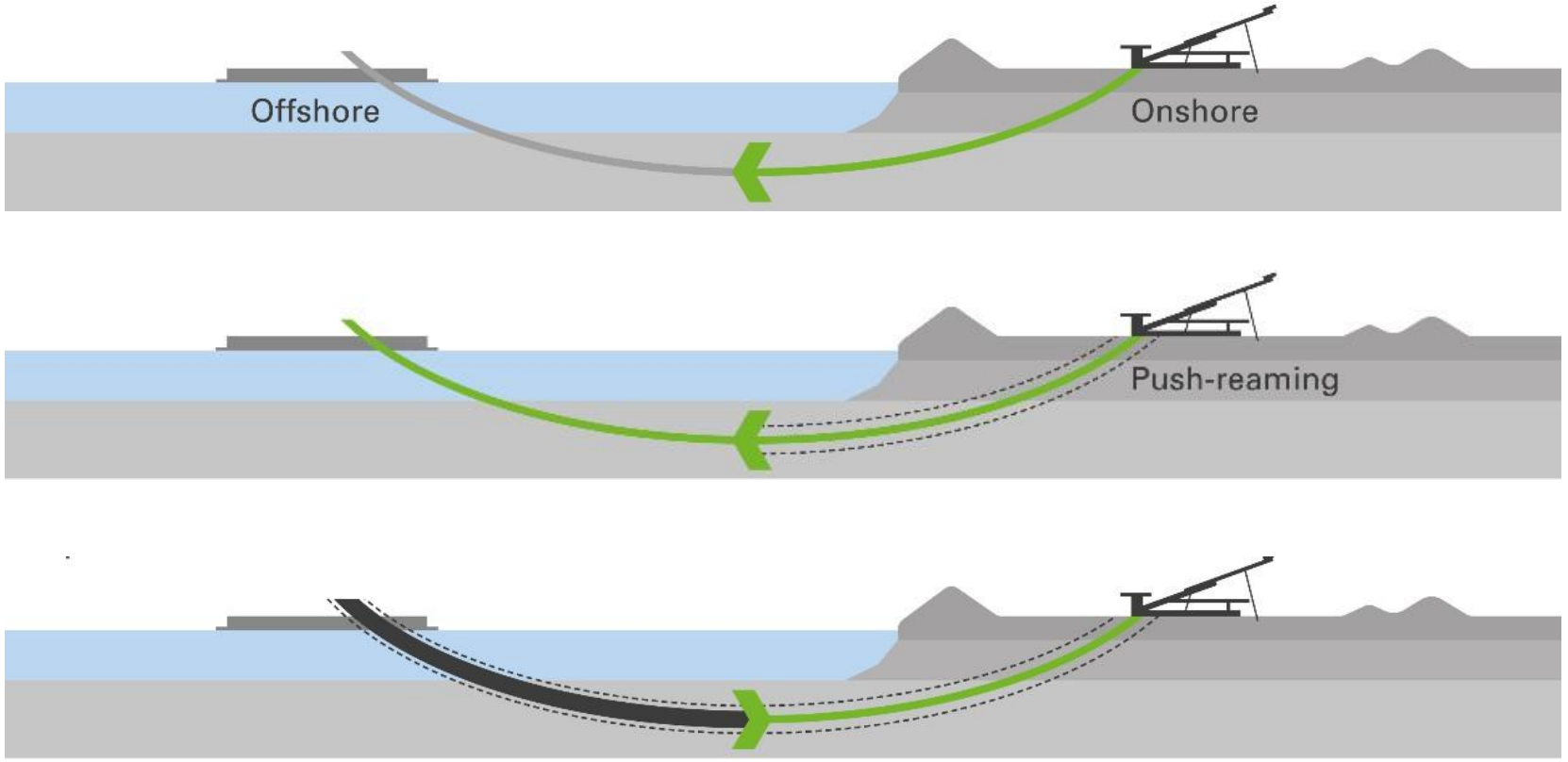
Frame Rigs F

- Pullforce: **100 – 500 tons**
- Low weight, Transport on trailer
- Crane required

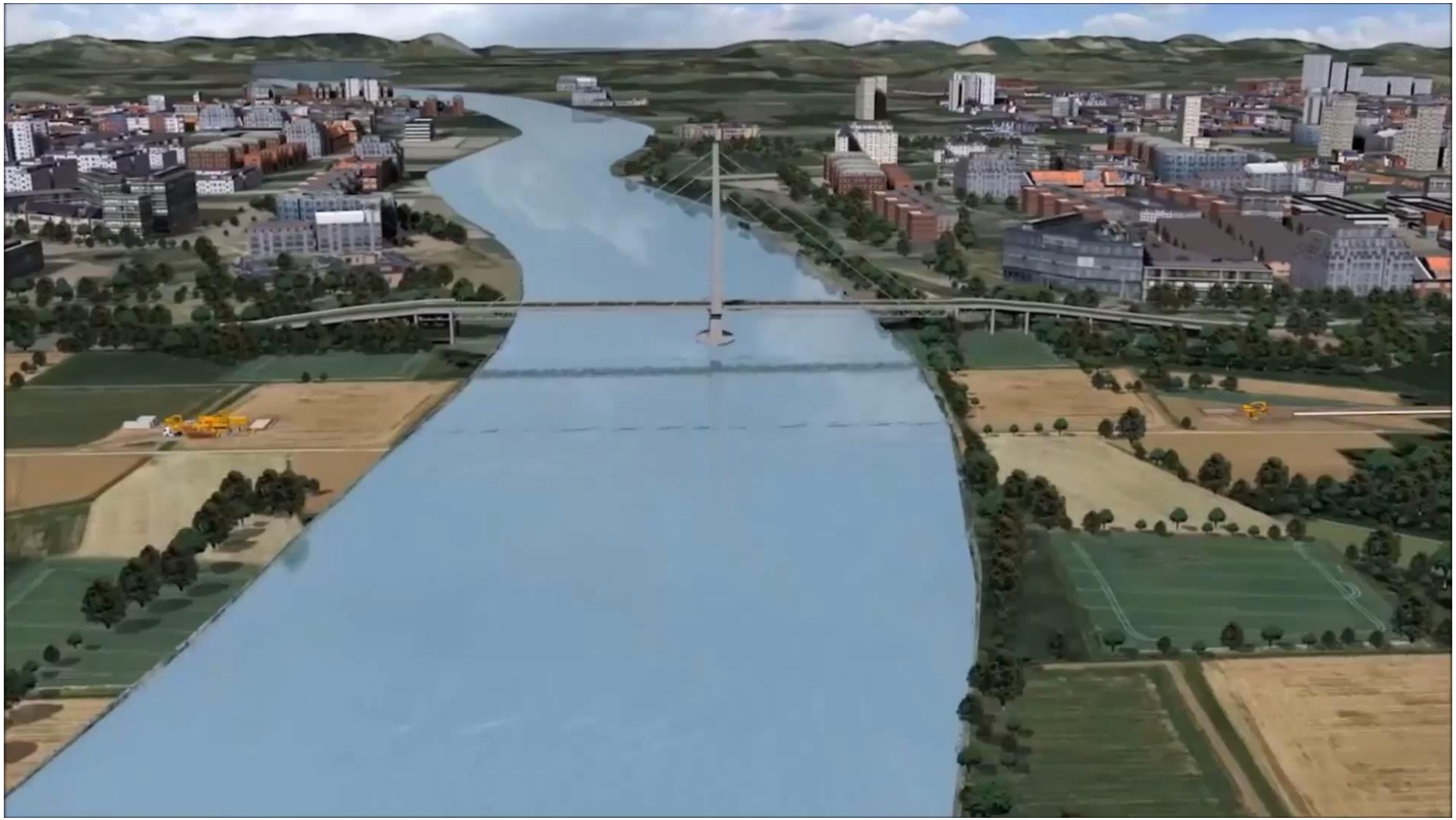
HDD | HORIZONTAL DIRECTIONAL DRILLING
ONSHORE APPLICATIONS



HDD | HORIZONTAL DIRECTIONAL DRILLING
SEA OUTFALLS & LANDFALS



HDD | HORIZONTAL DIRECTIONAL DRILLING



HDD | HK250T | River Crossing | Denmark

INSTALLATION OF CABLE BUNDLE WITH HDD

- H-395, HK250T
- Crossing of Eastern Limfjord
- Installation length: **1,551 m**
- Cutting diameter: 1,200 mm
- bundle 3xDN400 + 1xDN355 (HDPE)
- Geology: soft soil, dense chalk with flint

- Client: Energinet, Denmark
- Contractor: Van Leeuwen Sleufloze Technieken (VLST)

HDD | Pipeline – Sea Outfall | Australia

INSTALATION OF WATER PIPELINE

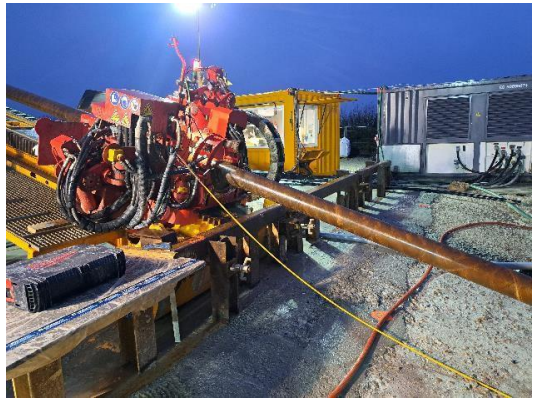
- HK250C Crawler Rig
- Location: Anglesea, Australia
- Installation length: 710 m
- Reaming diameter: 20“
- Product Pipe: 1x OD350mm = 14“
- Contractor: Dunstans
- Client: Barwon Water

HERRENKNECHT

HDD | Cable - Outfall | France

CELTIC INTERCONNECTOR IRELAND-FRANCE | CABLE LANDFALLS

- HK250T Trailer Rig
- Location: Clèder, France (Coast of Brittany)
- Installation length: 1380 m | 3x drives = 460 m
- Reaming diameter: 16“ / 20“
- Product Pipe: 1x DA 250mm = 10“ / 2x DA 350mm = 14“
- Ground conditions: granite
- Project status: completed in July 2024
- Contractor: Catalana de Perforacions | Client: Eirgrid – RTE



HDD | Pipeline – Shore approach | Indonesia

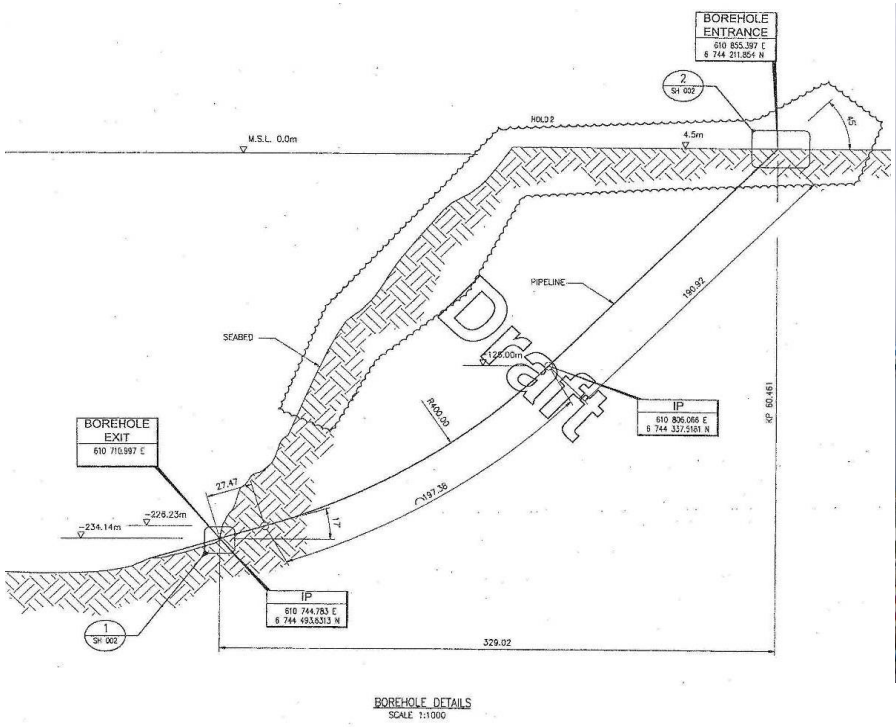
TANGGUH LNG EXPANSION

- HK400M Modular Rig
- HK500PT Pipe Thruster
- Location: Bintuni Bay, Papua Barat, Indonesia
- Installation length: 3 x 2,065m
- Reaming diameter: 30“
- Pipeline diameter: 24“
- Contractor: AJ Lucas | Client: BP

HDD | Pipeline – Shore approach | Norway

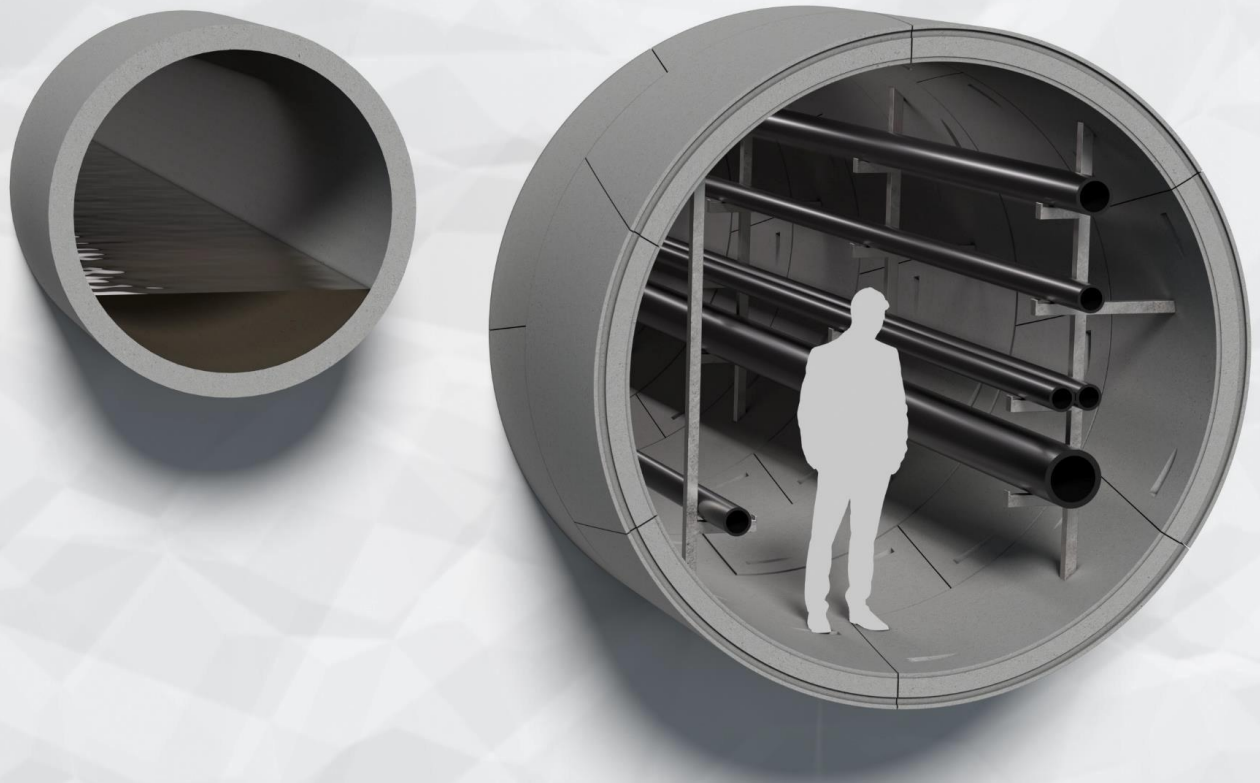
MONGSTAD LANDFALL FOR GAS PIPELINE

- HK250 Trailer Rig
- Geology: Basalt (270 Mpa)
- Location: Mongstad Norway
- Installation length: 1 x 416m
- Pipeline diameter: 14“
- Medium: Gas
- Entry Angle: 45°
- Exit Point: 230m below sea level
- Contractor: Visser & Smit Hanab



HERRENKNECHT AG

- Herrenknecht AG
- HDD – Horizontal Directional Drilling
-
- Direct Pipe



HERRENKNECHT AG

PIPE JACKING
MICRO TUNNELLING

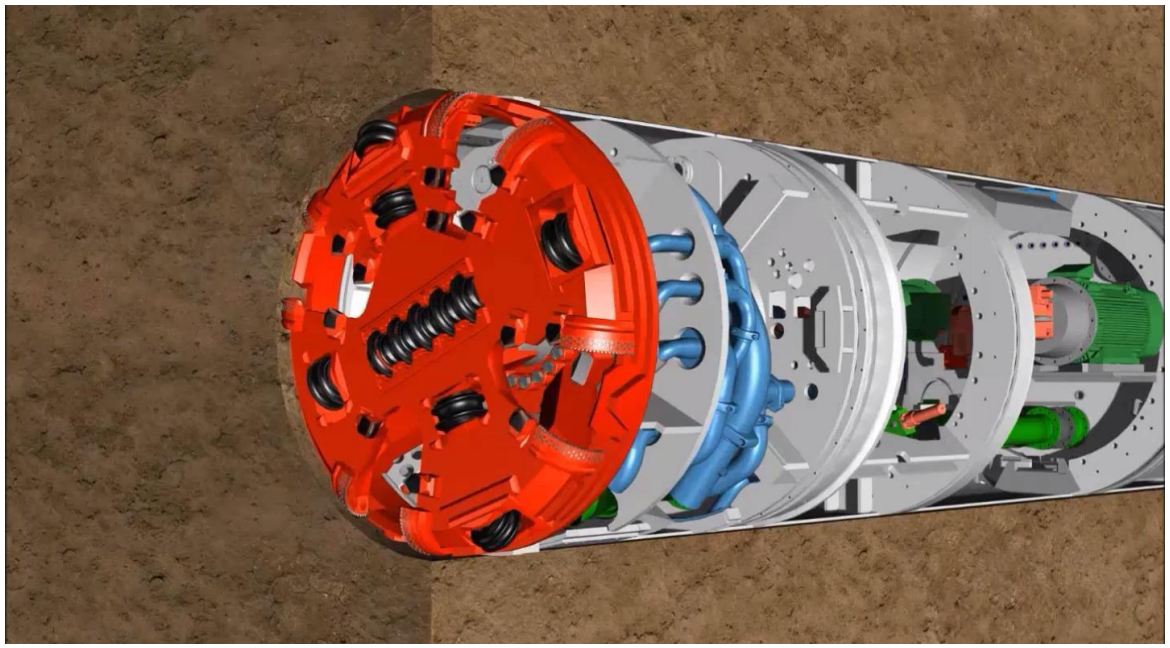
Tunnels for sewage, water,
protective tunnels for
supply lines and
underground cables

Pipe Jacking | Microtunnelling Technology

PIPE JACKING JOBSITE INSTALLATION

Pipe Jacking | Microtunnelling Technology

PIPE JACKING VIDEO



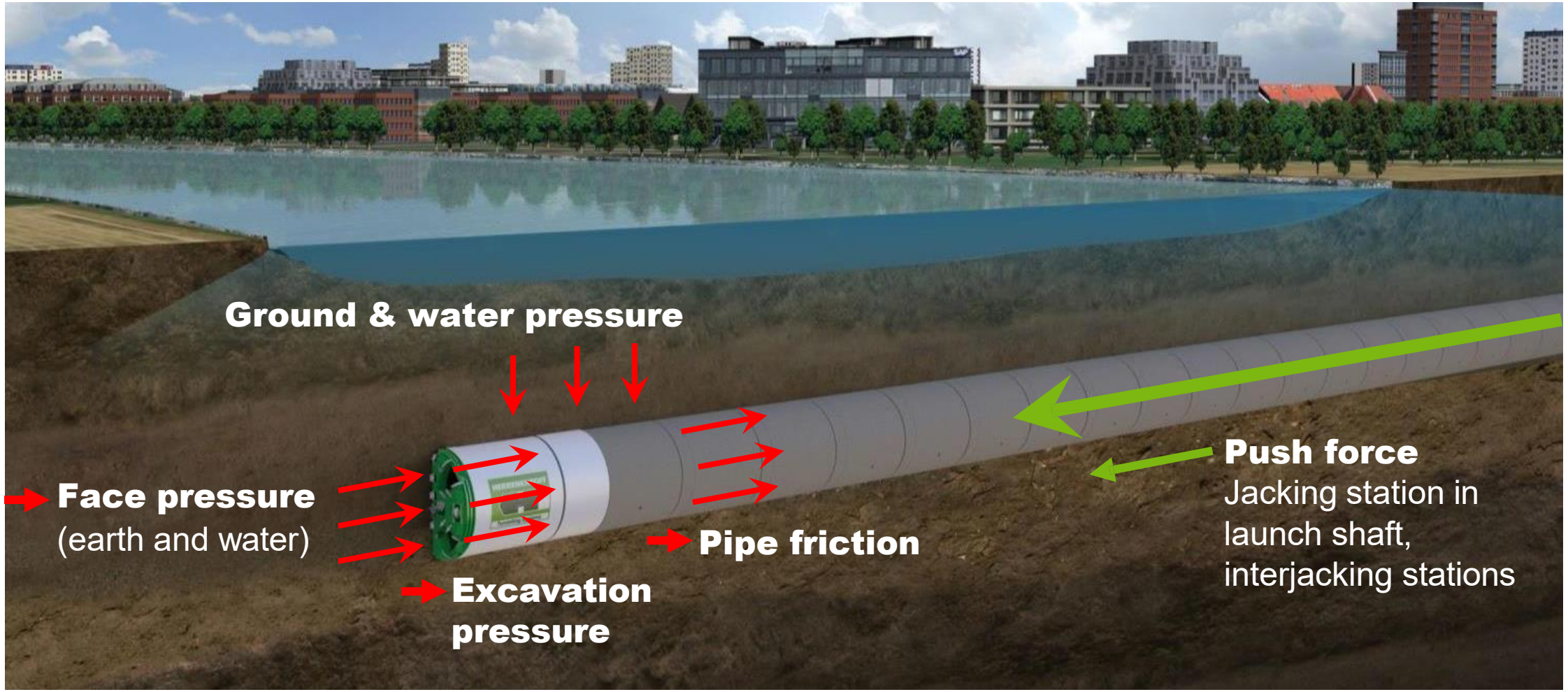
Pipe Jacking Principle

- Remote-controlled tunnelling
- With concrete jacking pipes

Slurry MTBM Principle

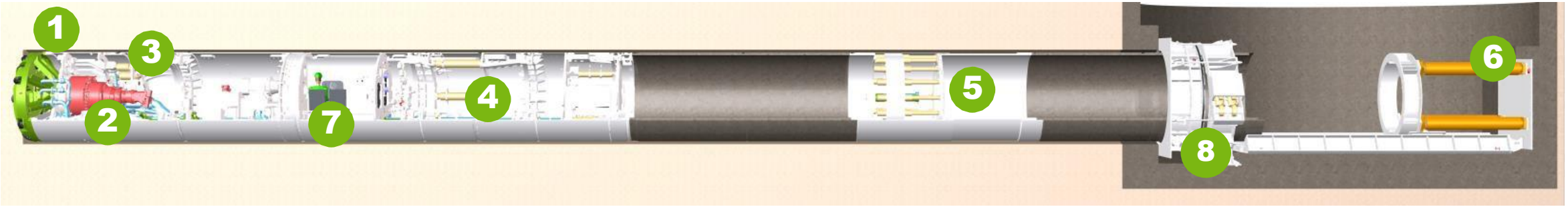
- MTBM with cutting wheel adapted to ground conditions
- Slurry circuit for transport of cuttings above ground

ACTING FORCES

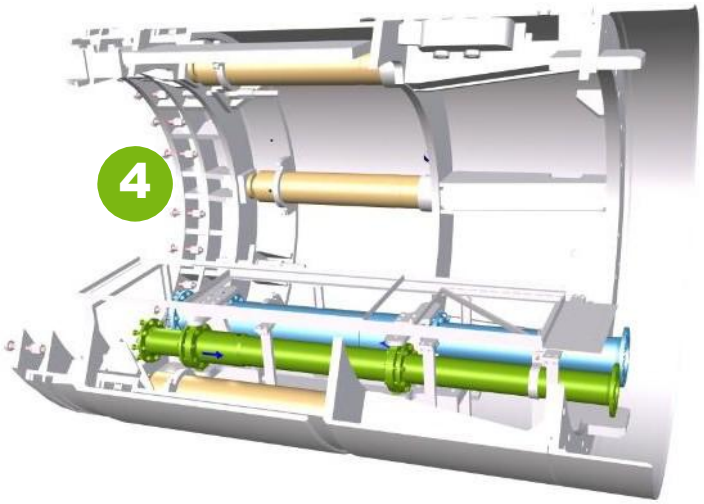


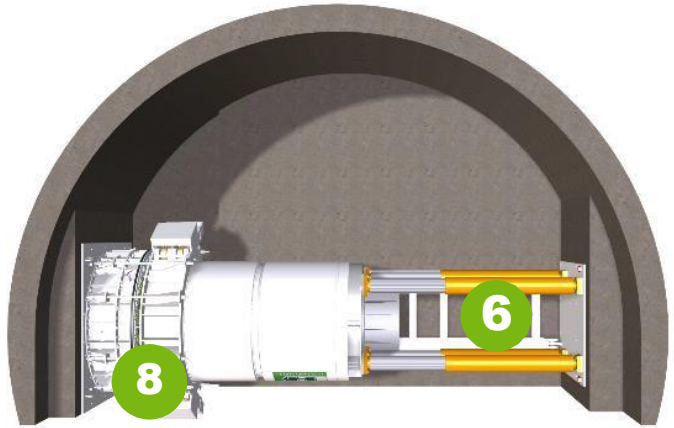
Pipe Jacking | Microtunnelling Technology | Machine design

KEY DESIGN PARAMETERS
OVERVIEW



1. Cutting wheel and cutter tools
2. Main bearing and main drive
3. Steering cylinders
4. Telecopic station
5. Intermediate jacking stations
6. Main jacking station
7. Airlock
8. Launch seal with pipe brake





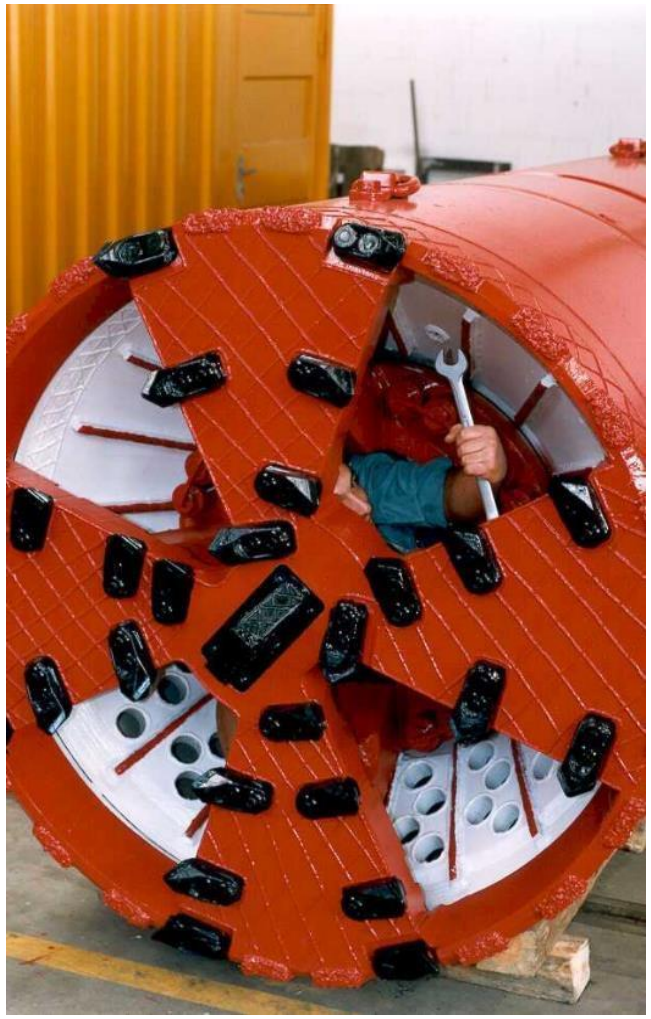
CUTTING WHEEL AND WEAR RESISTANCE

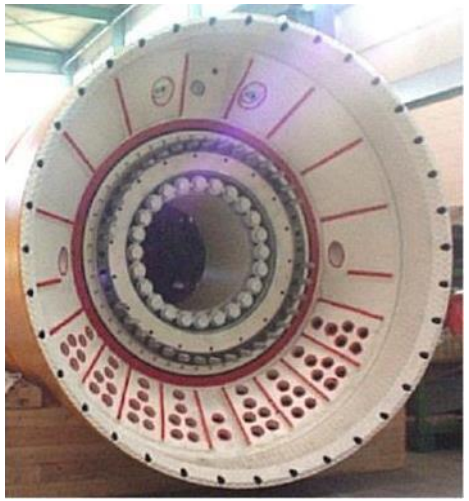
- Cutting wheel design and tooling adapted to ground conditions
- Hardfacing for cutter wear protection

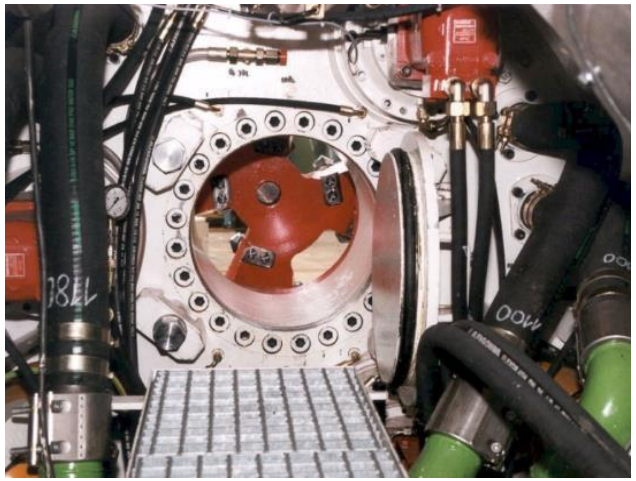
SCRAPER	BUCKET	RIPPER	Disc Cutter RING VERSION (1/2-ring)	Disc Cutter MONOBLOCK (1/2/3-ring)	Disc Cutter HARD FACING* (1/2/3-ring)	TCI CUTTER (opt. hard facing)
						

Pipe Jacking | Microtunnelling Technology | Long Distance

FACE ACCESS FOR TOOL INSPECTION & EXCHANGE



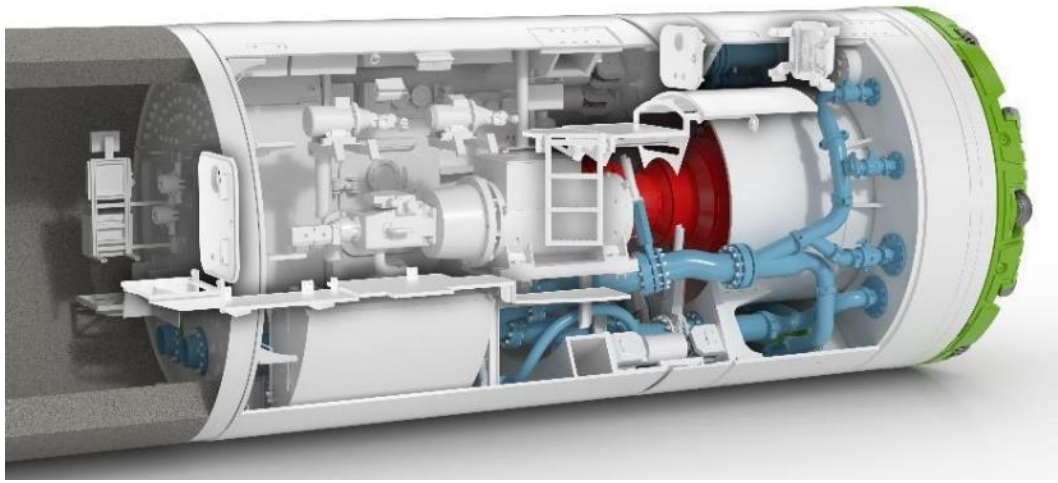


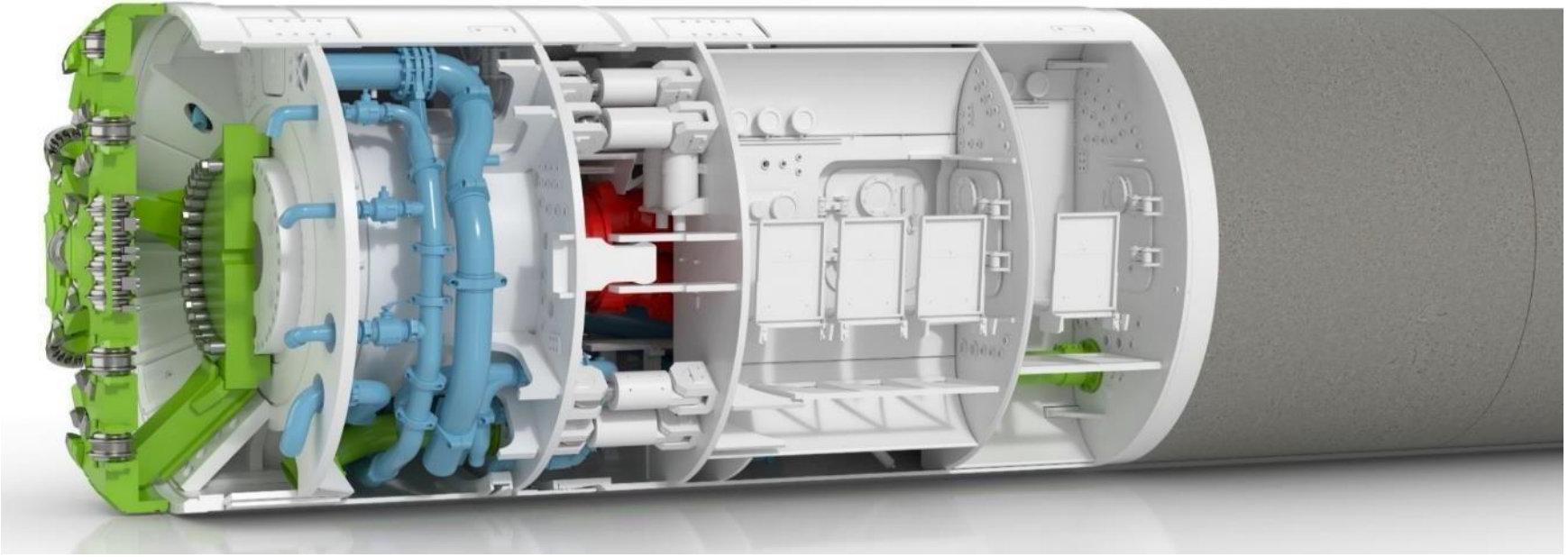


Pipe Jacking | Microtunnelling Technology | Long Distance

AIRLOCK FOR INTERVENTIONS

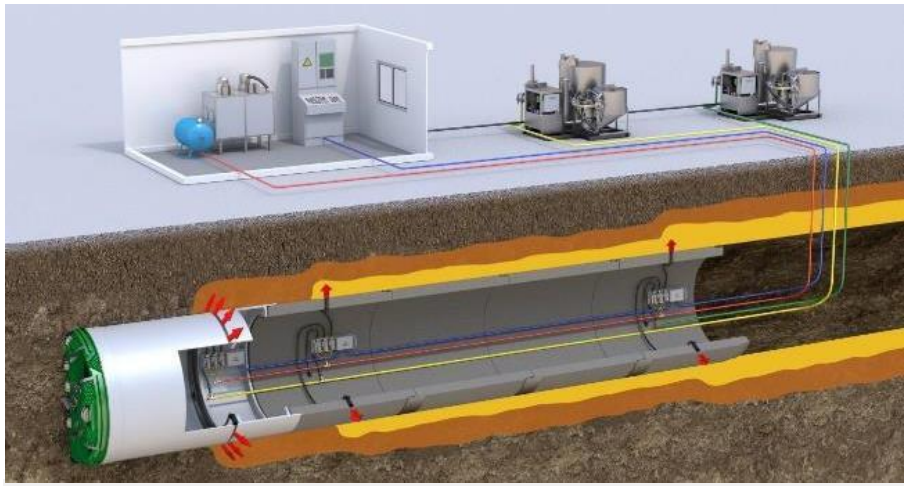
- Hyperbaric Interventions > ID1600





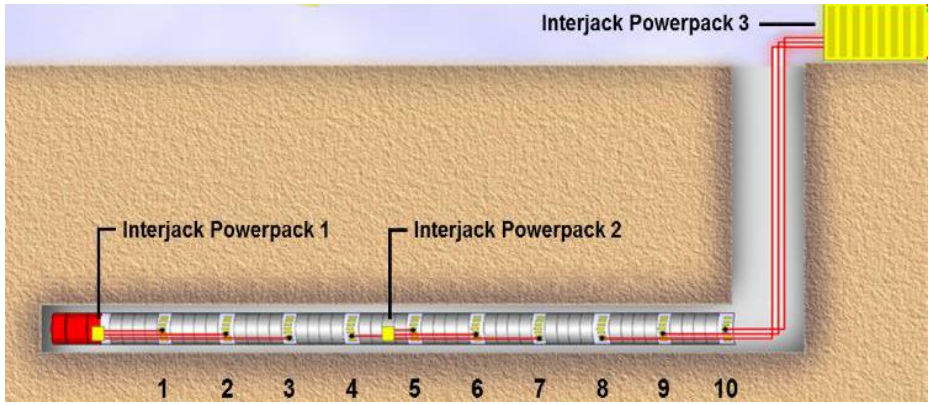
Pipe Jacking | Microtunnelling Technology | Long Distance

BENTONITE LUBRICATION & INTERJACKING STATIONS



Bentonite lubrication system

- reduce skin friction
- adapt to changing geology

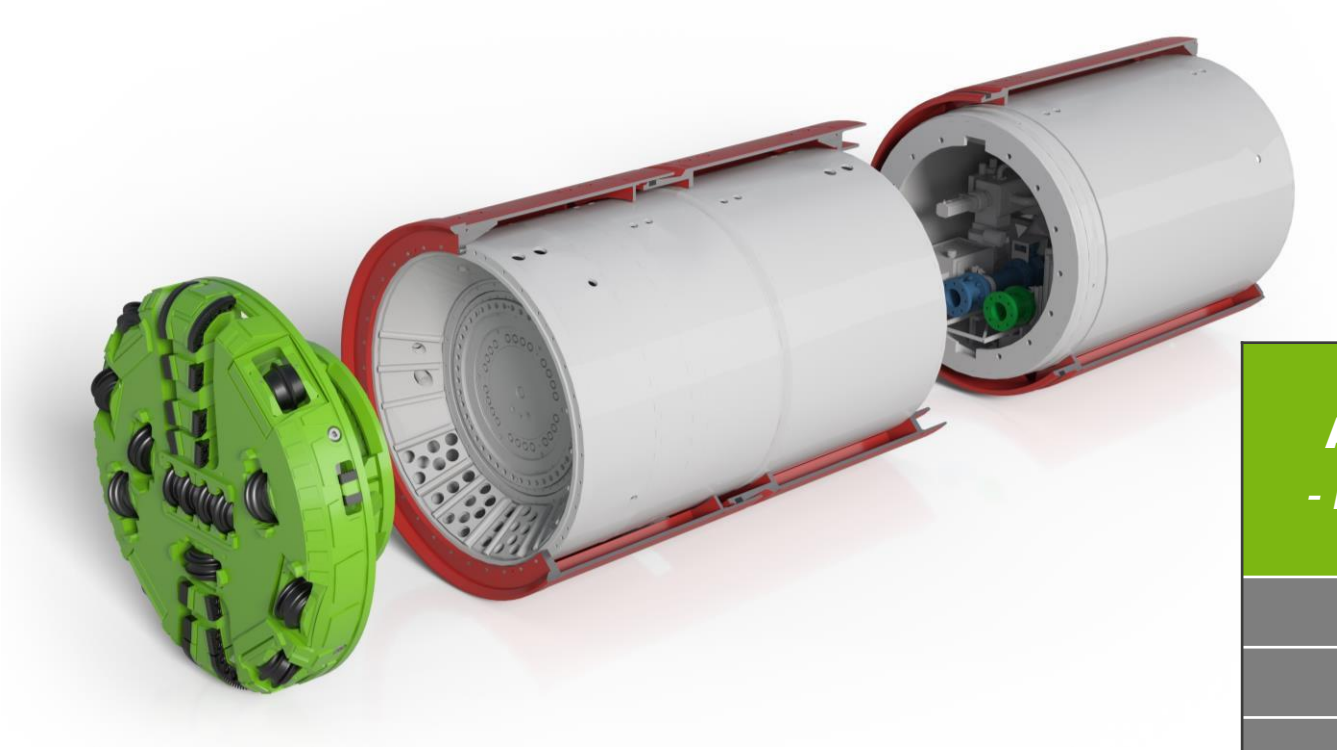


Interjacking stations

- regular intervals
- reduce jacking forces of main jacking station
- dismantled when finished

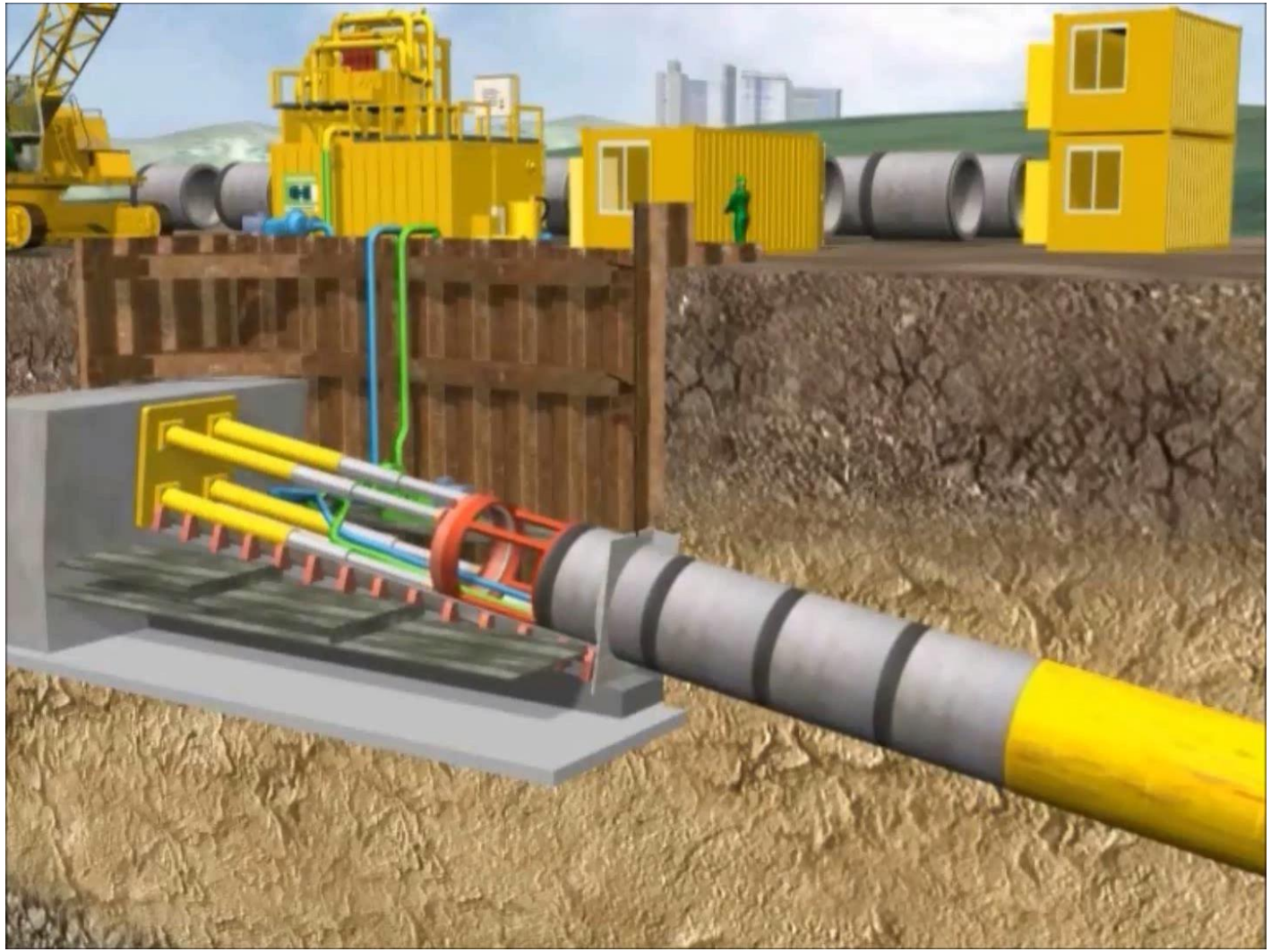
Pipe Jacking | Microtunnelling Technology | Diameter Increasing

FLEXIBLE DIAMETER WITH EXTENSION KIT



AVN type *- Exemplary -*	**Shield diameter** *Standard (in mm)*	**Shield diameter** *with extension kit (in mm)*
AVN 600	780	875
AVN 1200	1,505	1,740 | 1,810
AVN 1600	1,970	2,150
AVN 2000	2,425	3,025
AVND 2500	3,025	3,625
AVND 3000	3,625	4,225

SEA OUTFALL WITH PIPE JACKING



Sea Outfall Principle

› With offshore recovery of the tunnelling machine

Pipe Jacking | Microtunnelling Technology | Sea Outfall

SUBSEA RECOVERY PROCEDURE MTBM

01

Tunnelling machine is prepared for release from pipestring; bulkhead is closed

02

Divers fix the crane to lifting eyes of machine

03

Divers connect hydraulic supply lines to machine for the telescopic cylinders

04

Cylinders are extracted to release machine from the pipestring

05

Tunnelling machine is recovered and lifted up to the surface

Pipe Jacking | Microtunnelling Technology | Sea Outfall

SUBSEA RECOVERY OPTIONS

› With airbags

› Crane in harbor

› Crane on barge / jack-up plattform

Pipe Jacking | Microtunnelling Technology | Project References

EWS ESCONDIDA WATER SUPPLY PUNTA COLOSO CHILE

- M-1909M, M-1911M, 2x AVN2000AB, OD 2425 mm / OD 2525 mm
- Location: Antofagasta, Chile
- Tunnel length: 2x 530m + 350m
- 2x seawater intakes + 1x discharge line
- Ground conditions: **Hard Rock (up to 250MPa)**
- Slope: 3.4° | Water pressure: **3,5 bar**
- Project status: completed in 2016
- Contractor: CSM Bessac

Pipe Jacking | Microtunnelling Technology | Project References

UMM AL HAYMAN WWTP SEA OUTFALL KUWAIT

- M-2514M, AVND2000AB + ext. kit OD 2665 mm
- Outfall Tunnel Length: **1,960 m**
- Geology: sand, silty sand, max. 46 MPa
- Contractor: Joseph Gallagher Ltd
- Best daily performance: 47 m | Best weekly performance: 237.8 m
- End position reached: May 10th, 2022 | Recovery: Jul 12th, 2022

Pipe Jacking | Microtunnelling Technology | Project References

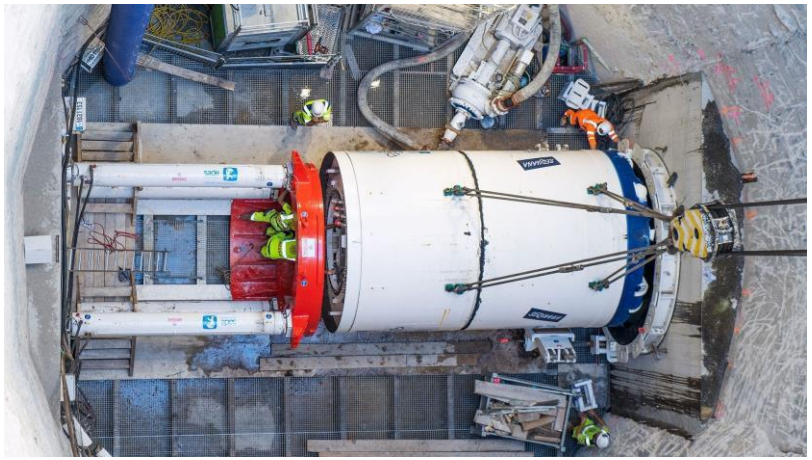
ATACAMA DESLALINATION PLANT CHILE

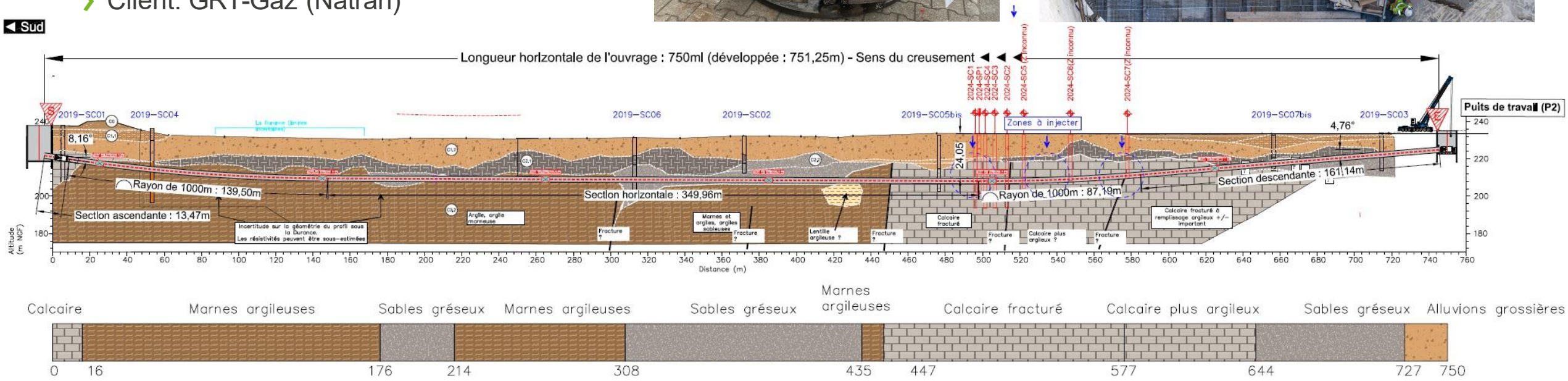
- M-1740M, AVN1800TB, OD2210
- Location: Caldera, Chile
- Drive Lengths: 325m + 265m
- Geology: **Hard Rock up to 250 Mpa**
- Water pressure: 2,5 bar
- Contractor: Eurohinca / Terratest
- Client: Econssa

Pipe Jacking | Microtunnelling Technology | Project References

RIVER CROSSING LA DURANCE PROTECTION TUNNEL PIPELINE

- M-3088M, AVN1800TB, OD2225
- Tunnel length: 750m
- Geology: Limestone, Marl, Sandstone, Sand, Alluvions
- Contractor: Sade
- Client: GRT-Gaz (Natran)





Pipe Jacking | Microtunnelling Technology | Project References

SEAWATER INTAKE FOR FISHFARM PESCANOVA PORTUGAL

- M-1216M, AVND2400 with Ext. Kit OD3800
- M-0518M, AVND2000 with Ext. Kit OD3040
- Location: Praia de Mira
- Drive lengths: 2 x 1,500m Water Intake
- Drive lengths: 2 x 1,350m Water Outlet
- Geology: Silty Sand
- Contractor: K-Boringen / ICOP

Pipe Jacking | Microtunnelling Technology | Project References

INCLINED PIPE JACKING UPHILL SEWAGE TUNNEL BAD LIEBENZELL GERMANY

- M-576M, AVN1200TB, OD1505
- Tunnel length: 126m
- **Slope: up to 52%**
- Geology: Cohesive ground, Boulders, Claystone, Sandstone, Quartzite
- Contractor: Rohrvortrieb Diez GmbH

Pipe Jacking | Rainwater Collector | France

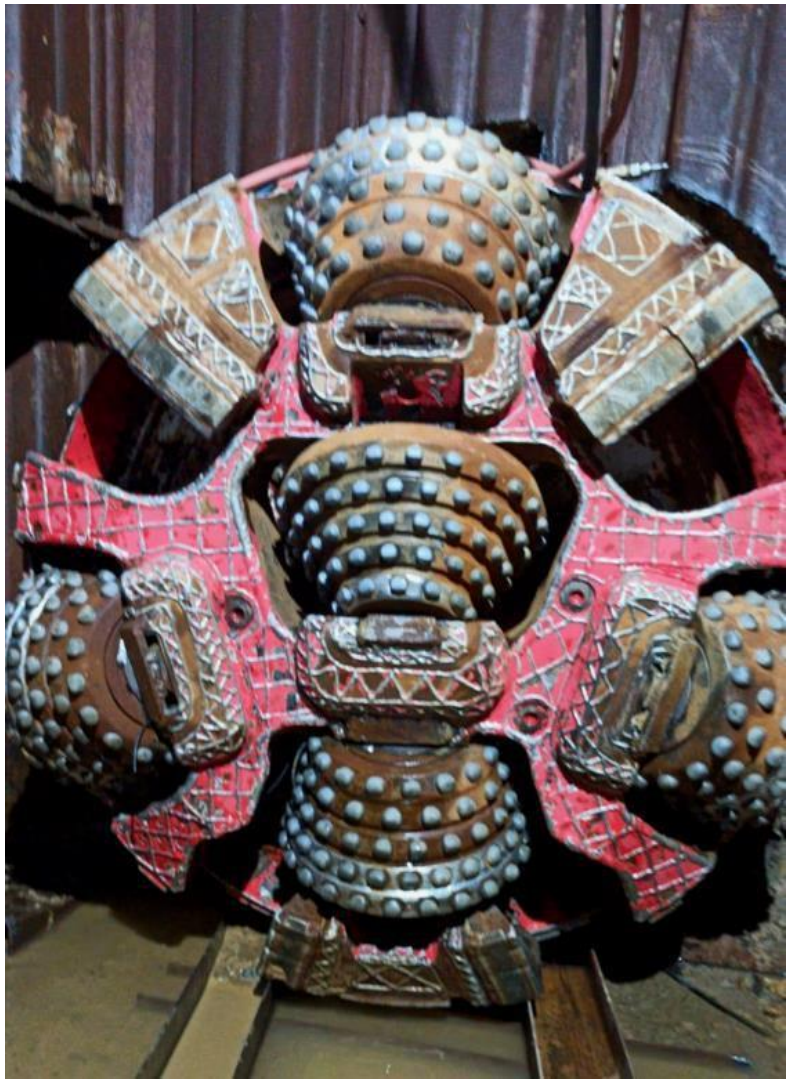
LIVRY-GARGAN BASSIN DU ROUAILLER

- M-1909M, AVN2000, OD 2425 mm
- Location: Livry-Gargan, France
- Rainwater Collector
- Drive length: 620m
- **Curve Drive Radius: 110m**
- Ground Conditions: Clay
- Contractors: Bessac & Sade

Pipe Jacking | Hard Rock | Small Diameter | Hong Kong

CONNECTION FOR WATER SUPPLY TUNNEL

- M-2496, AVN800XC, OD 975 mm
- Location: Wan Chai, Hong Kong
- Tunnel length: 107m
- **Curve Radius: 153m**
- Ground Conditions: Granite
- UCS Value: up to **200MPa**
- Contractors: VTC



Pipe Jacking | Sea Outfall | Desalination | Morocco

DAKHLA SEAWATER DESALINATION PLANT

- M-0498M, AVND2000, OD 2500 mm
- Location: Dakhla, Morocco
- Intake and Outlet tunnels: 550 + 685 m
- Ground conditions: sands, clay
- Project status: completed in 2025
- Contractor: Eurohinca | Client: Fisia Italimimpianti

Pipe Jacking | Sea Outfall | Desalination | Morocco

CHTOUKA DESALINATION PLANT, MOROCCO

- M-2449M, M-498M, 2x AVND2000, OD3000
- Location: Chtouka, Morocco
- 2x water intake tunnels: 1.117m + 1.118 m
- 1x brine outlet: 629 m
- Geology: sand, gravel, rock
- Contractor: Eurohinca
- Client: EAU DESSALÉE D'AGADIR S.A.
- MTBM recovery in 20 m water depth
- **Best daily performance: 50m**
- Drinking water (150,000 m3/d)
- Irrigation (125,000 m3/d) for an area of 13,600 ha

Pipe Jacking | Sea Outfall | Water Treatment Plant | Morocco

RABAT-TEMARA SEA OUTFALL

- M-1251M, AVND 2200
- 800m-long sea outfall from treatment plant (OD 2.63m)
- Herrenknecht AVN2200AB
- Tunnelling in 2009
- Customer: CSM Bessac | Client: Redal

Pipe Jacking – Onshore & Sea Outfall | Water Treatment Plant | Morocco

SIDI BERNOUSSI SEWER CONSTRUCTION CASABLANCA

- AVN2200AB, OD2665, Sea Outfall
  - 1,057m Sea outfall from treatment plant
  - Contractor: CSM Bessac

- AVND2500, OD3000, On-Shore Tunnels
- 2,5 km on-shore sewage collector tunnels
  - Total Drive length: 2,500m
  - Max. Drive length: 940m
- Contractors: Denys & Capep

- Client: City of Casablanca/Lydec

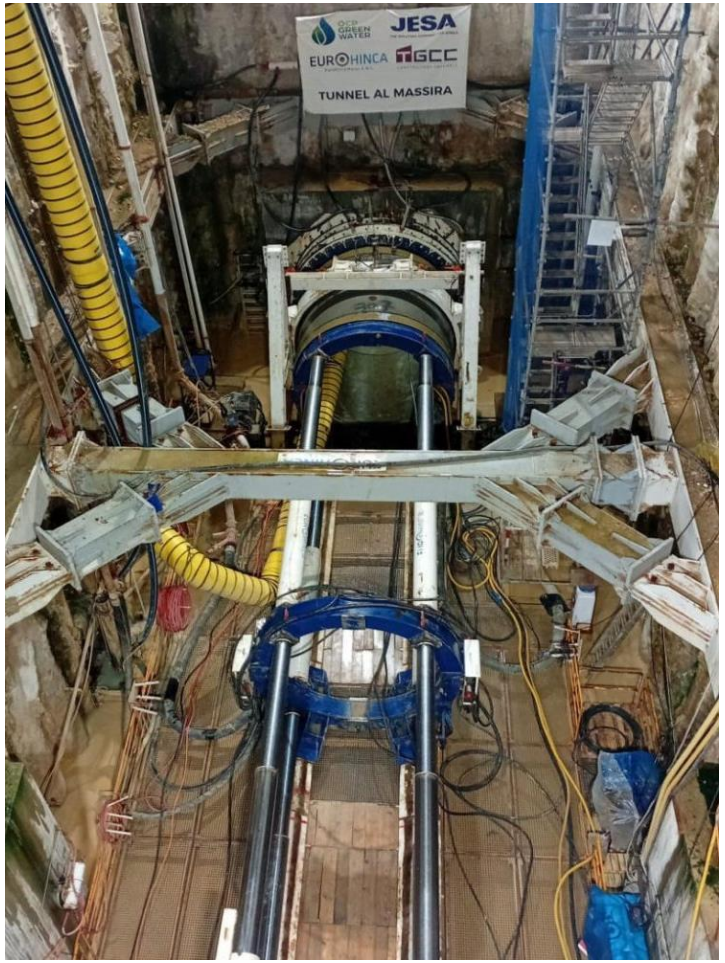
Ongoing

HERRENKNECHT

Pipe Jacking | Sea Outfall | Desalination | Morocco

OCP SAFI NEW SWI INTAKE

- M-498M, AVND2000, OD 3200 mm
- M-2883M, AVN2600, OD 3200 mm
- Location: Safi, Morocco
- Tunnel length: 858 m + 842 m
- Ground conditions: rock
- Project status: ongoing
- Contractor: Eurohinca
- Client: OCP Group / Green water



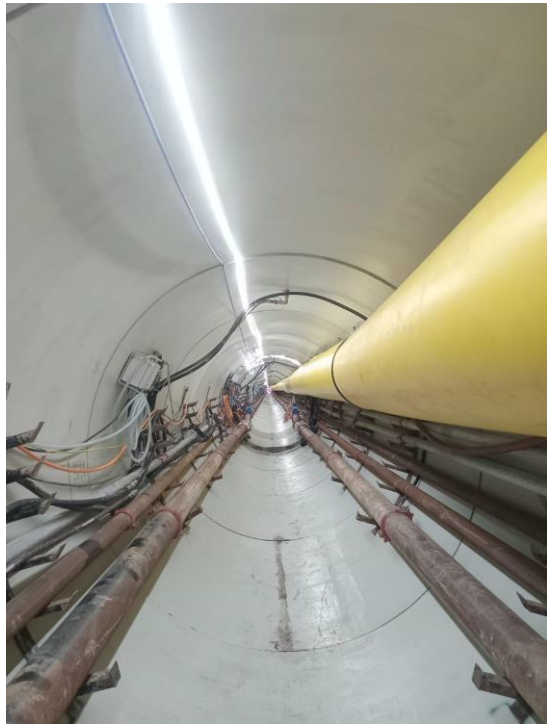
Ongoing

HERRENKNECHT

Pipe Jacking | Sea Outfall | Desalination | Morocco

DESALINATION PLANT CASABLANCA

- M-1469M, AVN2400AB | M-3001M, AVN2500AB
- Extension kit OD 3225 mm for Pipe OD 3200 mm
- Location: Casablanca, Morocco
- 2 seawater intakes: 1833 + 1850 m
- 1 brine outlet: 1706m
- Ground conditions: hard rock
- Project status: ongoing
- Contractor: Eurohinca
- Client: ONEE



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Tunnelling Technologies | Utility Tunnelling | Segment Lining | Sea Outfall

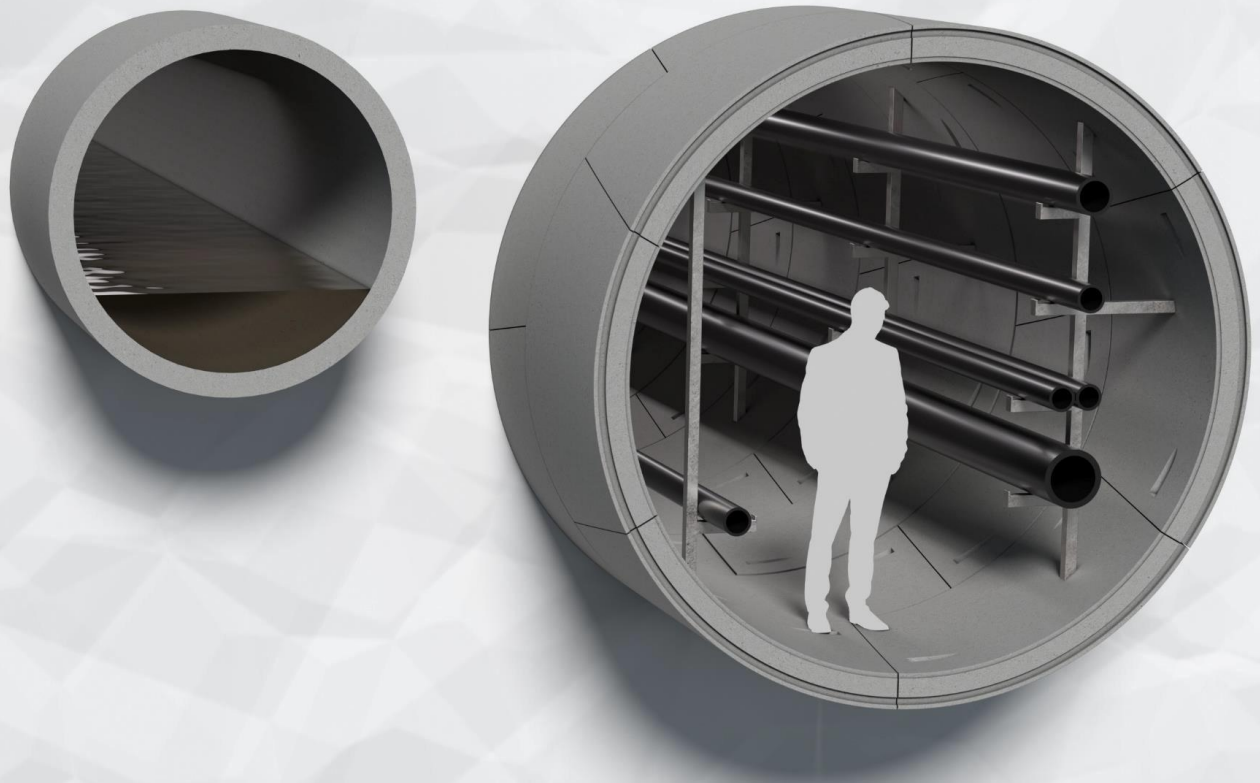
CASABLANCA SEWER

- 5.2km of tunnel to protect the Casblanca metropolis from flodding during heavy rain events

- Herrenknecht Multi-mode TBM
- Ø 6.350mm
- 1.6km in EPB mode + 3.6km in open mode (belt conveyor)
- Tunnelling from 2015 – 2017
- Customer: Makyol Insaat Sanayi Turzim ve Ticaret A.S.
- Client: Casa Aménagement

HERRENKNECHT AG

- Herrenknecht AG
- HDD – Horizontal Directional Drilling
- Pipe Jacking – Micro Tunnelling
-



UTILITY TUNNELLING

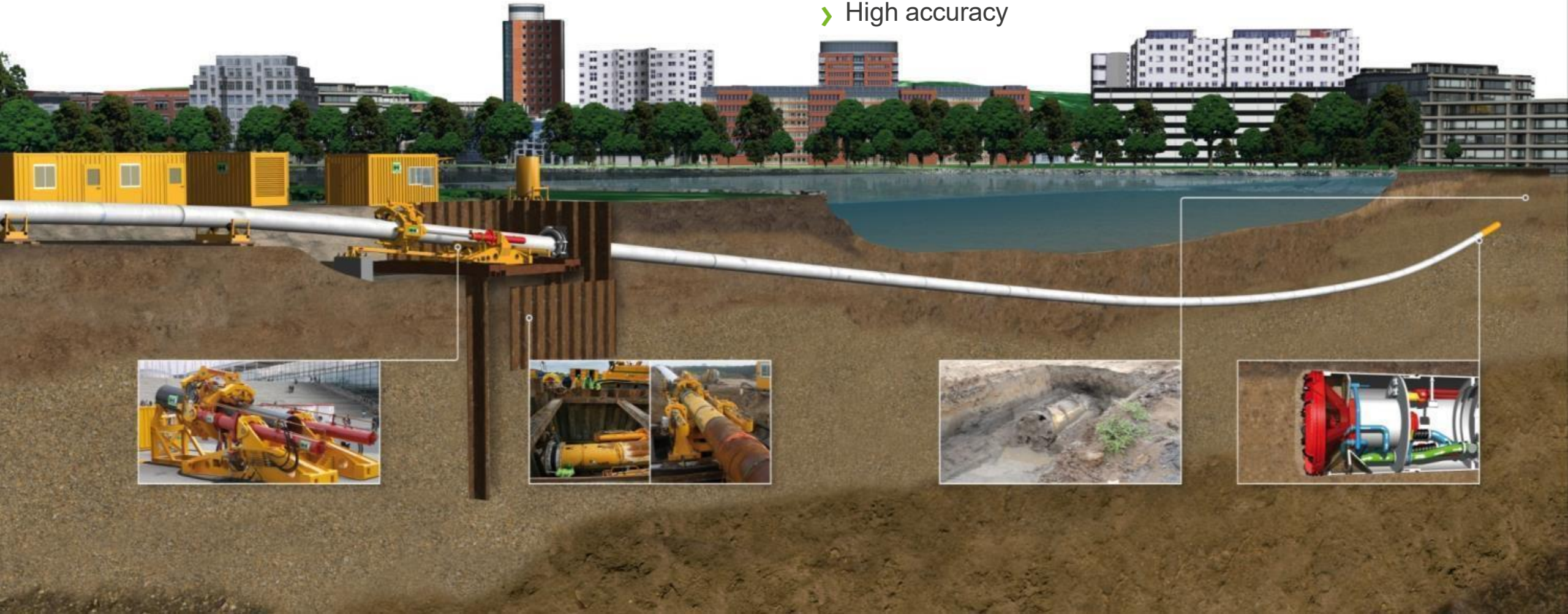
DIRECT PIPE SLURRY MICROTUNNELLING FOR SIMULTANEOUS PIPELINE INSTALLATION

Direct Pipe® | Microtunnelling technology

DIRECT PIPE® TECHNOLOGY

24“ up to 60“ steel pipeline installations

- One-pass installation
- min. frac out risk | borehole supported
- High accuracy



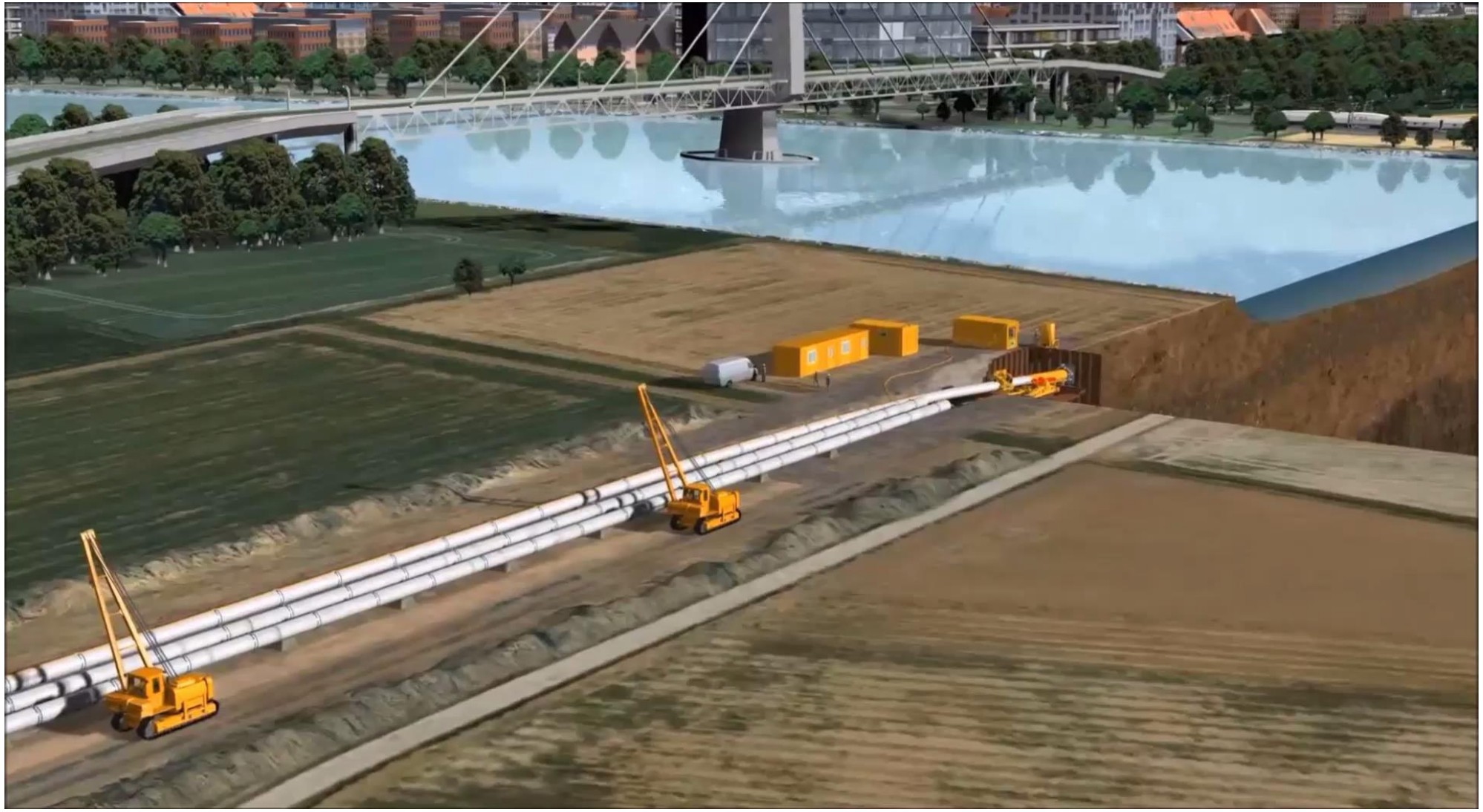
Direct Pipe® | Microtunnelling technology

DIRECT PIPE® TECHNOLOGY

- one pass installation
- min. frac out risk
- borehole permanently supported
- highly accurate
- less soil excavation
- shorter crossing distance

Direct Pipe® | Microtunnelling technology

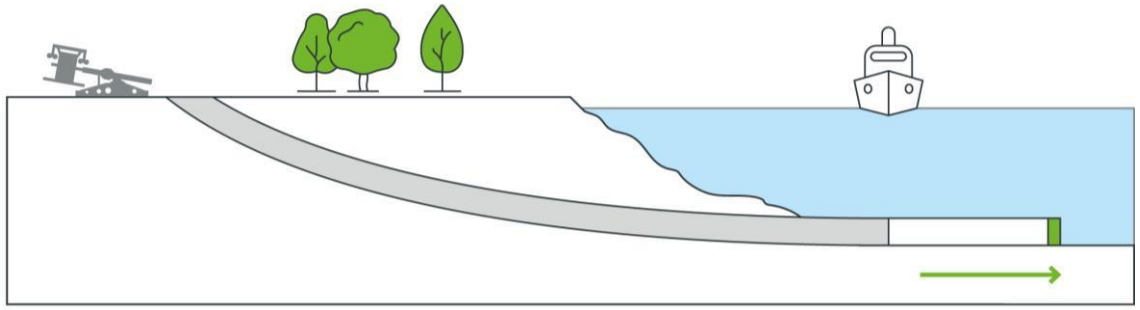
DIRECT PIPE® PRINCIPLE



Direct Pipe® | Microtunnelling technology

INSTALLATION OF HDPE PIPE

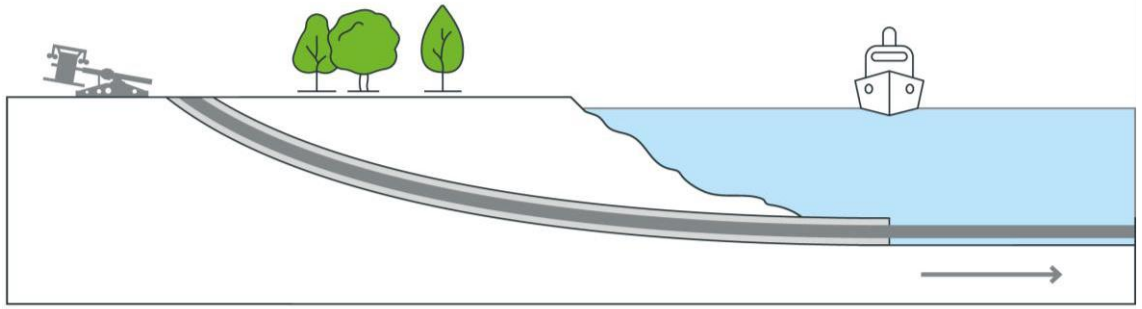
1.



Installation of steel pipe

Simultaneous excavation of borehole and installation of steel pipeline

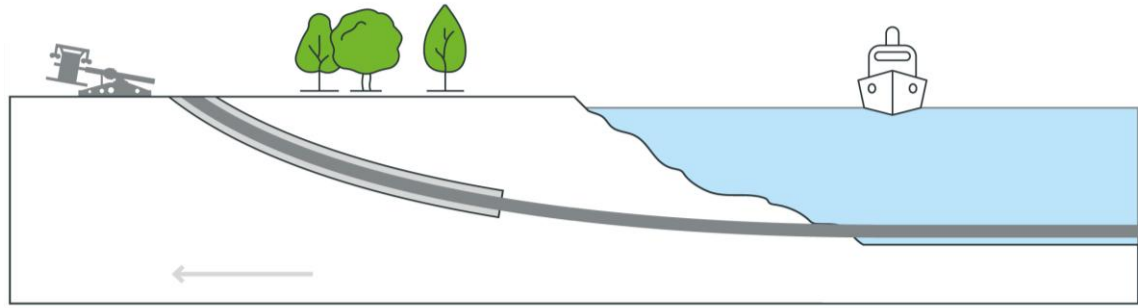
2.



Installation of HDPE pipe

Subsequent insertion of HDPE pipe into the steel pipe

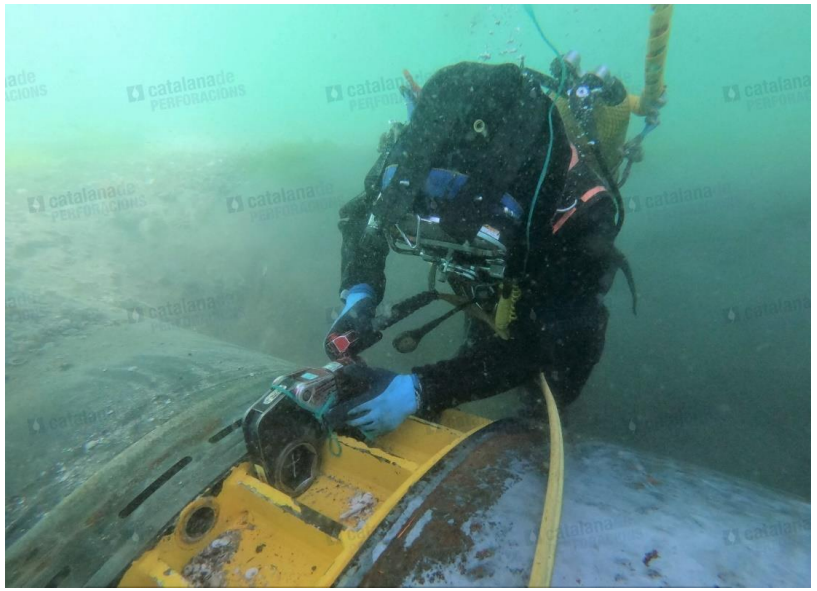
3.



Retraction of steel pipe with Pipe Thruster

Direct Pipe® | Microtunnelling technology

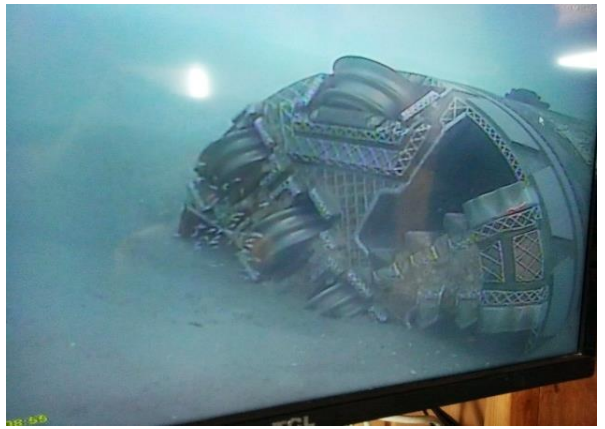
DIRECT PIPE OUTFALLS SUBSEA RECOVERY OF MTBM



Direct Pipe® | Microtunnelling technology

DIRECT PIPE OUTFALLS SUBSEA RECOVERY OF MTBM

Direct Pipe®: remote disconnection for marine outfall



Direct Pipe® | Microtunnelling technology | Shore approach

DIRECT PIPE OUTFALLS SUR DE TEXAS – TUXPAN PIPELINE

OUTFALLS FOR SUR DE TEXAS-TUXPAN PIPELINE

1 **Direct Pipe® Sea Outfall**
- Port Isabel, Brownsville, Texas, USA
- M-1491M, AVN1000DP (48") + HK750PT
- 1,495 m, 42" pipeline
- End position: December 02, 2017

2 **AVN Sea Outfall**
- Altamira, Mexico
- M-1275M, AVND2000, OD3200
- 2,246 m Pipe Jacking, tunneled casing
- End position: July 27, 2018

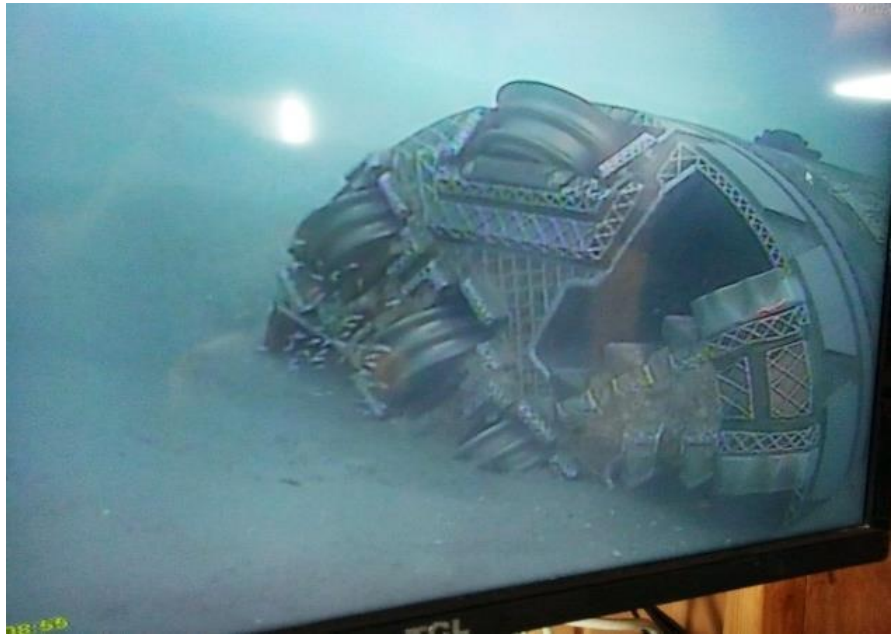
3 **Direct Pipe® Sea Outfall**
- Tamiahua (Tuxpan), Mexico
- M-2250M, AVN1200DP (56") + HK750PT
- 698 m, 56" casing
- End position: July 18, 2018

Direct Pipe® | Microtunnelling technology | Shore approach | 56“ Casing

SUR DE TEXAS – TUXPAN PIPELINE

1 Direct Pipe® Sea Outfall

- Port Isabel, Brownsville, Texas, USA
- M-1491M, AVN1000DP (48") + HK750PT
- 1,495 m, 42" pipeline
- End position: December 02, 2017



Direct Pipe® | Microtunnelling technology | Shore approach | 56“ Casing

SUR DE TEXAS – TUXPAN PIPELINE

3 Direct Pipe® Sea Outfall

- Tamiahua (Tuxpan), Mexico
- M-2250M, AVN1200DP (56") + HK750PT
- 698 m, 56" casing
- End position: July 18, 2018

- Use of Pipeline: 42“ Gas Pipeline
- Drilling length: 698 m
- Client: TransCanada
- Contractor: HDI Latam (HDI & GDI)
- Best Daily Performance: 82m
- Push Forces: 190 – 440 tons

Direct Pipe® | Microtunnelling technology | Shore approach | 48“ Casing

WORLD RECORD LENGTH, NEW ZEALAND

- M-2170M, AVN1000 + HK750PT Pipe Thruster
- 48“ Casing Snells Algies Wastewater Pipe and Outfall Replacement (Watercare, Auckland)
- Geology: Claystone
- **Drilling length: 2,021 m**
- Shore approach with offshore recovery
- Performance:
  - Best daily performance: 42.5 m
  - Best weekly performance: 211 m
- Contractor: Mc Connell Dowell
- Client: Watercare, Auckland

Direct Pipe® | Microtunnelling technology | Shore approach | 48“ Casing

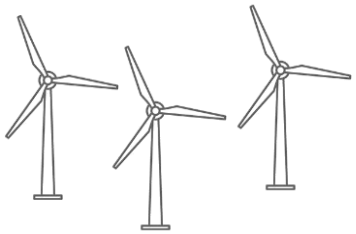
DIRECT PIPE OUTFALLS CABLE LANDFALL SCOTLAND, UK

- M-2130M, AVN 1000, 48“, H-336, HK750PT Pipe Thruster
- 48” Casing for 33kV Cable, 2x 440 m
- Remote recovery module for offshore recovery of microtunnelling machine
- Contractor: Stockton Drilling | Client: Scottish & Southern Energy (SSE)

Direct Pipe® | Microtunnelling technology | Shore approach | 42“ Casing

CVOW - CABLE LANDFALLS OFFSHORE WIND VIRGINIA

- M-2761M | M-2762M | M-2075M, AVNS800A, 42“ | HK750PT
- Location: Norfolk, VA, USA
- Installation length: 9 drives of ~ 550 meters length each
- Slip-lining of 36" HDPE carrier followed by removal of 42" casing
- Ground conditions: sand, clay
- Project status: completed in April 2024
- Contractor: Michels | Client: Dominion Energy



HERRENKNECHT AG

Thank you for your attention !