MinEx CRC

Australian Government
Department of Industry, Science and Resources

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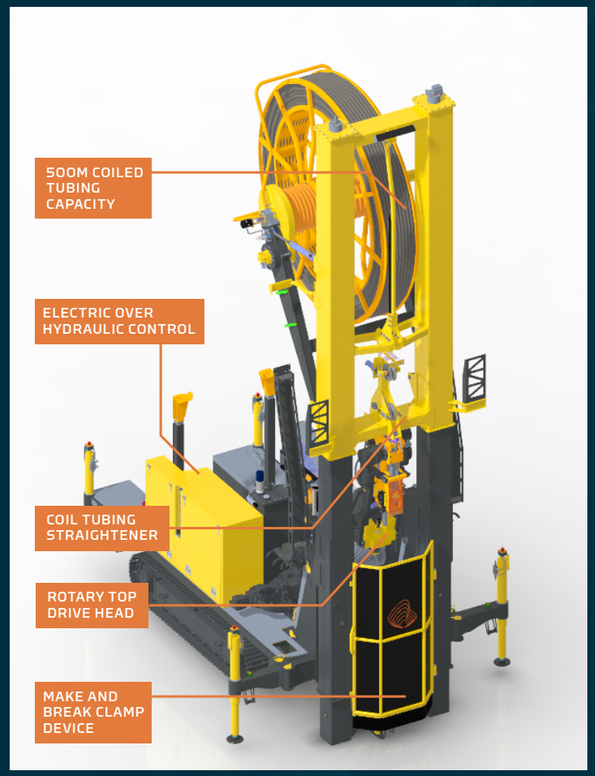
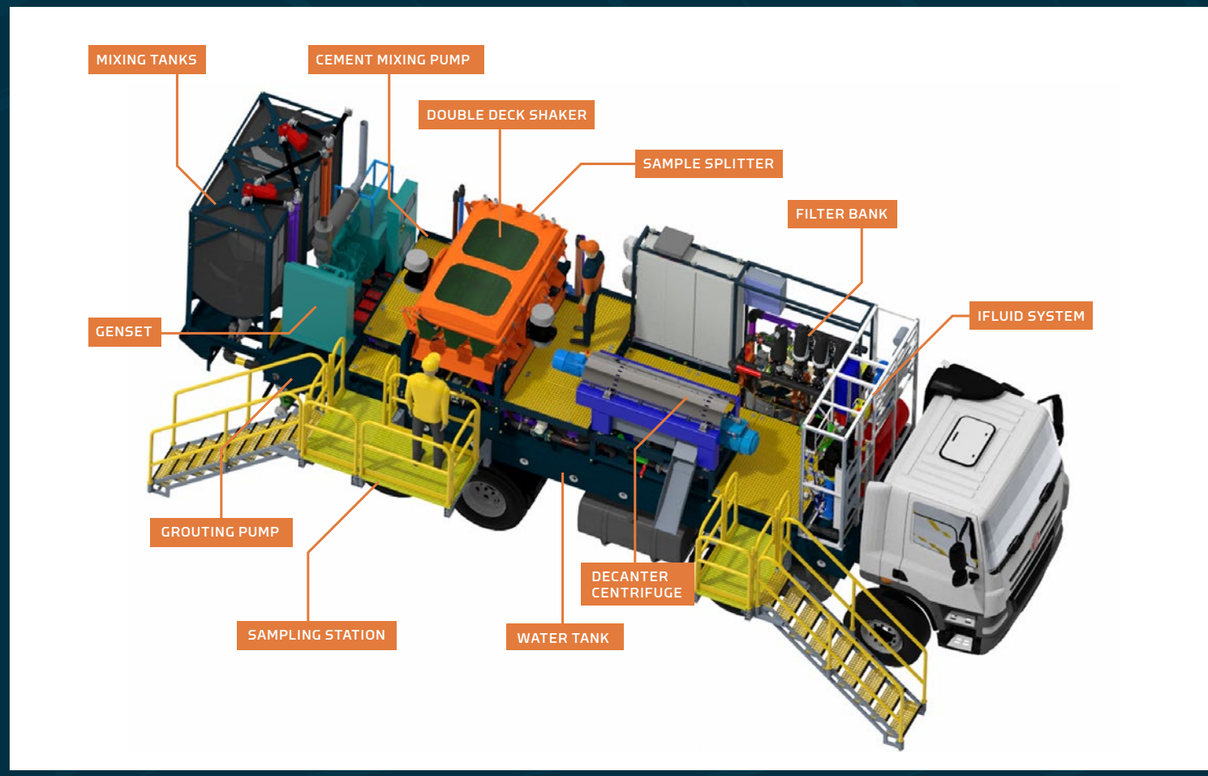
ROXPLORER® CT DRILLING SYSTEM

CHEAPER, FASTER, SAFER, CLEANER MINING TECHNOLOGY

COILED TUBING DRILLING AND SAMPLING FOR GREENFIELDS MINERAL EXPLORATION

The RoXplorer® is a unique coiled tubing (CT) drilling platform that delivers the safety, environmental and productivity benefits of CT drilling in a light weight, agile and robust platform suitable for mineral exploration drilling. RoXplorer® is designed to drill unconsolidated cover and hard rock formations delivering high-quality samples of drill cuttings and core to depths of 500m.





Innovative

The key feature of RoXplorer® CT drill rig is the patented mast design and over-the-hole positioning of the coil reel with multiple benefits including:

- Increased coil life
- Seamless transition between CT and conventional top-drive drilling
- Rapid loading and unloading of tooling
- Drill string incorporated on the rig for ease of set up, pack down and transport

Fluid management for the RoXplorer® CT drilling platform is provided by a purpose-built Hydraulic Processing System (HPS), coupled with a universal polymer fluid additive, LiqiCTrol. The HPS and LiqiCTrol deliver benefits over-and-above conventional mud systems including:

- Reduced fluid management costs
- Real-time and remote monitoring
- Automated dosing
- Multifactor performance optimisation (cuttings transport, sample quality, fluid cleaning, bore hole integrity)
- Agile response to changed or adverse conditions (e.g. to mitigate fluid loss events)
- Reduced wear on downhole tools

Functional simplicity

The RoXplorer® CT platform has been designed to deliver priority drilling functions (safety, efficiency, productivity, high quality sampling) with minimal infrastructure and streamlined operating processes.

The RoXplorer® drill rig features a compact and reliable design with a diesel deck engine, hydraulic system and drill coil incorporated on the track-mounted platform weighing 16 tonnes. (use total weight including coil).

The electric-over-hydraulic control system and drillers console with ergonomic graphic user interface delivers constant feedback to the driller enabling informed decision making. The operator console can be positioned to give maximum comfort to the driller in changeable environmental conditions.

The HPS incorporates all fluid management functions (cleaning, additive preparation and dosing, monitoring) and cuttings sampling onto a single, truck-mounted platform. The RoXplorer® CT system is completed by attaching hoses between the drill collar, HPS and drill coil to close the fluid circuit.

Sensors on the drill rig and HPS provide continuous measurement of drilling and fluid parameters and allow for remote monitoring and automated adjustment of the drilling and fluid parameters according to drilling conditions.

Safe

While drilling in CT mode there are no rod connections and no spinning drill rods on surface, effectively removing two of the most significant safety hazards on the drill site.

Energy and water efficient

The RoXplorer® CT drilling platform has low energy and water consumption compared to top-drive rotary and pneumatic percussion drilling systems.

No energy is used spinning drill rods and less energy is required to drive downhole motors and hammers using non-compressible fluids compared to pneumatic drilling systems.

All drilling fluids are recirculated through the HPS to the drilling operation removing the need for fluid sumps on the drill site and reducing the risk of surface spills.

Continuous fluid monitoring and dosing with LiqiCTrol mitigates fluid loses to the formation and helps maintain hole integrity.

Agile

The RoXplorer® CT drilling platform and all support vehicles can be accommodated within an area of less than 20 x 20 meters.

Mobilisation to remote locations can be achieved with three vehicles (excluding a water truck) with set-up to drill within three hours of arrival at the drill site.

The RoXplorer® offers wireless tramming and set up functions for added safety and mobility on the drill site. Tramming (at 6km/h) provides an alternative transport mechanism over short distances or in areas with poor road access.

High quality sampling

The dynamics of fluid and cuttings transport within the drill hole and through the RoXplorer® and HPS are predictable and can be managed to deliver high quality cuttings samples that are representative of the interval drilled.

The HPS includes a cuttings sampling system which can be tuned by the user to a chosen sample volume and particle size threshold (with minimum mesh size of 150µ).

Cuttings sample quality and depth fidelity have been benchmarked by twinning rotary mud/ diamond and RC drill holes in multiple drilling scenarios and ground conditions.

Cuttings samples are well-suited to in-field analysis (e.g. pXRF, hyperspectral scanning) for real time generation of geological data.

The ability to collect drill core delivers a key benefit for mineral exploration end-users who place high value on rock texture and structural information collected from the bore hole.

Productive

Removal of rod connections from the drilling operation increases the effective drilling time (bit-on-bottom) delivering consistent and predictable drilling productivity.

Rapid tripping (~20m per minute) allows bit changes and alterations to the bottom hole assembly (BHA) to be made safely and with little impact on productivity.

Fit-for-purpose of bottom hole tools consistently deliver penetration rates of >10m per hour when drilling ahead in CT mode with blade, drag or percussion bits.

Versatile

RoXplorer® offers multiple modes of CT drilling to suit ground conditions and drilling purpose. Downhole motors coupled with blade or drag bits deliver best performance in unconsolidated cover materials. Hammers and percussion bits penetrate rapidly through hard rock. Intervals of 43.9mm diameter core (equivalent to NQ) up to 3m in length can be taken by drilling with the Selective Coring Interval BHA.

Industry Participants:

AngloAmerican BHP Epiroc SOUTH32 wassara

Research Participants:

Curtin University CSIRO mriwa University of South Australia

TECHNICAL SPECIFICATIONS

RoXplorer®

Dimensions	Metric	Imperial
Length	8.3 m	27.2 ft
Width	2.5 m	8.2 ft
Height, Mast Down	3.3 m	10.8 ft
Weight	16 tons	26k lbs

Hydraulic Processing System (HPS)

Dimensions	Metric	Imperial
Length	11.3 m	37.1 ft
Width	2.5 m	8.2 ft
Height	4.3 m	14.1 ft
Weight, Empty	23 tons	46k lbs

RoXplorer®	Description	Metric	Imperial
Injector	Thrust	3500 kgf	7716 lbf
	Pullback	7000 kgf	15430 lbs
	Max ROP	1500 mm/min	5 ft/min
	Max Tripping Speed	20 m/min	65 ft/min
Coil Tubing	Reel Capacity	500 m	1640 ft
	Tubing Size	44.45 mm OD x 4.8 mm WT	1.75" OD x 0.19" WT
	Estimated Life	Up to 935 cycles	Up to 935 cycles
Mast	Telescopic Stroke	3.35 m	11 ft
	Max Tooling Length	4.2m	13.8 ft
Water Pump	Max Flow	240 L/min	63.4 gpm
	Max Pressure	280 Bar	4060 psi
Crawler	Max Speed	5 km/hr	3 mph
	Max Approach	15°	15°

Hydraulic Processing System (HPS)	Description	Metric	Imperial
Tanks	Fresh Water (in frame)	8000 L	2113 gal
	Ctrol Storage	4000 L	1056 gal
	Shaker Tank	300 L	79 gal
	Centrate Tank	50 L	13 gal
Gen Set		150kVA	150 kVA
Shaker	Double Check	150µ screen	0.002" screen
Centrifuge	CDNX200		
Grout Pump		12.24 l/hr up to 16 bar	0.05 gpm up to 232 psi

RoXplorer® (CT) Information – Casing Installation

Max Rotary drilling bit diameter	121.0 mm	4.75”
Max PQ casing installation depth	60 m	200 ft
Max HQ casing installation depth	250 m	800 ft

RoXplorer® (CT) Information – Coil tube drilling

Max drilling bit diameter	95 mm	3.74"
Min drilling bit diameter	60 mm	2.36"

RoXplorer® (CT) Information –Selective coring

Hole Diameter	60 mm		2.36"
Core Diameter	43.9 mm		1.73"
Core Length	1500mm or	3000mm	59" or 118"

CONTACT

Andrew Bailey
CEO MinEx CRC

M +61 409 617 286
E andrew.bailey@minexcrc.com.au

MINEX.COM.AU

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