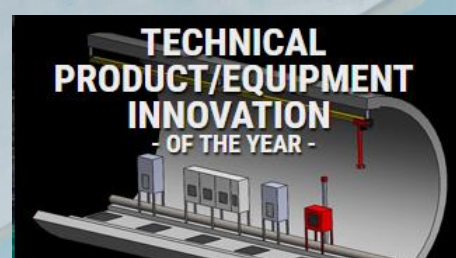




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DD422iE – Automatic Drilling Jumbo

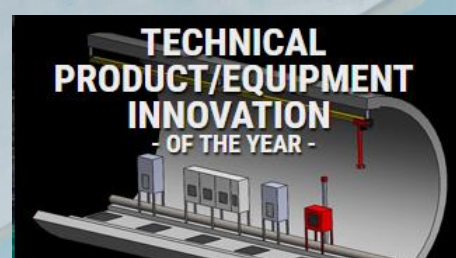
WITH ELECTRIC DRIVELINE SYSTEM FOR UNDERGROUND TUNNELING AND MINE DEVELOPMENT



Johannes Väливаara
Product Manager, UG Drills
Sandvik Mining and Rock Technology



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Stakeholders

Jaakko Kilponen

Manager of Mining
Boliden Kylylahti Oy

 **BOLIDEN**

DD422iE – AUTOMATIC DRILLING JUMBO

SUMMARY

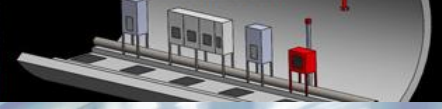
- World's first highly automated UG mining / tunneling jumbo with electric driveline system
- Better Health & Safety
- Increased Drilling productivity
- Reduced Operating costs
- Energy efficiency
- Automation & Digitalization





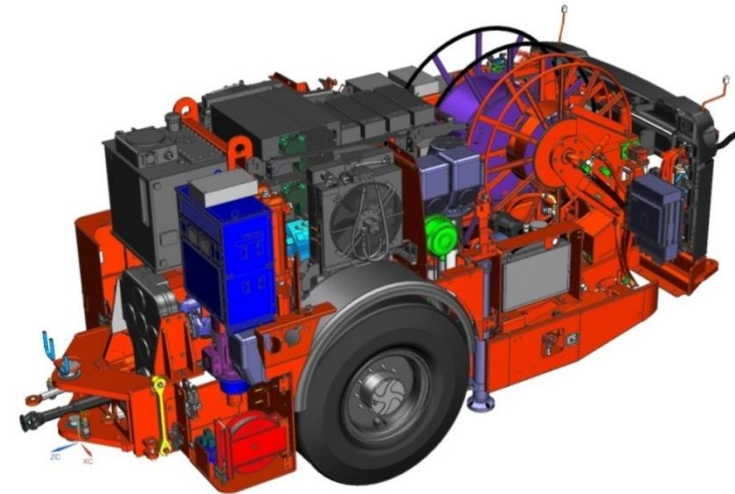
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DD422iE – AUTOMATIC DRILLING JUMBO ELECTRIC DRIVELINE SYSTEM

- Onboard battery pack to store energy for tramming
- Electric motor mechanically connected onto axles via dropbox (high torque, high efficiency)
- Tramming speed control via inverter (high precision)
- During drilling the electric motor is connected onto hydraulic pumps via same drop box
- Multivoltage compliancy (380-1000V, 50/60Hz)



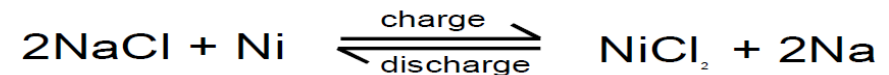


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DD422iE – AUTOMATIC DRILLING JUMBO BATTERY PACKAGE

- Sodium Nickel Chloride (SoNick) technology – regarded as safe battery chemistry for underground operations
- One battery block contains 252 cells connected together and contained in a vacuum sucked steel box. Weights 210kg.
- Total Energy: 3 x (24,7kWh, 38Ah)
- Operating temperature over 250degC
 - Requires preheating (up to 24hrs)
 - Thermal loss <130W
 - Keeps operation temp. with own energy 7 days
- Air cooled with fan (150degC air out)





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DD422iE – AUTOMATIC DRILLING JUMBO BENEFITS

Better Health & Safety

- Zero Emissions (DPM / NOx / CO2)
- Reduced heat generation
- Less noise
- Reduced risk of fire (no fuels exposed with hot surfaces)
- Utilisation of DD422i / DT922i cabin ergonomics:
 - Increased visibility
 - Reduced noise and dust
 - Maximised operator ergonomics





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DD422iE – AUTOMATIC DRILLING JUMBO BENEFITS

Increased Drilling productivity

- Active power compensation system to draw reserve power from batteries during peak loads
 - Battery charging done while power intake is low (eg. boom movements) during the drilling cycles
 - Possibility to prelimit power intake from mine electrics
 - Sandvik patented technology!
-
- Stabilised power load for mine electrics
 - Up to 20% increase in drilling power
 - No waiting times to charge up the batteries



DD422iE – AUTOMATIC DRILLING JUMBO BENEFITS

Reduced Operating costs & Energy efficiency

Direct savings:

- Reduction in operating costs (electric driveline vs. diesel)
- Regenerative braking system
- Concept easily adaptable to various UG Construction / Mine operations

Indirect saving potential:

- Reduced costs of diesel fuel logistics
- Reduced costs in ventilation (Greenfield projects)





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DD422iE – AUTOMATIC DRILLING JUMBO BENEFITS

Automation & Digitalization

Wide range of automatic drilling functions

STANDARD

- Torque optimised drilling control system
- Electric joystick controls & GUI
- Advance carrier functions
- No instrumentation

SILVER

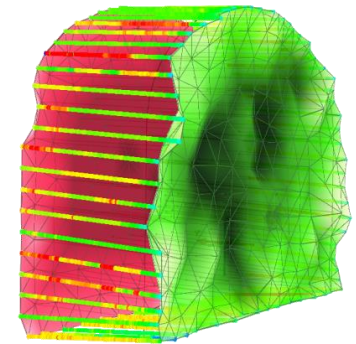
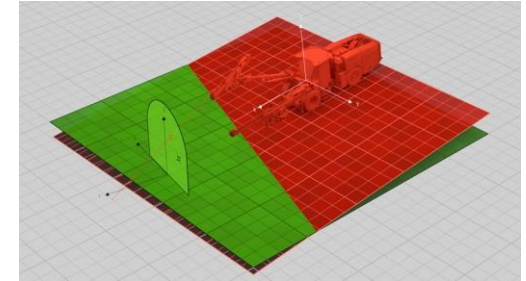
- Basic angle & drilling depth measurement
 - Reference hole & penetration rate information
 - Counters for drilling consumables

GOLD

- Instrumented drilling booms
 - Design & analyses tools for drill patterns
 - Drill bit location & angle indication vs given plans

PLATINUM

- Upgraded boom kinematic model
 - Automatic boom control
 - Semiautomatic boom control
 - Hole end-correction





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DD422iE – AUTOMATIC DRILLING JUMBO CASE STUDIES

BASIC DETAILS:

- Located in eastern part of Finland, near the city of Outokumpu
- Production rate in 2016 was 9,000 tonnes of copper, 9,000 ounces of gold and 1,600 tonnes of zinc
- Long hole open stoping with voids filled by a mixture of waste rock and cemented waste rock
- The lowest level in decline appr. 800m

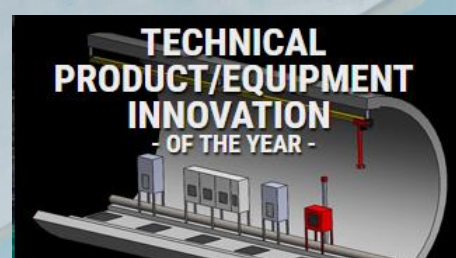
VIDEO: [Link](#) OR https://www.youtube.com/watch?v=l_WB5kqHgXQ

BOLIDEN





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DD422iE – Automatic Drilling Jumbo

WITH ELECTRIC DRIVELINE SYSTEM FOR UNDERGROUND TUNNELING AND MINE DEVELOPMENT



THANK YOU!