TRANSITIONING TO ZERO-EMISSION EQUIPMENT

Brian Huff
Chief Technology Officer
Current Status of the Zero Emission Mine

- Very Active in Northern Ontario
- New generation lithium battery equipment in service since 2011
- All major mining companies in Canada are planning a full conversion to zero emission equipment underground
KL Gold - Macassa BEV Fleet - Since 2011

- 34 machines, 38 chargers, 80 batteries
- 187,000 operating hours
- 80% of production from BEV
- 85% availability

- Artisan 2.7 tonne LHD conversion
- Artisan A4 - 4 tonne LHD
- Artisan Z40 - 40 tonne HT
- Epiroc ST7 - 7 tonne LHD
- Epiroc ST2G - 3.6 tonne LHD
- Epiroc MT2010 - 20 tonne HT
- RDH 3 yd - 5 tonne LHD

ALL have Artisan’s Powertrain
Why use battery powered equipment?

- **Ventilation Reduction**
  - No emissions (H2O/DPM/NOx/etc.)
  - 88% reduction in heat
  - Less dust (no tailpipe)

- **Cooling/Heating reduction**
  - Less airflow = less cooling or heating

- **Time to Production**
  - Expand with no new shafts

- **Productivity**
  - Higher power and smaller

- **Health Concerns**
  - DPM/Dust/Noise/Vibration

- **Possible New Regulations**
Managing the Transition

Infrastructure
- Electrical Requirements
- Underground Shop Requirements

Charging Logistics
- Fast Charge or Swap

Personnel
- Operators
- Technicians
- Supply Chain
- Mine Management
- New service personnel type - Battery equipment technician

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Infrastructure Transformation

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Infrastructure Transformation

Facilities - Swapping Bay

- Purpose built cut out

- Swapping Bay requires:
  - Higher back height
  - Level floor
  - Overhead crane
  - Room for machine
  - Room for 2-3 packs
  - Room for charger
Artisan Products

Z40

- Battery-Electric
- 40 tonne Truck

ArtisanVehicles.com/Z40
Artisan Products

Battery-Electric
10 tonne LHD

ArtisanVehicles.com/A10
Artisan announces that it is to be acquired by Sandvik
Artisan Products

Z40

- Battery-Electric
- 40 tonne Truck

ArtisanVehicles.com/Z40

Battery Swap Video ►
ENTER CHARGE BAY
DISCONNECT BATTERY
02:00

DROP USED BATTERY
01:30

DRIVE TO NEW BATTERY
01:30

PICK UP NEW BATTERY
01:00

CONNECT BATTERY
02:35

LEAVE CHARGE BAY

TOTAL TIME
00:00