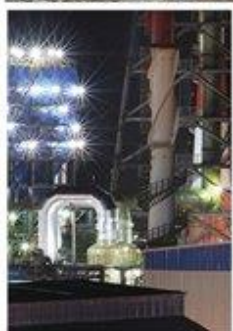




Modern Technology in mining

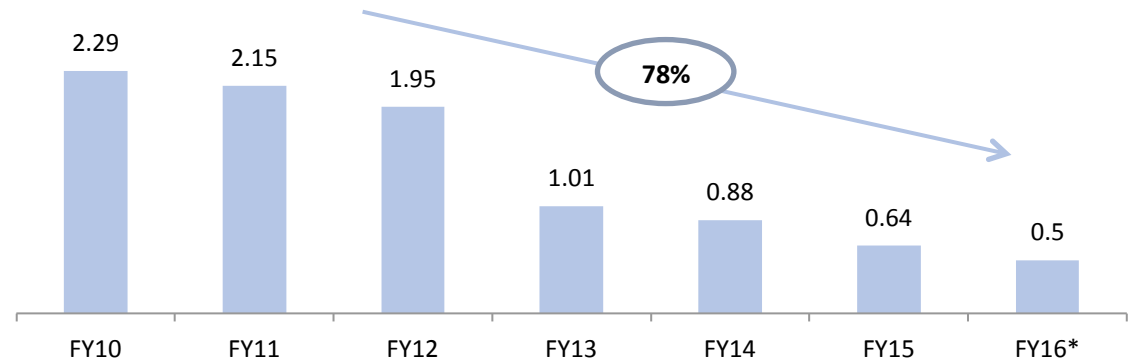


**Hindustan Zinc Limited
Integrated mining and Metal Company**

Zero harm to people, host communities and environment

- Safety cultural transformation journey from reactive to interdependent;
- Promoting behaviour based safety

LTIFR
(per million man-hours worked)



*As per new ICMM Guidelines

Sustainability Initiatives

- Zero water discharge
- Sewage treatment plant as sustainable water source
- Green energy of 309MW



Portfolio of Tier - 1 Assets

Rampura Agucha Mine

Reserve : 51.1mt
Resource : 52.7mt
Reserve Grade : Zn 14.0%, Pb 1.8%
Current Ore Capacity : 6.15 mtpa

Kayad Mine

Reserve : 3.9mt
Resource : 2.0mt
Reserve Grade : Zn 13.4%, Pb 1.8%
Current Ore Capacity : 1.00 mtpa

Sindesar Khurd Mine

Reserve : 33.2mt
Resource : 76.3mt
Reserve Grade : Zn 4.7%, Pb 3.2%
Current Ore Capacity : 4.00 mtpa

Rajpura Dariba Mine

Reserve : 9.3mt
Resource : 49.4mt
Reserve Grade : Zn 6.3%, Pb 1.6%
Current Ore Capacity : 0.90 mtpa

Zawar Mining Complex

Reserve : 9.5mt
Resource : 82.3mt
Reserve Grade : Zn 3.4%, Pb 1.7%
Current Ore Capacity : 1.80 mtpa
CPP : 80MW

Chanderiya Smelting Complex

Pyrometallurgical Lead Zinc Smelter:

105,000 tpa Zinc and 85,000 tpa Lead

Hydrometallurgical Zinc Smelter: 420,000 tpa Zinc

Captive Power Plant: 234MW

Dariba Smelting Complex

Hydrometallurgical Zinc Smelter:
210,000 tpa Zinc

Lead Smelter: 100,000 tpa Lead

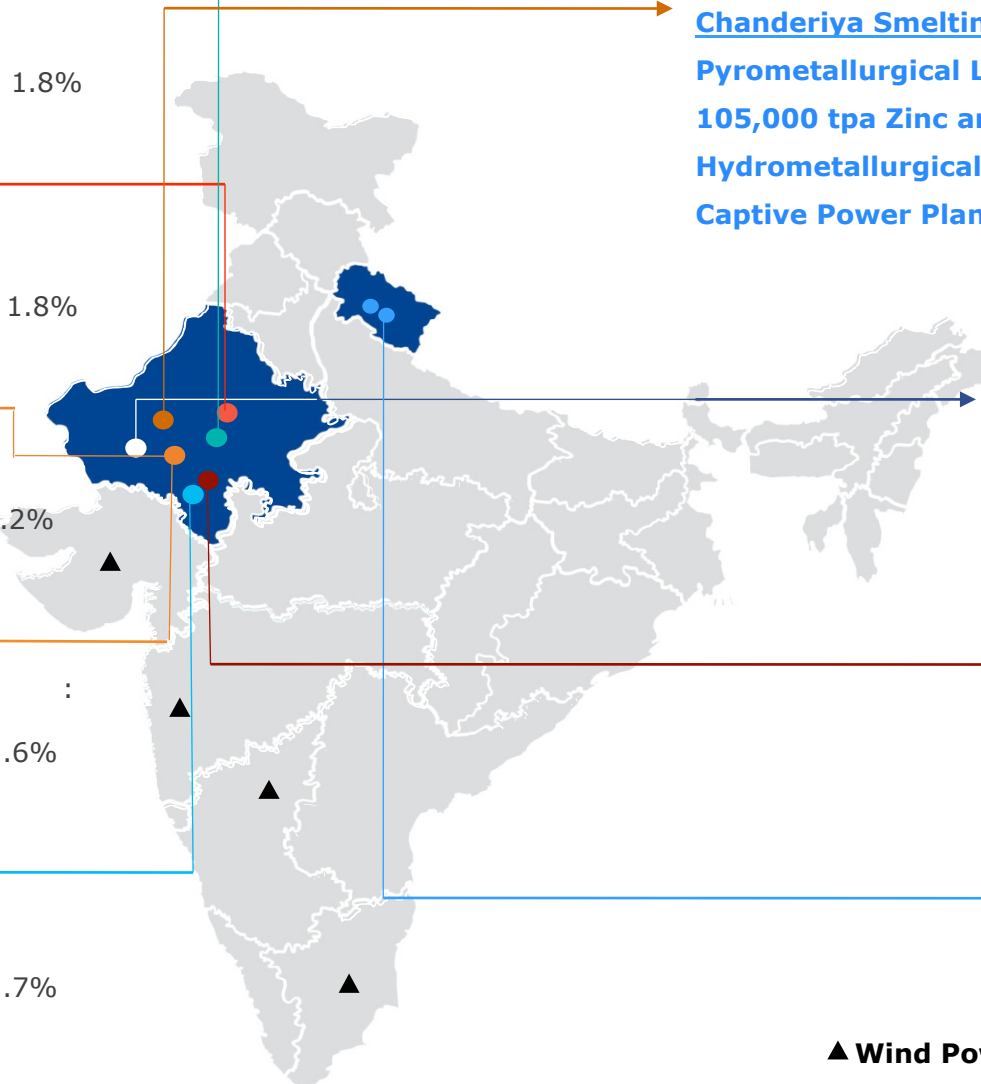
Captive Power Plant: 160MW

Zinc Smelter Debari

Hydrometallurgical Zinc Smelter: 88,000 tpa Zinc

Pantnagar & Haridwar

Processing & Refining of Zinc, Lead & Silver



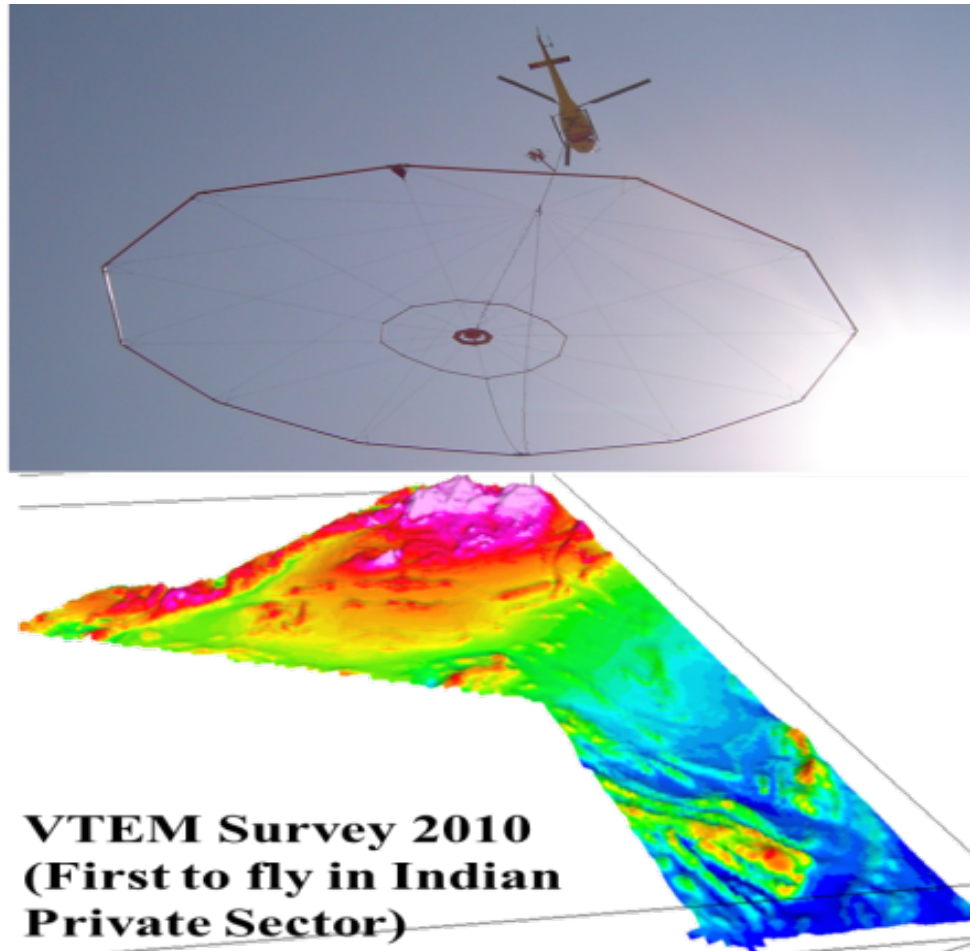
▲ **Wind Power** Generation Capacity of 274 MW

Pioneers in Mineral Exploration in India



VTEM HELIBORNE SURVEY

High Sensitivity Magnetic & Time Domain EM survey
over 1500 sqkm area (~8700 line km) in Sawar-Jobner RP

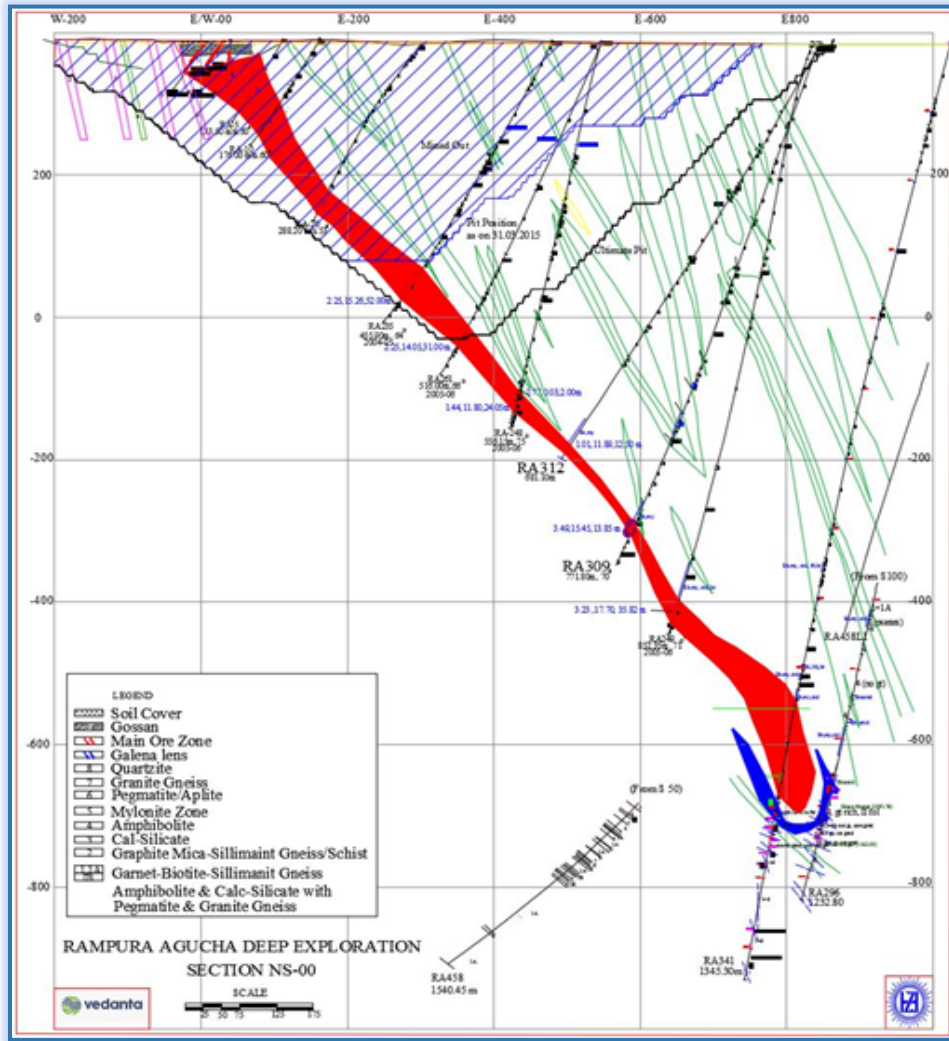


**VTEM Survey 2010
(First to fly in Indian
Private Sector)**

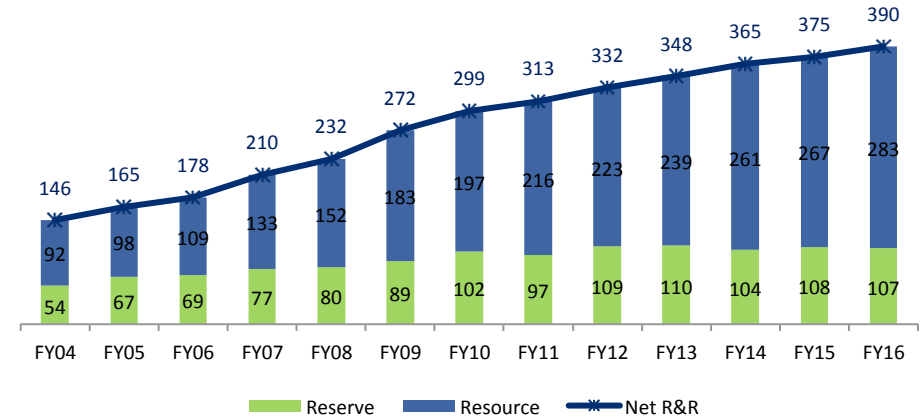
Titan Deep Earth Imaging Survey



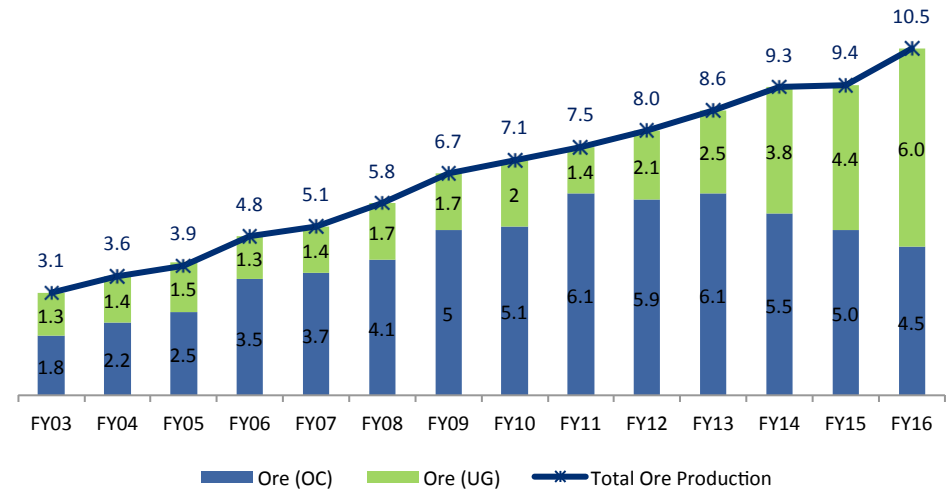
Strong Track Record of Growth



Reserve & Resource (mt) - 2.5X Growth

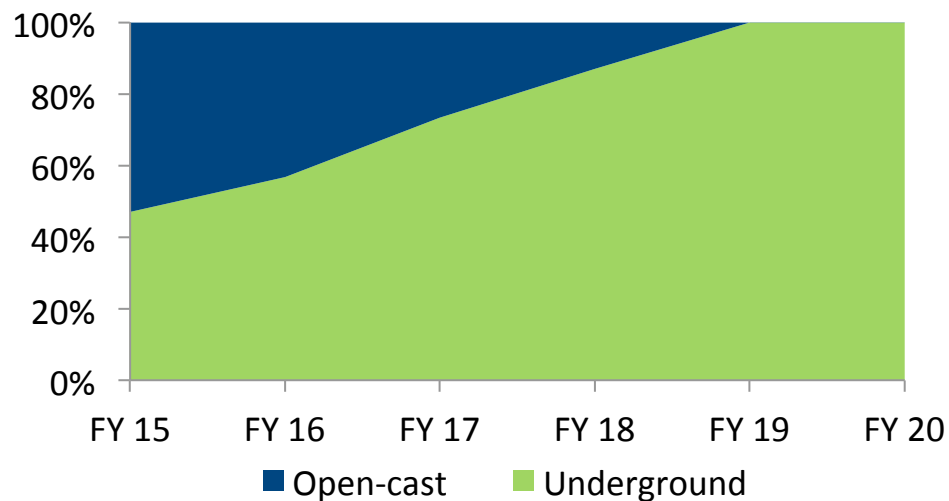


Ore Production(mt) - 3X Growth

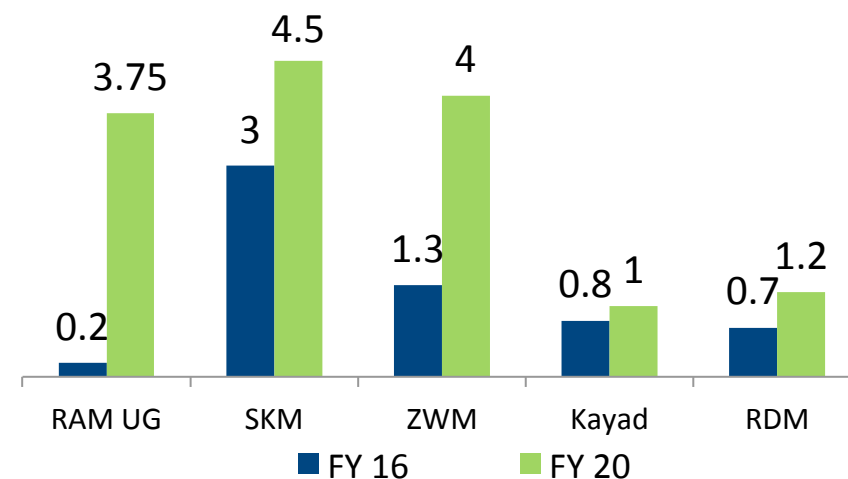


- Resource driven growth
- Five major projects to increase mined metal capacity by 20% to 1.2 mtpa.

Transition to underground mining (% share in MIC)



Journey Ahead - Projects



Background :

- Ore production 0.9 Mtpa to 6.15 Mtpa

Mine planning and designing :

- Pit designing and optimization with best in class software
- Ramp gradient changed from 1:16 to 1:12 & finally to 1:10, resulting into 10% reduction of waste & improvement in OEE of HEMM

Drilling & Blasting :

- ANFO to SME (Site mix emulsion) and from D Chord to electronic detonator.
- Established (in consultation with CIMFR) and carrying out pre splitting at the perimeter of every cut back – enabled mining upto a depth of 400m.

Loading & Hauling –

- Bigger fleet from 50 T to 100 T and to 221 T class trucks and excavators from 4.3 Cub M to 34 Cub M
- Real time management through Truck Dispatch System (TDS) improved truck utilization from 70% to 82%
- Simulator based operators' skill mapping and up gradation



Pre Split- Results



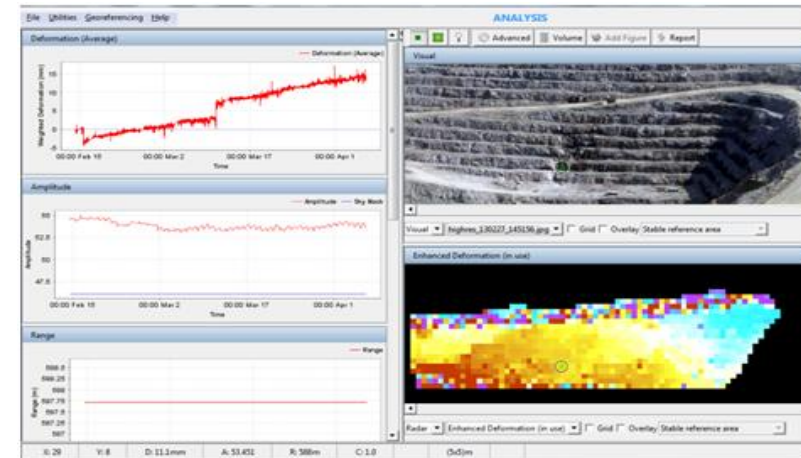
Slope Stability Management

- Established three layers slope monitoring system i.e. SSR, Prisms, & Inclinometers; First mine in India to use SSR
- Depressurization of pit walls through vertical and sub horizontal holes



Waste Management

- Design of Stand Off distance from toe of WD to crest of pit.
- Monitoring of OB dump slopes by SSR and Prisms
- The overall slope angle is 26° , with FOS of 1.2



Adoption of technologies in UG operations

Mine Access:

- Track less mining with decline : 5.5 m X5.0 m to accommodate bigger fleet
- Large dia high speed shaft : From 3 meter to 7.5 meter dia

Equipment:

- **Face Drilling** : From jack hammer to long feed jumbos
- **Production Drilling** : From pneumatic to high speed long hole electro-hydraulic solo
- **Loading** : From track loader to LHDs (from 1 T to 17 T). Manual to remote operation and moving to fully automated system.
- **Hauling** From track to trackless mining (5 T GB car to 63 T LPDTs)
- **Back Filling** : From sand fill to paste fill
- **Hoisting** : Large dia high speed shaft : From 3 meter to 7.5 meter dia
- **Blasting** : From ANFO with safety fuse to emulsion with electronic detonators
- **Vertical Development** : From drill blast to mechanical raise boring



- Use of hand held Gas Detector (CO/SO_x/NO_x)
- Use of self Rescuer and Refuge Chamber
- Use of Leaky Feeder based voice communication
- Automatic Fire extinguisher system on vehicles
- Well equipped mine rescue stations



Use of Self Rescuer



Multi-gas Detectors



NO Detectors



Self Rescuer



Refuge Chamber

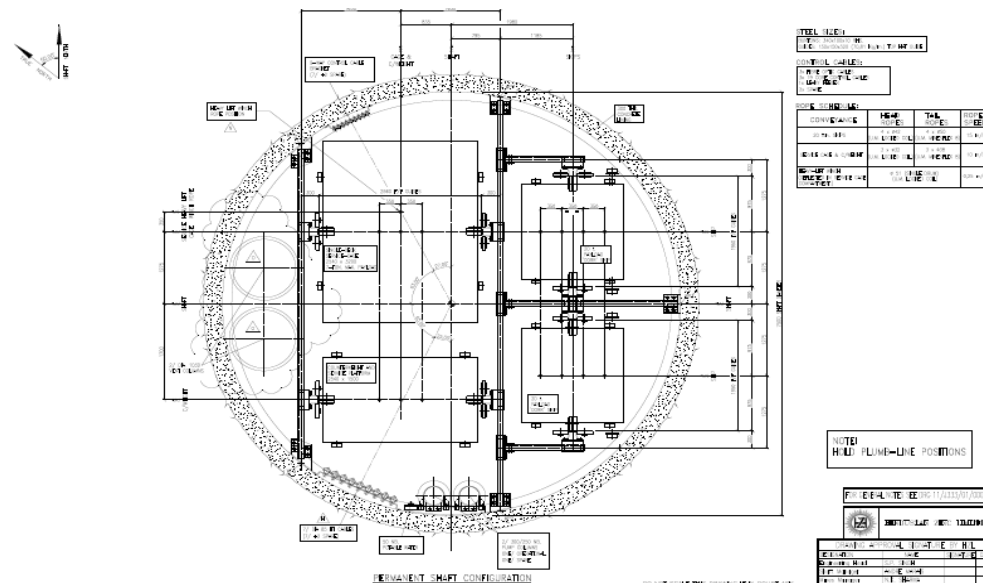
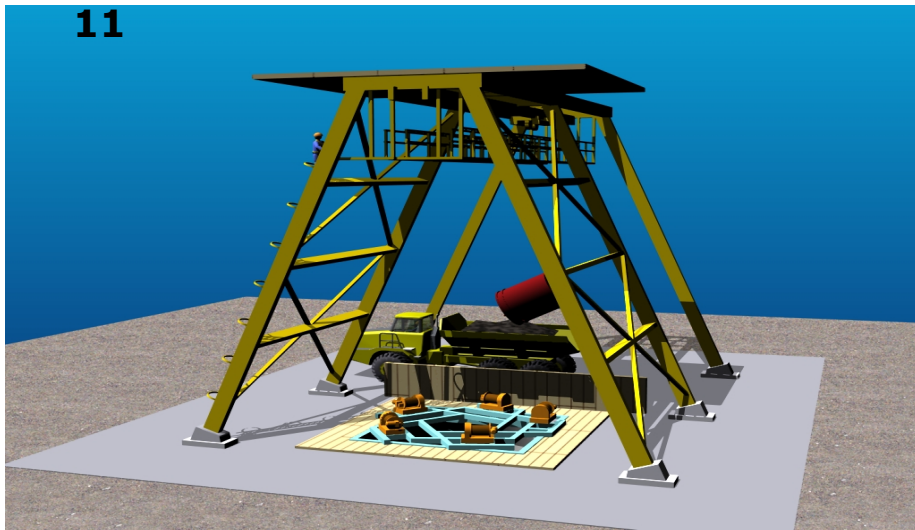


Underground Ambulance

Shaft Sinking and Final Configuration



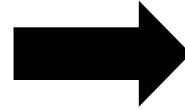
11



Underground Mine Production Cycle



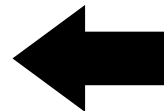
Stope Drilling



Stope Blasting



Loading & Transportation



Stope Filling & Curing



Single Shot Blasting :Current Practice



D & B Parameters

- ❑ Drilling Factor : 10 te/mtr
- ❑ Toe Spacing : 3.3 mtr
- ❑ Ring burden : 3 mtr
- ❑ Slot raise (WxH) : 2m x 3m
- ❑ Hole size : 89mm(shot hole), 127mm(reamer)
- ❑ Powder Factor : 3.3 te/kg
- ❑ Total firing time : 8 sec (approx)

Upgradation

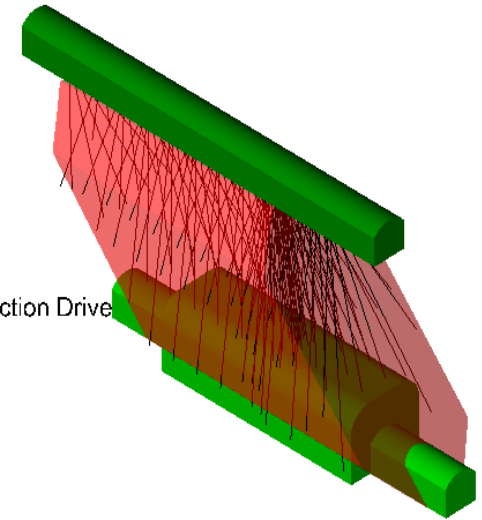
- Increasing the void by stripping the extraction level i.e. sides and roof
- Drilling the entire stope by SOLO (Drill rig: DL 421-15C)
- Firing sequence of stope blasting in single shot(using Electronic Detonators)

Slot raise → Widening of slot upto full width

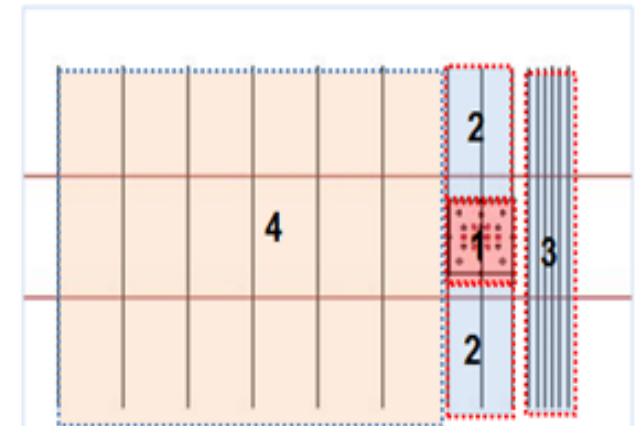
FW Rings ← HW Rings

Drill Drive

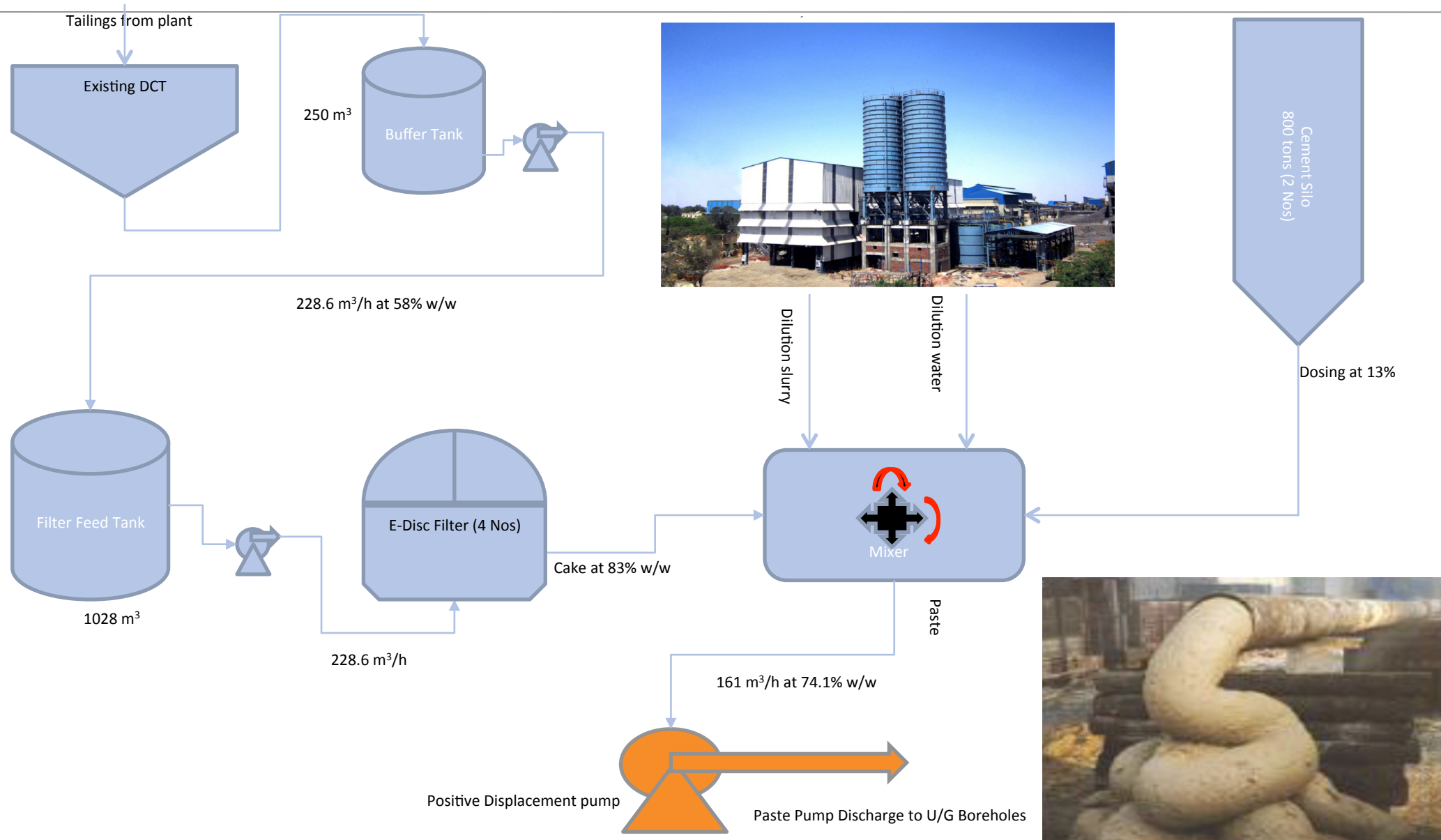
Extraction Drive



Firing Sequence



Paste Fill Technology



Simulator : Use the latest technology



- ✓ Skill mapping of operators
- ✓ skill enhancement
- ✓ Refresher training
- ✓ Only skilled and certified operators are authorised to operate HEMM

Digital Mining

Establishing wi-fi network underground to improve the safety & Productivity

- Asset (Men/Machine/Material) tracking using wi-fi tags & real time visibility of operations
 - Tele-remote operations of Loaders
 - Automation of auxiliaries – Pumping station, ventilation, Sub-stations etc
 - VoIP based communication
-

Way Forward

- Refrigerated ventilation may be required in deep mining
- New mining methods for geo technically challenging ground conditions
- Top down mining method at RA UG for better ground management and stability
- Centralized control & command center for integrated mining operations
- Use of slag & fly ash as binder in paste design

THANK YOU!

