Some aspects of current shotcrete practise in South Africa - Mining

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CONTENTS

- MINING AND IT’S CHALLENGES TO THE SHOTCRETE OPERATION AND HOW THEY ARE BEING DEALT WITH
- FIBRE REINFORCED SHOTCRETE
- SHOTCRETE EQUIPMENT USED IN SOUTH AFRICAN MINES
- SPECIFICATIONS AND QC
- FUTURE NEEDS
MINING AND IT’S CHALLENGES TO SHOTCRETE OPERATIONS

- What is different in a Mining Environment to the Tunnelling / Civil Environment?
  - Depths of the South African Mines
    - 0 - > 3000 meters
      - Access via Shafts, Sub-Shafts and Declines
  - Horizontal travel distances
    - 0 - > 5000 meters
      - Conventional (Rail)
      - Trackless (New mines)
  - Congestions
    - Shaft time for hoisting materials
    - Limitations of Weights and Dimensions of Machines and Material containers
MINING AND IT’S CHALLENGES TO SHOTCRETE OPERATIONS

How are we dealing with some of these logistical problems?

- Underground Batching-plant
  - In combination with Robotic spraying machines on trackless operations
MINING AND IT’S CHALLENGES TO SHOTCRETE OPERATIONS

How are we dealing with some of these logistical problems?

- **Surface batching plant and Slick Line, for Wet Method**
  - Method used on mine development projects
  - Dropping shotcrete mixes 2300 meters in single drop
  - Receiving in purpose made Kettle before being pumped horizontally to the area of application
  - Materials and mix design used must be of high quality
  - Require high level of communication & safety
MINING AND IT’S CHALLENGES TO SHOTCRETE OPERATIONS

How are we dealing with some of these logistical problems?

- Surface Batching plant and Kibble transport
  - Being used in shaft sinking operations
How are we dealing with some of these logistical problems?

- **Pre-bagging of Shotcrete materials, both Wet and Dry Method**
  - Method used in large scale in Canada and South Africa
  - Materials pre-bagged in controlled conditions by SABS / ISO accredited plants
  - Bag sizes of 25 – 30 kg, transported to the U/G working area
  - Pre-bagging plants in all the major mining regions, operated by CLP, Concor and Pre-Crete
  - The method of choice where Hand application is being done
MINING AND IT’S CHALLENGES TO SHOTCRETE OPERATIONS

How are we dealing with some of these logistical problems?

- **Tailings shotcrete** for Wet Method only
  - Utilising the existing Back-fill Plant, Ranges and Tailings material for making and transporting the bulk of the materials
  - Second step mixing taking place Underground. Adding Cement, Coarse Aggregate and Fibres prior to spraying
FIBRE REINFORCED SHOTCRETE

FIBRES

- South African Miners was amongst the first to convert from Steel to HPP fibres
- Majority of Fiber Reinforced Shotcrete used in South African mines today is with HPP Fibres
- Local production of HPP Fibres
SHOTCRETE EQUIPMENT USED IN SOUTH AFRICAN MINES

SHOTCRETE PUMPS USED IN SOUTH AFRICAN MINES

65 – 70 % of shotcrete used in South African Mines are applied using the wet mix method

- BASF CONSTRUCTION CHEMICALS
- RAMBO – RAMBOMIX, Wet mix machines
- MEYCO EQUIPMENT Wet and Dry mix machines
- RSS MINING SERVICES
- ROCKY – ROCKYMIX Wet mix machines
- ROCKCRETE EQUIPMENT & GUNITE SERVICES
- ROCKCRETER Dry & Wet mix machines
- MAYCO Wet mix machines
- WILDEN PUMPS WITH MIXER
SHOTCRETE EQUIPMENT USED IN SOUTH AFRICAN MINES

ROBOTIC EQUIPMENT

- **FERMEL**
  - Locally manufactured
- **NORMET**
  - Imported
- **MEYCO EQUIPMENT**
  - Imported robotic manipulators
- **THABANCHU MINING**
  - Locally manufactured for own use
Mines determine their own requirements for the shotcrete with regards to:

- Fresh concrete performance
- UCS, Early and Final strength
- Load Absorption (EFNARC / ASTM) Normally referring to EFNARC @ 500 - 700 Joules or equivalent in ASTM
- Frequency of Testing. From 0 – PMC Standard
THANK YOU FOR YOUR ATTENTION!