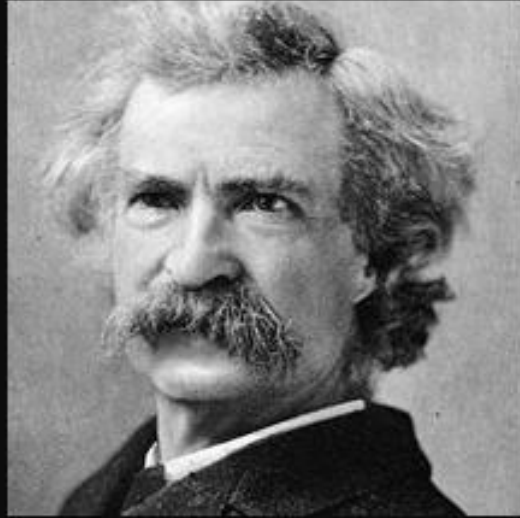




Practices for Areal Coverage Support for Ribsid es

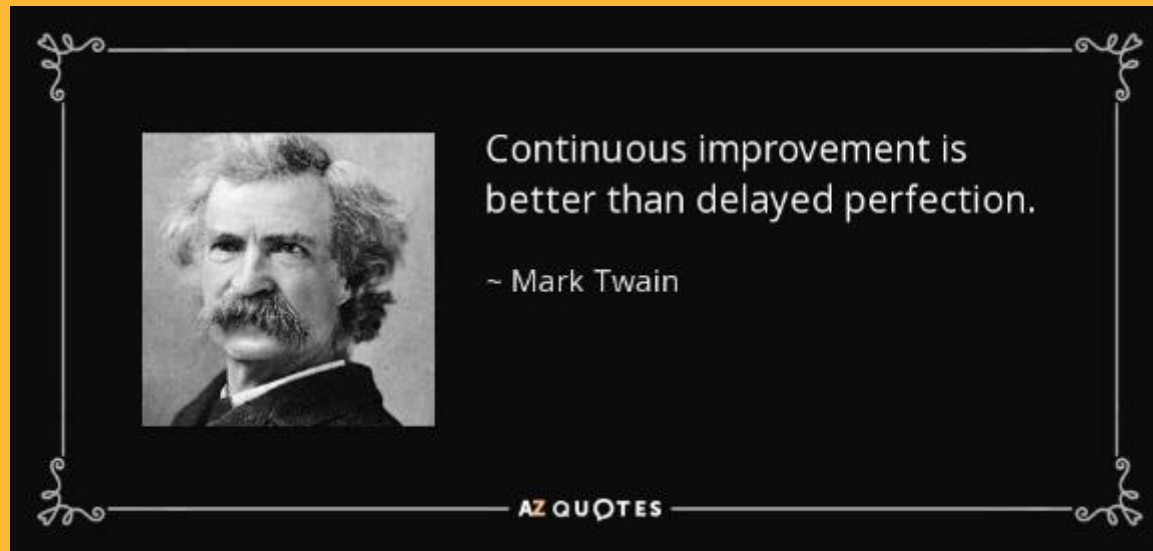
M. Barnard – Principal Rock Engineer



Continuous improvement is
better than delayed perfection.

~ Mark Twain

AZ QUOTES



- ❑ Delaying progress whilst looking for a 'perfect solution' can have negative consequences.
 - ❑ INACTION! ANALYSIS PARALYSIS!

- ❑ Hasty decisions can also have the same (potentially worse) consequences.
 - ❑ INADEQUATE ASSESSMENT!

Key = striking a balance!

Thungela Resources Background

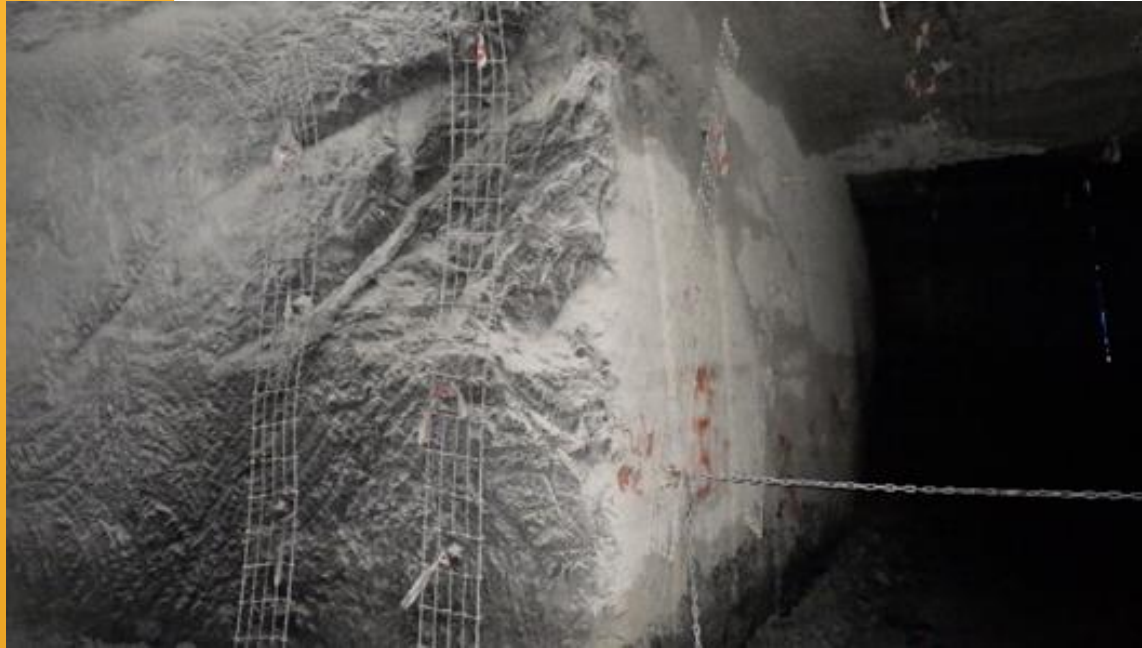
Thungela Resources Background

- ❑ Thungela Resources was formally Anglo-American Coal South Africa.
- ❑ Born from a demerger from Anglo American in 2021.
- ❑ Operates predominantly in the Mpumalanga Province (some other operations further afield and internationally).
- ❑ South African coal mines:
 - 4 underground operations
 - 3 opencast operations
- ❑ Underground mines range from newly established mines to some at the end of their life.
- ❑ Extracting No. 2 and No. 4 Seams.

**Let's go on a
journey...**



Where it began?



Straps – commonly used for many years.

- Easily installed.
- Good for confining movement along features.

BUT

- Limited areal coverage = not suitable for friable conditions.

Welded Mesh



Then came....

- ❑ Addresses the short-coming of the coverage provided by straps.
- ❑ Initially planned for usage on the roof.

But...



- ❑ Tragic fatal FoG accident.

LEARNINGS:

- ❑ Equipment (bolters) not fit-for-purpose.
- ❑ Critical aspects missed during the Management of Change process.
- ❑ Ribside meshing had not been considered.

**Next stage of the
journey...**

Ribslides!!!



Safety First

- ❑ Stopped all ribside meshing unless authorized by the site Rock Engineer and the Mining Manager (3.1(a)).
 - Onerous and impractical.
 - Disempowered production crews.
 - Could allow deterioration of conditions.

Not a sustainable
solution.

So, what then????

The Process

- ❑ Engagement with stakeholders (from people at the coal face to OEM).
- ❑ Procedural reviews and risk assessments.
- ❑ Physical trials.

**The
results?**



New Processes

- ❑ Developed two safe methods for installing mesh on the ribsides:
 - Using Z-hooks.
 - Primary meshing (with bolting).
 - Good contact with the rock surface.
 - Slower, but better for support.
 - Using double-nut washers.
 - Secondary activity (post-bolting).
 - Gaps left between the mesh and the rock surface.
 - Can be installed faster, but allows for more deformation of the ribsides.

Primary Meshing with Z-hooks

Z-Hooks



Image 1: Identification of the area and marking of fictitious sidewall slips.

Z-Hooks



Image 2: Marking of correct drill depth and drilling Z-Hook holes.

Z-Hooks



Image 3: Z-Hook and insertion tool in roof bolter chuck, ready to insert Z-Hook.

Z-Hooks



Images 4 and 5: Inserting the Z-Hook.

Z-Hooks



Image 6: 4 x Z-Hooks installed – Note the positions: above the “unstable” area being meshed.

Z-Hooks



Image 7: Placing the mesh sheet onto the Z-Hooks – Note the distance between people and sidewall.

Z-Hooks



Image 8: Mesh placed, ready for bolting.

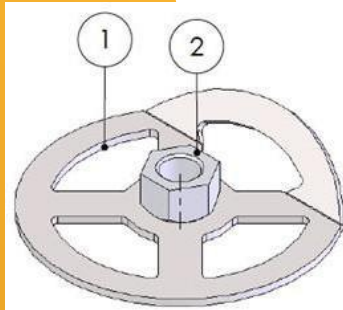
Z-Hooks



Image 9: Mesh bolted, area made safe.

Secondary Meshing with Double-nut Washers

Double-nut Washers



- ❑ Ribside/pillar of concern is bolted to secure the major blocks.
- ❑ Mesh is hung on the bolts.
- ❑ Mesh is secured with the double-nuts (screwed onto the thread of the bolts).

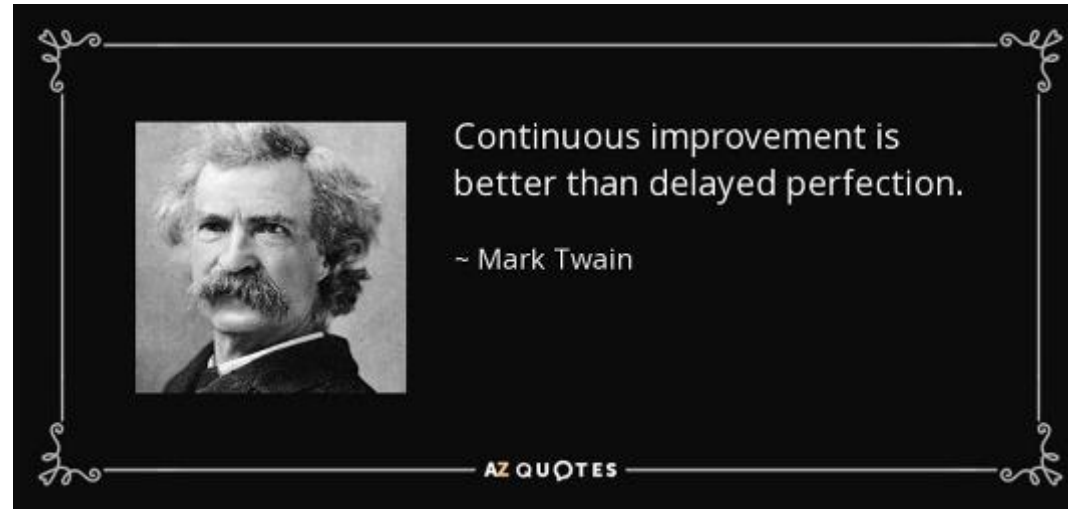
Pros and cons with both options, but they are:

- Safe,
- Risk assessed, and
- Proceduralised.

What can we
take away from
this journey?



Takeaway Points



- ❑ Never forget the importance of assessing and managing change.
- ❑ Continuously review systems, processes, material, etc.
- ❑ There are invaluable insights that can be gained by stepping back and just observing.
- ❑ A holistic approach involves the participation of all stakeholders.
- ❑ KISS Principle. The simplest solutions are often the best.



thungela

Credit is given to the countless people that have been involved in this process, as well as the greater mining community for sharing and growing together.

Thank you

QUESTIONS?

