

Problem 6: ASSESSMENT OF THE PERFORMANCE OF COMPOSITE LINER: SHOTCRETE AND TSL

Industry: Mining Industry

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Moderator:

Student Moderator:

Problem Statement:

Shotcrete, typically 50 mm to 100 mm thick, has been a traditional surface support applied at the mines for many years. Thin Spray-on Liners (TSLs), on the other hand, have been an alternative to shotcrete with its reduced thickness of about 5 mm to 10 mm. The use and acceptance of TSLs, however, has been problematic simply due to the wrong perception that “a thin liner is a weak liner”. However, numerous physical property tests on both TSLs and shotcrete demonstrated that TSLs, in fact, match and in some cases over perform the strength of shotcrete.

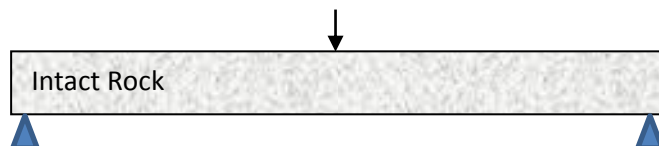
It seems that the acceptance of TSLs would still take a while and shotcrete cannot be singled out in this process of acceptance. It is possible that the worth of TSLs could be shown by TSLs’ influence in the performance enhancement of shotcrete. In this case, a TSL is applied over shotcrete to form a composite liner.

A number of laboratory tests have been performed to check the influence of TSLs on rock and shotcrete performance. Masethe (2015) found that tensile strength of shotcrete increased by 40% after 28 days when covered by 5 mm TSL. Mpunzi’s (2011) laboratory tests on rocks coated with TSL material showed that the sprayed liners enhance the strength of the rock.

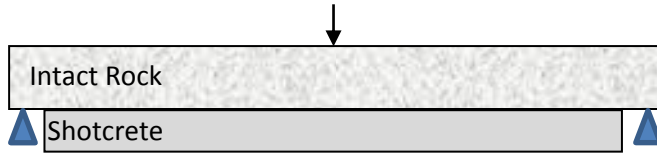
The research question that would be addressed during the workshop would, therefore, aim to address and quantify the positive contribution TSLs would impose over shotcrete performance. Would it be possible to match the performance of thicker shotcrete by reducing the thickness of shotcrete when it is used in combination with a TSL? If the outcome is positive, then one can, at least, motivate the application of TSL as surface support. The advantages in reducing the thickness of liner application are that the quantity of material transported to the excavation site would be reduced easing the logistical requirements, transport costs and spraying time.

The following scenarios are suggested to be examined during the workshop;

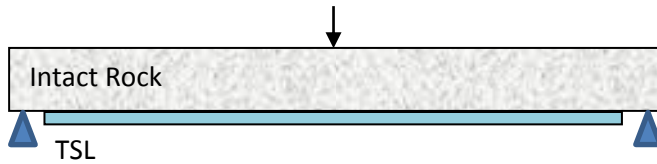
1. Rock performance in the absence of any liner.



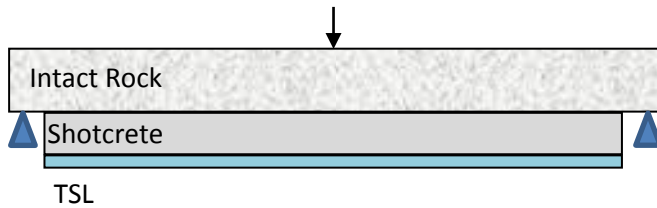
- Shotcrete's influence in the enhancement of Rock performance.



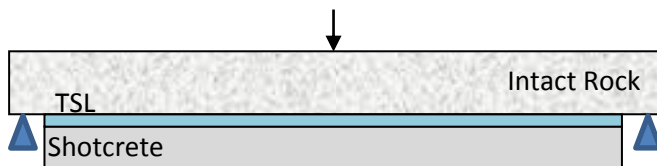
- TSL's influence in the enhancement of Rock performance.



- Composite liner influence in the enhancement of Rock performance. (TSL over shotcrete)



- Composite liner influence in the enhancement of Rock performance. (shotcrete over TSL)



- Compare cases 2 and 4 and assess the shotcrete + TSL thickness that matches the shotcrete only thickness.

The performance assessment would incorporate energy absorption capability or maximum force required for rock failure. The mechanical properties of various rock substrates, shotcrete and TSLs would be available if needed.