

LAST DEVELOPMENTS FROM NTNU / SINTEF

Dirk van Oosterhout

Content - Last developments from NTNU / SINTEF

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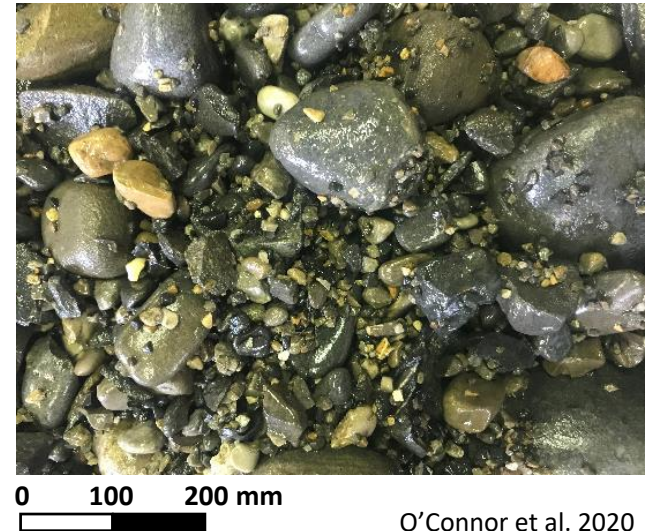
Soft ground TBM performance and wear

- Joint research project between Hyundai Engineering and NTNU
- Main activities
 - Collection of TBM data and geotechnical data
 - Statistical analyses on the dataset
- Created generic models to predict advance rate based on TBM parameters and geotechnical parameters

Assessing the abrasivity characteristics of the central Dublin fluvio-glacial gravels

- University College Dublin
- Metro tunnel under Dublin in coursed grained soil
- XRD, DTA, LCPC, CERCHAR, SAT™, SGAT, Sievers' J-miniature drill test, PSD, particle shape, point load test
- Identify the main challenges related to wear and tunnelling through course grained soil

- Paper under review



O'Connor et al. 2020

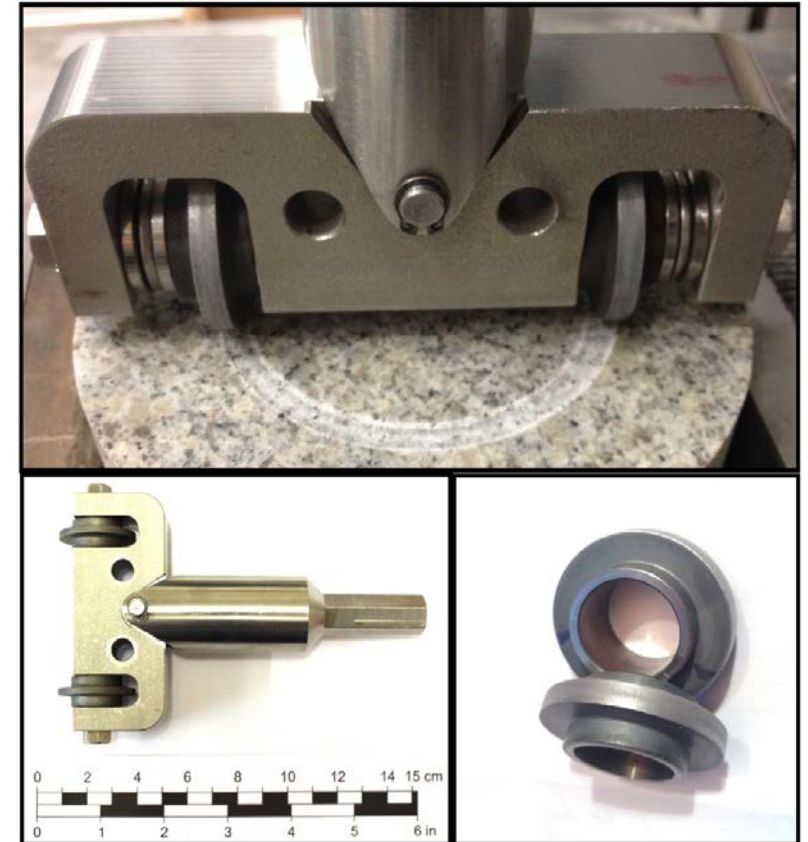
Novock project - Pre-treatment of rock

- SINTEF - NTNU Department of Physics
- Use high frequency alternating voltage to reduce the strength properties of the rock
 - Drillability test
 - Microscopy
- Weakening mineral bindings between quartz grains and neighboring grains
- Paper under review



Rolling Indentation Abrasion Test (RIAT)

- Test miniature disc cutters for measurements of indentation and abrasion
- Rolling movement and vertical thrust - equivalent operational parameters
- Disc cutter steel
- Rock specimen with intact mineral bindings and texture
- Results from initial testing are published in:
Macias, F.J., Dahl, F.E. and Bruland, A. (2016). New rock abrasivity test method for tool life assessments on hard rock tunnel boring: The Rolling Indentation Abrasion Test (RIAT). *Rock Mechanics and Rock Engineering*, Vol. 49, no. 5 (2016), pp 1679-1693.



(Macias et al. 2015)

Further development RIAT

➤ A reason to invest in RIAT!

Further development RIAT

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- New RIAT apparatus

- New functionality for research purposes

Further development RIAT – New functionality/plans for research

- Effect of water/lubricants/additives on the wear of the cutters
- Effect of rotation speed (RPM test) on indentation and wear under laboratory conditions
- Effect of lab thrust force (Penetration test) on indentation and wear under laboratory conditions
- Relationship between wear of TBM cutters and wear of miniature disk cutters for different rocks
- Relationship between the indentation by TBM cutters and indentation of miniature disk cutters for different rocks
- Effect of rock surface smoothness on abrasion and wear
- Effect of changes in steel quality on the wear of the cutters
- Effect of temperature of disc cutters
- Test of samples with smaller core diameter (50 - 60 mm split in half and combined) compared to 100 mm core samples so far used.
- Test on the effect of rock mass pre-treated by plasma shock or alternating high frequency voltage
- Effect of peak loads due to fractures on wear and indentation
- Measurements of sliding abrasion by use of steel and tungsten carbide test pieces instead of miniature disc cutters
- Abrasion and indentation on rock with a confining pressure (sample in pressure cell)
- Double track tracks by use of 4 – 6 adjacent miniature disc cutters.

Ending slide

We see a bright future for RIAT

Invite industry for cooperation on research with RIAT related to your own activities

References

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