

Hard Rock Tunnel Boring

Performance predictions and cutter life assessments

Brief introduction to Javier Macias' PhD work (2012 – 2016)

TBM Applications III, 05.11.2019, Trondheim

Objectives and research design



**Performance
predictions & cutter
life assessments**

NTNU model



**Development of a
new rock abrasivity
test method**



Wear mechanisms

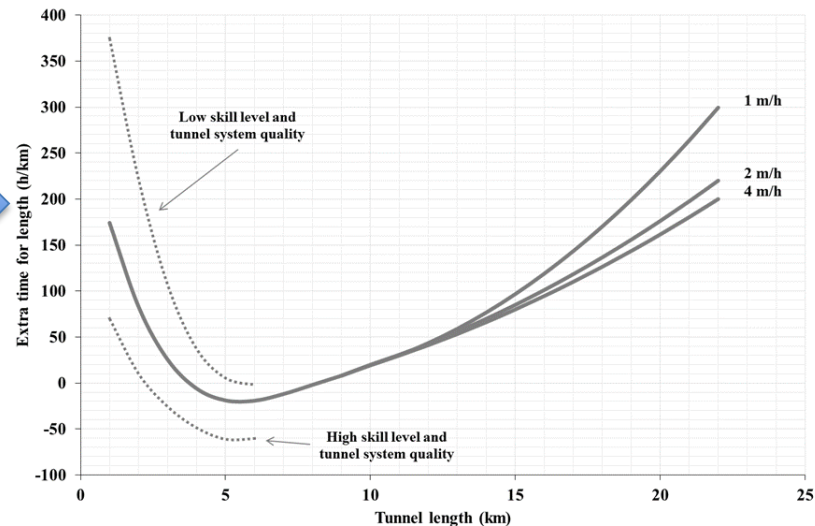
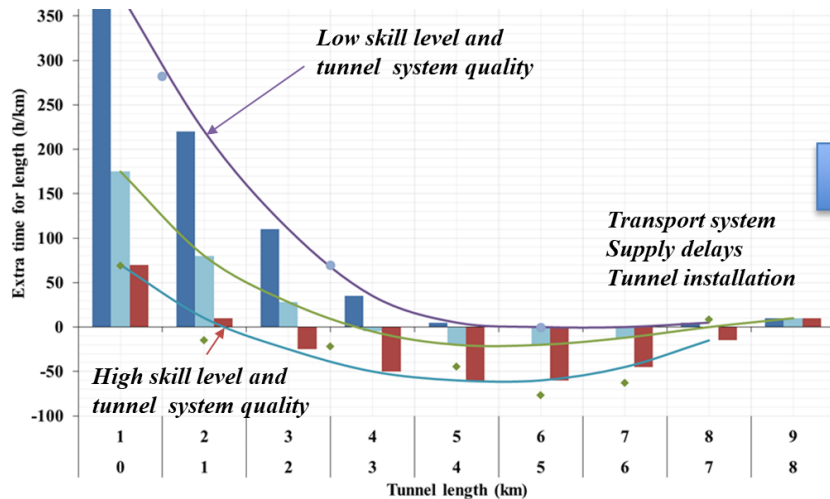
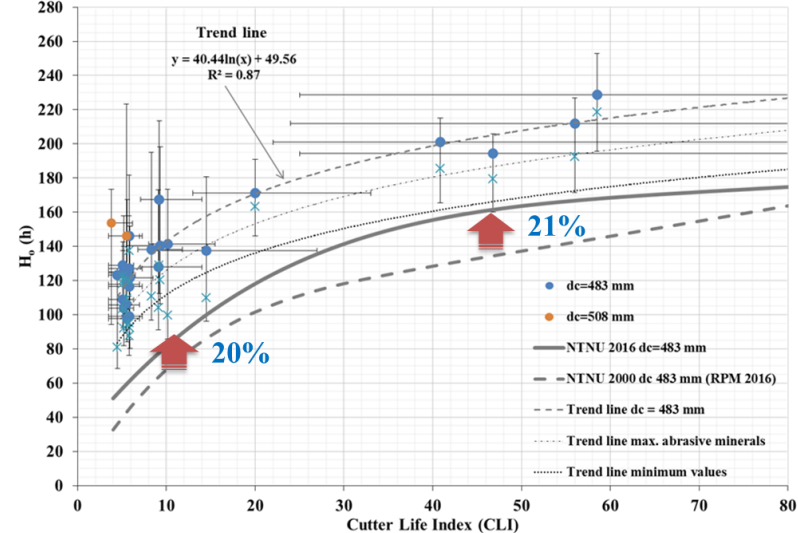
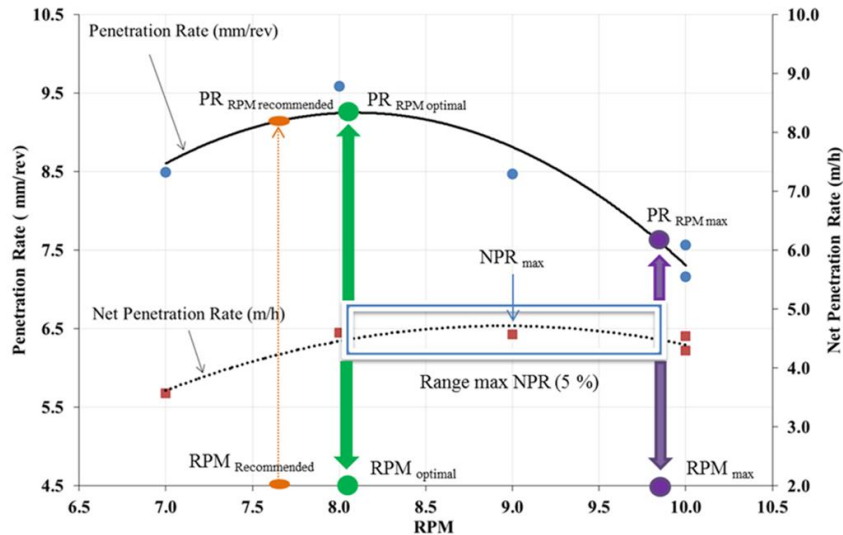


Main outcomes

Publication of a new version of the NTNU prediction model for hard rock tunnel boring

- Updated and extended recommended TBM specifications
- Updated fracture classes and classification
- Updated basic penetration rate
- Updated basic cutter ring life
- New parameters:
 - Cutterhead velocity – on penetration
 - Cutter thrust – on cutter consumption
 - Tunnel length – on machine utilization





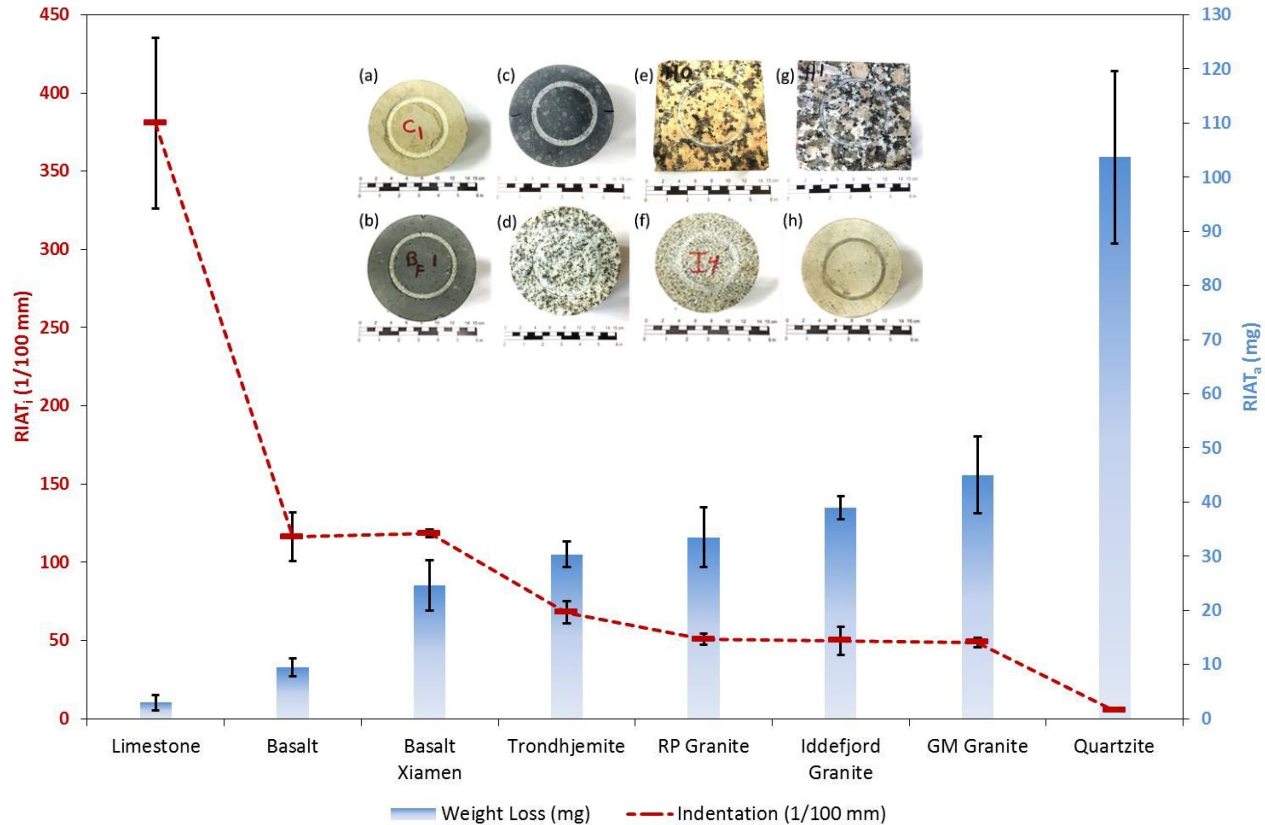
Main outcomes

Rolling Indentation Abrasion Test (RIAT)

- New test method for tool life assessments
- Rolling contact on intact rock samples
- Abrasivity and indentation
- Wide range of abrasivity



Rock abrasivity test method



Main outcomes

Wear process and failure mechanisms in cutter rings

- Rolling – Indicated as primary mode of contact
- Abrasive wear – Main wear mechanism
- Fatigue – Wear mechanism
- Temperature may be a wear mechanism in TBM cutter rings



Summary of main outcomes

- ***New edition of the NTNU prediction model*** for performance and cutter life assessment
- ***New Rock Abrasivity Test Method*** for Tool Life Assessment in Hard Rock Tunnel Boring: ***The Rolling Indentation Abrasion Test (RIAT)***
- Understanding and identification of ***wear process and failure mechanisms*** in cutter rings

Thanks for your attention!

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PhD Thesis:

<http://hdl.handle.net/11250/2429327>