

# Test & Measurement International Conference & Workshop

## CSIR Dynamometer Testing Facility Woven Brake Liner Tests

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18 September 2024 13h00  
CSIR ICC, Pretoria

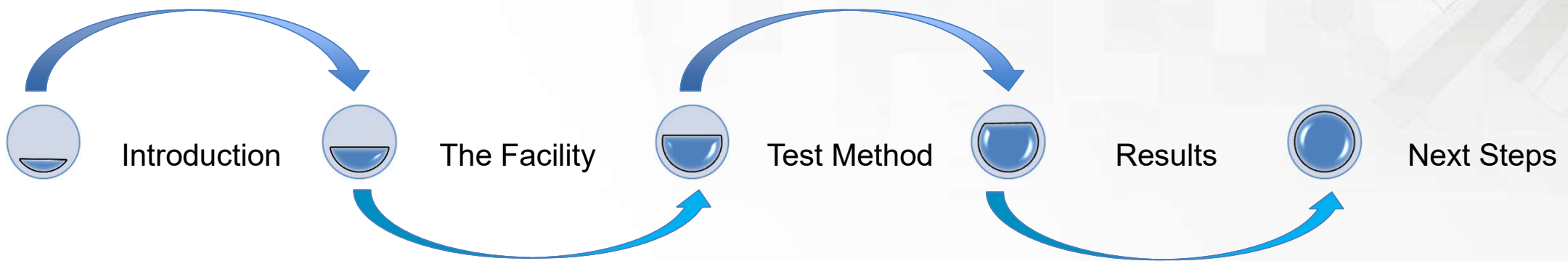


science & innovation

Department:  
Science and Innovation  
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# Contents



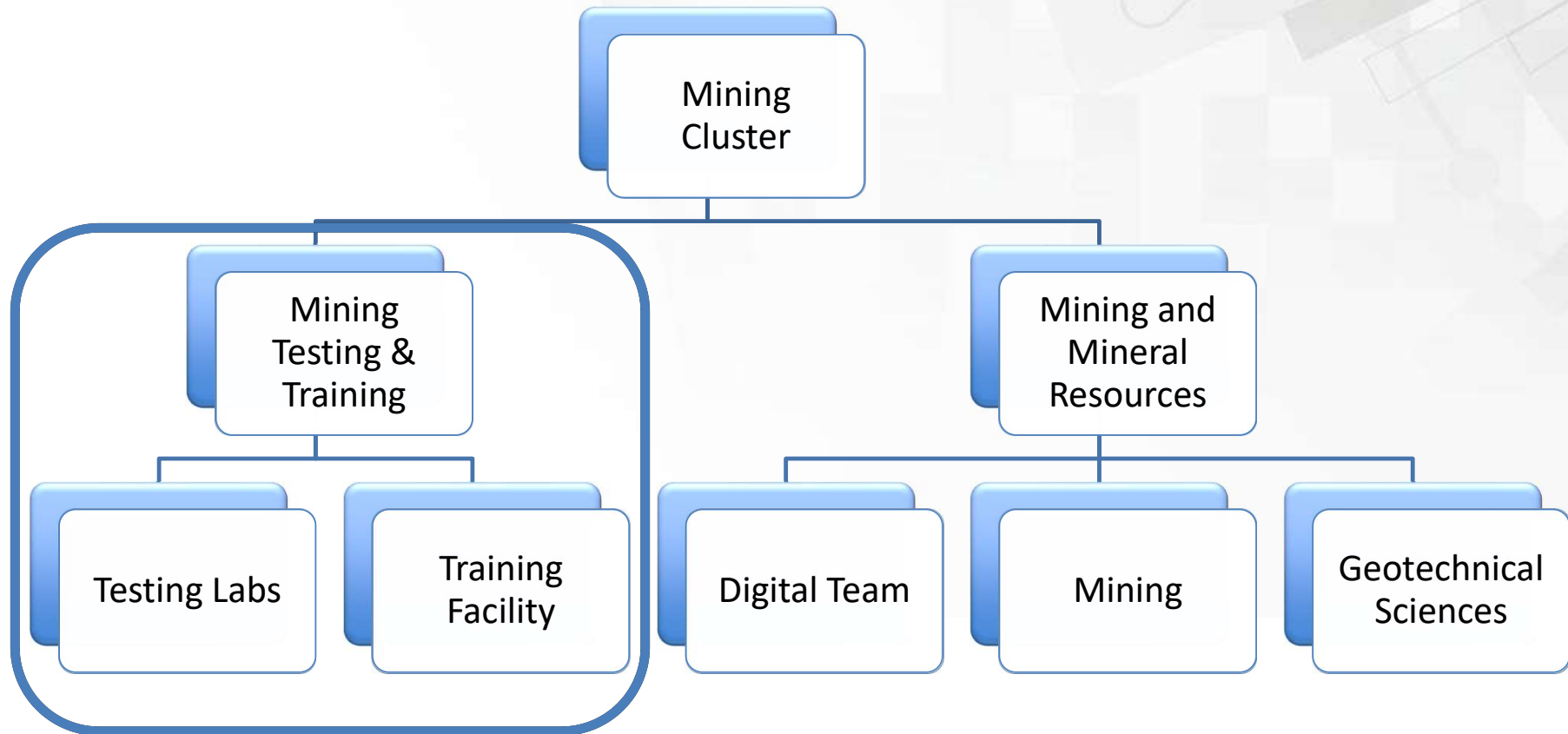
# Why is this work important?

- Mining industry uses winder drums to hoist people and material in and out of shafts
- Previously accidents have led to fatalities due to uncontrolled movement of such winders
- Safety devices such as brakes are installed on the winders
- Brake liners must be replaced periodically to assure safety
- Quality testing and verification is undertaken on brake liner samples
- A Dynamometer test system was built in the 1990s and was last used in 2002 before being recommissioned in 2022
- Old brake liners have asbestos incorporated in them, a local SMME developed a woven brake liner



<https://www.glencore.com.au/operations-and-projects/qld-metals/resourceful/resourceful-april-2022/innovative-five-year-service-agreement-for-mine-hoists>

# The Mining Cluster



# The Facility

<b>Region A</b>	Diepsloot, Kya Sands, Dainfern, Midrand, Lanseria, Fourways
<b>Region B</b>	Randburg, Rosebank, Emmarentia, Greenside, Melville, Mayfair, Northcliff, Rosebank, Parktown, Parktown North
<b>Region C</b>	Roodepoort, Constantia Kloof, Northgate, Florida, Bram Fischerville
<b>Region D</b>	Doornkop, Soweto, Dobsonville, Protea Glen
<b>Region E</b>	Alexandra, Wynberg, Sandton, Orange Grove, Houghton
<b>Region F</b>	Inner City, Johannesburg South
<b>Region G</b>	Orange Farm, Weilers Farm, Ennerdale, Lenasia, Eldorado Park, Protea South



# The Facility



Rope  
Testing  
Laboratory



Mechanical  
Testing  
Laboratory



SCSR  
Testing  
Laboratory



# The Dynamometer

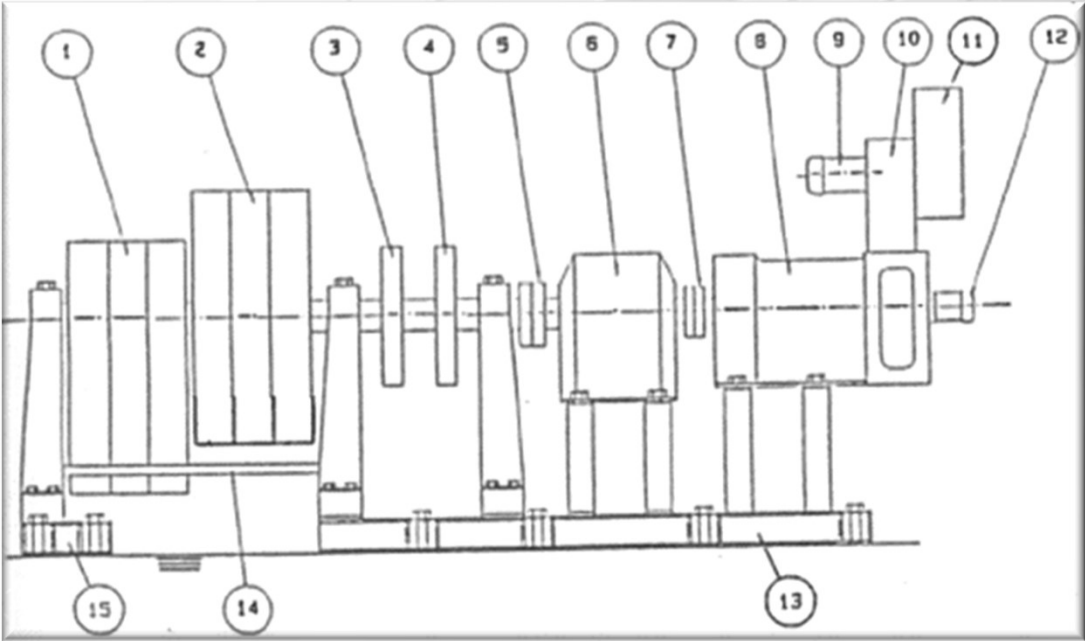


Brake liner

Brake drum

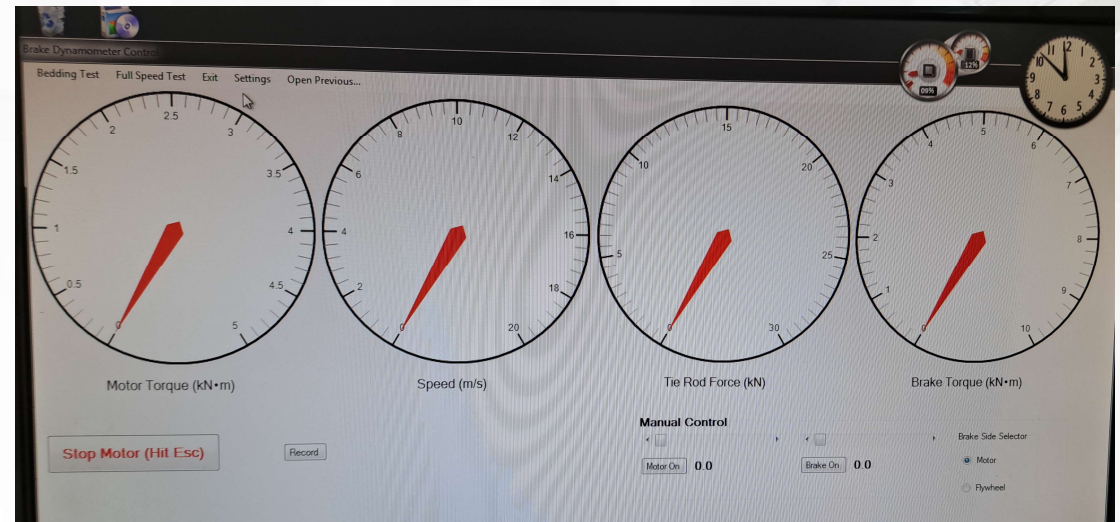
To evaluate the brake liner's ability to stop a high-speed conveyance during an emergency

# The Dynamometer



1 Unused Flywheels	6 2:1 Reduction Gearbox	11 Air Filter
2 Flywheels on shaft	7 Coupling	12 Tachogenerator
3 Brake Drum (flywheel side)	8 100 kW DC Motor	13 Base
4 Brake Drum (motor side)	9 Fan Motor	14 Flywheel Support
5 Coupling	10 Fan	15 Bearing Base

# The Control System



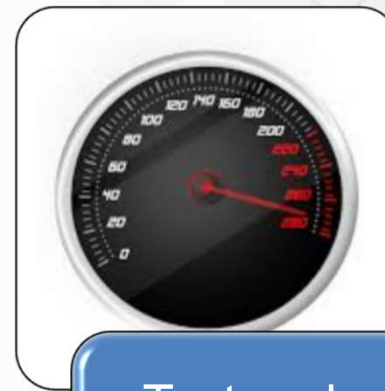
# Test Method



Prepare the liners to align with the drum circumference



Bed the liners to achieve consistent friction coefficient

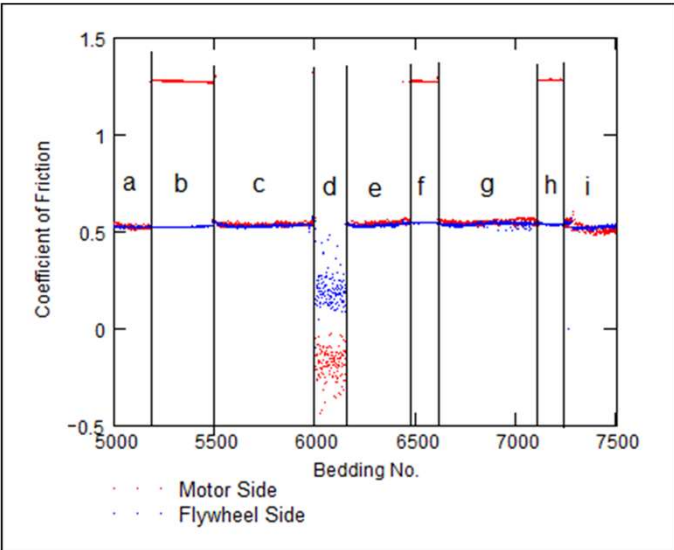


Test under severe emergency conditions (18 m/s)



Analyse results and finalise report

# Bedding-In







Consistent CoF  
(benchmark ~0.4)



Several brake applications at 1m/s

# Emergency Braking Test Protocol

Inputs	Value
Torque	3 088 Nm
Brake Torque	4 843 Nm
Speed	18 m/s

-  Stop without slip/skidding/vibration
-  Consistent CoF (~0.4)
-  Heat absorption
-  No signs of high wear

Simulate worst case scenario, apply the brakes under the worst condition through two applications in quick succession

# Results / Conclusion

Lining No.	Material	CoF	Reduction in temp (%)	Pass / Fail	Distance travelled (m)
A	Woven lining	0.4	40	Pass	116
B	Asbestos – DR	0.1	28	Fail	107
C	Asbestos – D2	0.1	14	Fail	160
D	Asbestos – TA	0.7	32	Fail	111
E	Asbestos – TAB	0.3	29	Fail	112
F	Moulded non-asbestos	0.4	20	Pass	112
G	Woven non-asbestos	0.3	22	Pass	116
H	Flexible moulded asbestos	0.2	28	Fail	145

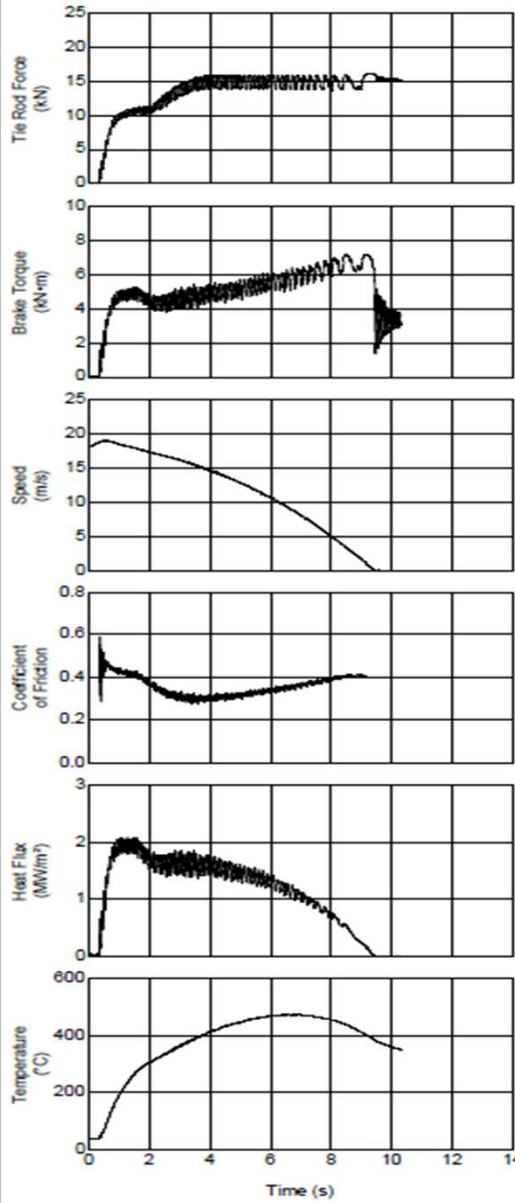
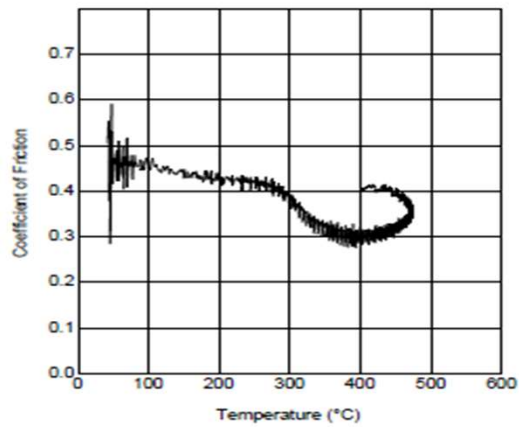




### Brake Dynamometer Test Results

Test No.: 139  
 Test Date: 2023/01/26 02:43:07 PM  
 Material: Kapabrake  
 Motor Torque: 3088 N-m  
 Brake Torque: 4843 N-m  
 Initial Speed: 18 m/s  
 Initial Temperature: 38 °C  
 Peak Temperature: 474 °C  
 Final Temperature: 250 °C  
 Distance Travelled: 114 m  
 Peak Heat Flux: 2.1 MW/m<sup>2</sup>  
 Total Heat Absorbed: 1743 kJ  
 = 11.6 MJ/m<sup>2</sup>  
 = 482 MJ/m<sup>3</sup>

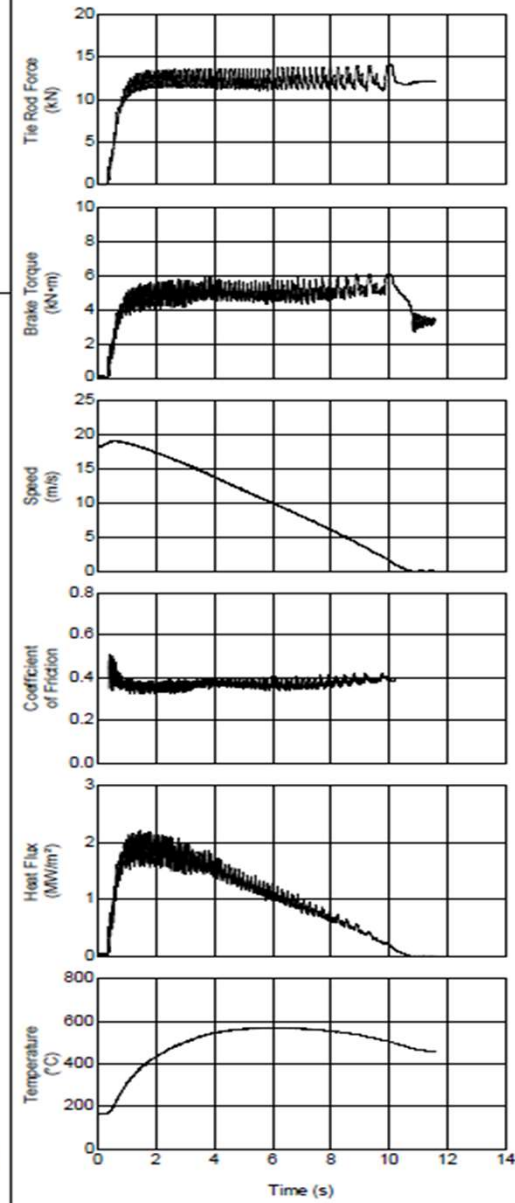
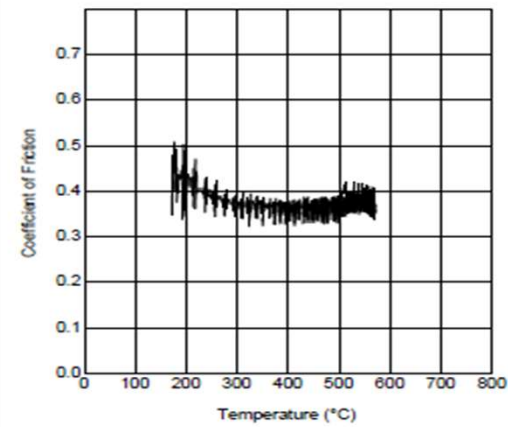
Comments:



### Brake Dynamometer Test Results

Test No.: 140  
 Test Date: 2023/01/26 02:45:20 PM  
 Material: Kapabrake  
 Motor Torque: 3088 N-m  
 Brake Torque: 4843 N-m  
 Initial Speed: 18 m/s  
 Initial Temperature: 164 °C  
 Peak Temperature: 570 °C  
 Final Temperature: 340 °C  
 Distance Travelled: 116 m  
 Peak Heat Flux: 2.2 MW/m<sup>2</sup>  
 Total Heat Absorbed: 1732 kJ  
 = 11.5 MJ/m<sup>2</sup>  
 = 479 MJ/m<sup>3</sup>

Comments:  
Smokes slightly



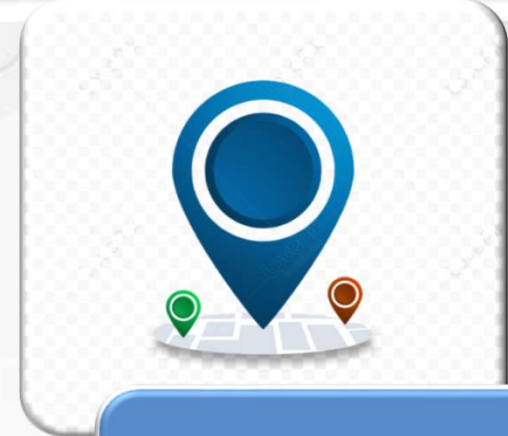
## Next Steps



Test new liner



Compare with prominent liner



Localise the local SMME liner technology

The background is a dark blue gradient with abstract geometric patterns. On the left side, there are several overlapping circles and lines, some in a lighter blue shade, creating a complex, network-like structure. The overall aesthetic is modern and technical.

**Thank you**  
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