

# Dynamic Brake Testing Presentation

Blackwater Mine



## Context



Blackwater Mine had for many years been undertaking in-service brake testing of haul trucks. It became apparent that the pass-fail criteria was inappropriate and did not comply with Australian Standards.

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## Introduction



This presentation will endeavour to explain how Blackwater Mine has developed a new brake testing procedure for rubber tyred heavy mining equipment that exceeds the following:

- SOP 140.00
- The Australian Standard (AS 2958.1 -1995) &
- The Coal Mining Regulations

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## Information



### Before Implementation

- Testing empty but using loaded vehicle testing criteria
- No secondary / park-brake test carried out
- No formal training package
- Poor braking performance on some vehicles example:
  - Tow hauler (595T gross) descending ramps when service brakes were insufficient to stop the vehicle

### After Implementation

- Safer than previous
  - Designated Test area
  - Standardised testing
  - Changed culture



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## Mandatory Brake Testing



- Two tests shall be carried out **fully loaded** and in accordance to the following:

- Australian Standard 2958.1
- Safe Work Instructions
- BMA SOP 140.00 Brake Testing
- OEM Guidelines



- Conducted on a six month interval, scheduled and planned in SAP and include:

- Service, Secondary and Park Brake Test

- The Mandatory Brake Test results shall be recorded on a **Mandatory Brake Test Sheet**.

- Hard copies to be stored in the Mandatory Statutory Filing Room / electronically stored in SAP.

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## Maintenance Brake Testing



- This was introduced following evaluation of brake performance after repairs were carried out. It is additional to what has been required regarding brake testing. It involves doing a test with the machine empty, then doing it loaded.**

- Testing shall require **all** brake systems to be tested.

- The **Maintenance Brake Test** results shall be recorded on a Maintenance Test sheet.

- Hard copies are stored in the Maintenance Statutory Filing Room / electronically stored in SAP. The maintenance schedule is updated.

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## Empty Testing – Maintenance



BMA Blackwater came up with a standard based on a given that a loaded truck was half as heavy again as an empty truck then the breaking efficiency should also be 50% higher than the loaded test ( $F=ma$ ). Blackwater have set this standard as a starting point.

The following relationship is considered:

$$\text{unloaded (BP\%)} = 3/2 \times \text{loaded (BP\%)}$$

Service unloaded = 28%  
Secondary unloaded = 20%

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## Braking Performance (BP%)



To establish performance percentage that references the Australian Standard

Converting distance measurement to Braking performance (service / secondary brake)

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## Braking Performance (BP%)



- Converting distance measurements into a Braking performance % (**Service Brake**)

Service Brake @ 32km/h		
	AS Distance (m)	BP (%g)
Articulated	23.27	17.32
Rigid	21.33	18.88

$$BP(\%) = \frac{100 \times (V_o)^2}{254 \times L}$$

≥19%

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## Braking Performance (BP%)



- Converting distance measurements into a braking performance % (**Secondary Brake**)

Secondary Brake @ 25km/h		
	AS Distance (m)	BP (%g)
Articulated	21.53	11.43
Rigid	18.38	13.37

$$BP(\%) = \frac{100 \times (V_o)^2}{254 \times L}$$

≥13.5%

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## Work Instruction / JSA Examples



Mandatory and Maintenance brake tests are carried out on a machine specific basis as per JSA & Work Instruction

### Mandatory Brake Test

[Job Safety Analysis Grader 24H](#)

[Safe Work Instruction Grader 24H](#)

### Maintenance Brake Testing

[Job Safety Analysis Rear Dump 789](#)

[Safe Work Instruction Rear Dump 789](#)



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## Brake-Testa Millennium Unit



The Brake Testa Millennium HV (BTMeHV), is an advanced electronic instrument for accurate and simple determination of the braking performance of a moving vehicle.

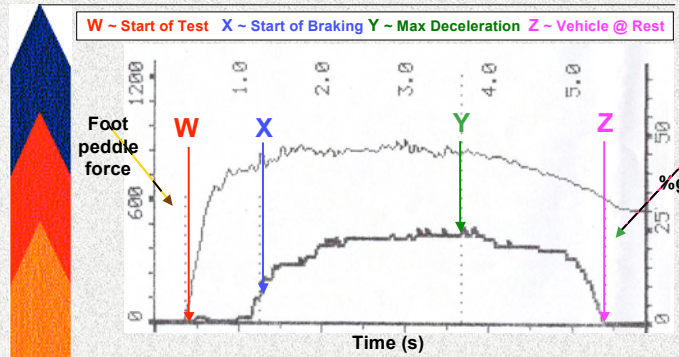
- Durable
- Simple operating procedure, guided by LCD prompts
- All required parameters are printed on reports
- Reduces variables
- Graphic printout for easy interpretation



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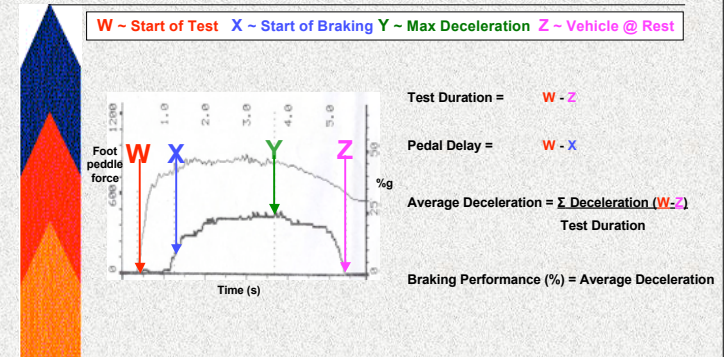
## Graphical Output



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## Parameter Explanation



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## Benefits For Blackwater Mine



- Improvements in safety for operators, testers and workforce
- Numbers of trained personnel conducting tests have been restricted, the outcomes are accurate and reliable
- Brake testing results are more consistent. Eg. Identify potential failure in braking systems of machinery during testing processes.
- Mandatory testing has identified failed machines for which operators have not reported braking defects. All failed machines have subsequent brake defects.
- Better understanding of brake testing process
- High benchmark
  - for compliance
  - credibility of tests
- Planning Department will schedule for the SAP system to generate a work order for a Mandatory Brake Test. The Safe Work Instruction / JSA / Brake Testing Checklist will be attached electronically to this work order. (This process will ensure the machine is also scheduled)

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## Goals For the Future



- Maintaining a standard which ensures safety for operators and testers
- Designated test areas close to workshop, pre-strip and mining
- All BMA Pits to implement brake testing procedure
- Mandatory brake testing history may allow the possibility of having the scheduled 6 monthly tests prolonged therefore ensuring a major cost saving in this area
- To have a scheduled machine loaded and available for the testing process therefore improving productivity.
- Aim to have this package used in other mining industries ie. Metalliferous etc.
- To periodically review the brake testing procedure for continuous improvement

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