

A New Method for Diesel Particulate Measurement of Raw Engine Emissions

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Coal Mines Technical Services



Coal Services Pty Limited

Why Diesel Particulate tests need to be carried out

- With heightened awareness of the serious health impacts of DPM, mining regulators and mine operators are now actively seeking practical measures to reduce human exposure to this dangerous airborne pollutant.
- The high economic and social cost of respiratory ailments, heart disease and brain damage associated with exposure to diesel particulate matter (DPM) is now widely acknowledged. In the confines of underground mining, where diesel engines are the dominant source of mobile power, this issue has even greater relevance and importance.
- One way rectifying this is by the use of Diesel Particulate filters to mining equipment, and regular monitoring of Diesel particulate levels on all Mining equipment and all diesel powered mining vehicles.



MPM-4M diesel particulate analyser



Remote operation
cable connection



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MPM-4M Diesel particulate analyser

- Utilises similar laser light scattering technology to existing analysers currently in use
- Developed by PM-Tech Australia in conjunction with MAHA Germany
- Testing configured to comply with MDG29 Guidelines for raw emission testing of diesel engines in NSW



MPM-4M Features and improvements over similar devices

- Heated sample line eliminating drying system
- Sample not diluted, single sample tube. Alternative systems utilise combination of 2-3 lines (i.e. water trap, diluted sample, undiluted sample lines)
- Single accessible water trap/ filter system
- Internal program and display automatically prompts user for load/idle conditions during emission testing (timer displayed on screen)
- Auto zero feature
- Can be calibrated using a range of calibration 'plugs'
- Single operator possible using removable remote start cable
- Simple maintenance and reduction in internal components
- Compact enclosure
- Reliable operation



Previous Method for DPM



Test equipment has noticeably downsized!



CO ,CO2 , Nox Analyser

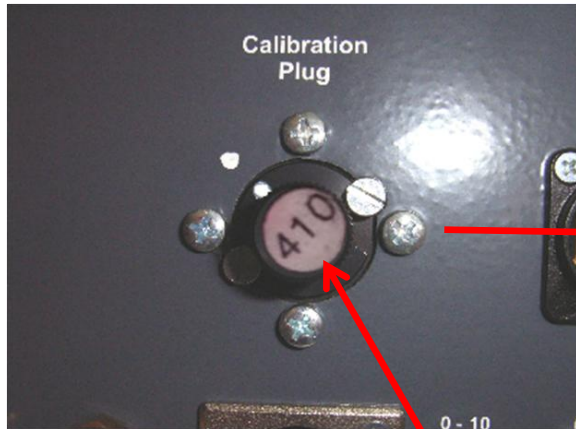


WET EXHAUST OUTLET (ED10 LHD LOADER)



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MPM-4M Calibration plug and filters



Water trap and
filter access



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MPM-4M – Test sequence



Warm up screen



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Typical test sequence

To zero instrument
hold probe in clean air
then press
ENTER

1. Start Zero

Ready to Test
Insert Probe in Exhaust
Press
ENTER
to begin test

3. Prepare to Test

IDLE
PM Concentration
0.0
mg/m³

5. 20 sec Idle (Phase 1)

Zeroing PM Sensor
1

2. Auto Zero (3 seconds)

Test will start in
3
seconds

4. Five Seconds Countdown

FULL POWER
PM Concentration
62.3
mg/m³

6. 20 sec Full Power (Phase 2)



Typical test sequence

IDLE

PM Concentration

19.7

mg/m³

7. 20 sec Idle (Phase 3)

TEST COMPLETED

8. Test Over

Test Result **142** mg/m³ EC

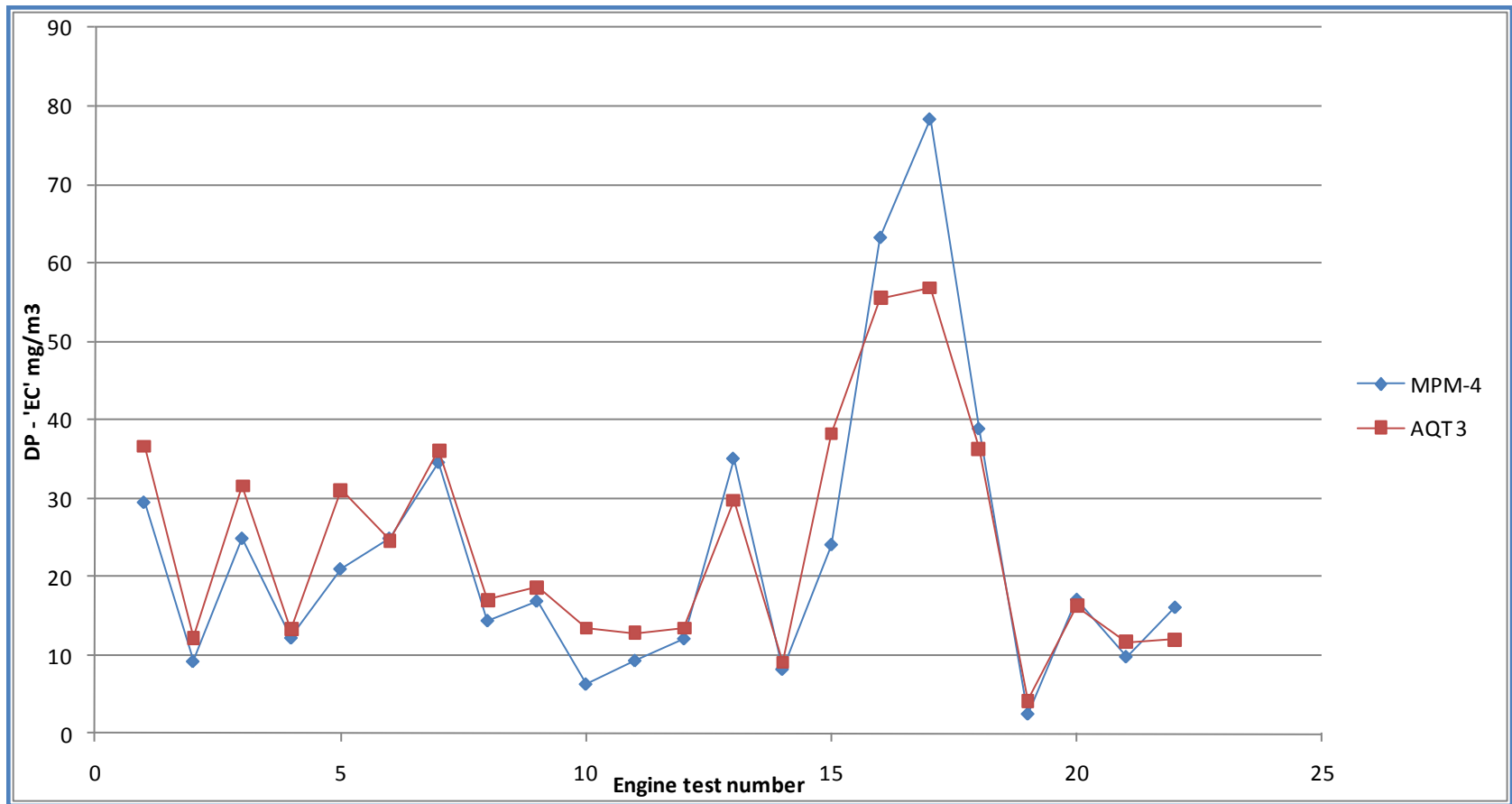
Supplementary Data

Average conc (Idle Modes)	75.1	mg/m ³	EC
Average conc (Full Power)	277	mg/m ³	EC
Minimum concentration	0.00	mg/m ³	EC
Maximum concentration	545	mg/m ³	EC

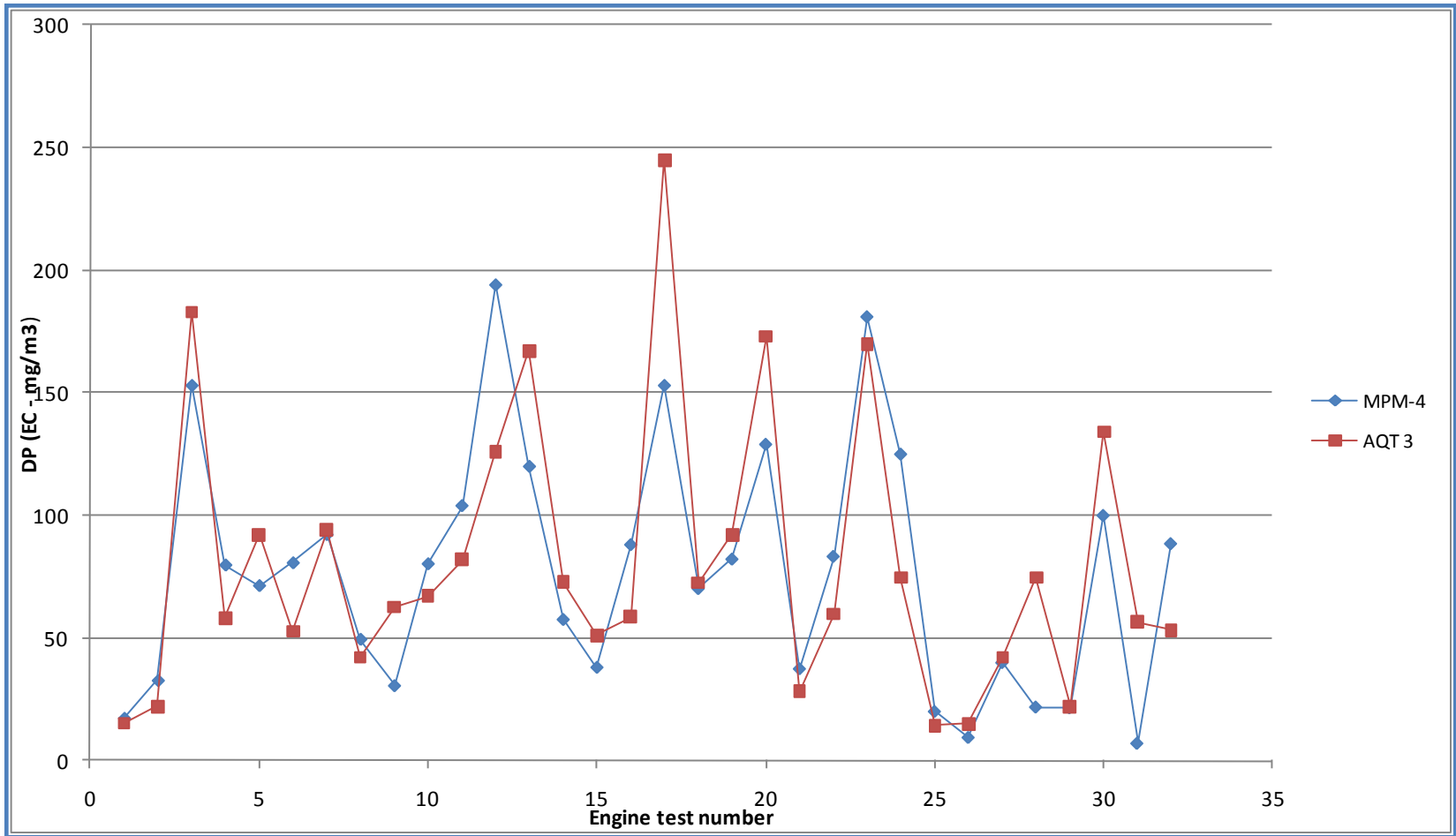
Record Test Results, then
press ENTER to start new test



MPM-4M Correlation data – Site 'A'



MPM-4M Correlation data – Site 'B'



Diesel Particulates in Coal Mines

**WITH CORRESPONDING ENGINE
NUMBERS AND MIR Nos**

And Sample of emissions certificate



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COAL MINES TECHNICAL SERVICES

A Division of Mines Rescue Pty Ltd, NSW
1/30 RALPH BLACK DRIVE, NORTH WOLLONGONG, 2500

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ACCREDITED FOR
TECHNICAL
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Laboratory accreditation No. 1757

Certificate of Analysis

This certificate has been issued without alterations or corrections.

Tahmoor Colliery
Old Hume Highway
Tahmoor NSW

Diesel Exhaust Emissions Sample Job N°: D14231

Test Location: Tahmoor

Engine Details:

Engine number: U314939N8
Engine type: Perkins
Model: 1104C-44
Machine type: PJB Minecruiser DE022
Approval N° (MIR): 08232
Approval N° (MDADES):
DEV/DEL/DEE N°:
Flight RPM: 2400
Hour meter reading: 4333

Date of test: 10 October, 2011
Date of previous test: 12 July, 2011
Test type: Three monthly

Test Conditions:
Method of loading: Torque stall
Method of sampling: Direct

Fail

Baseline:

Test	Carbon dioxide (%)	Carbon monoxide (ppm)	Oxides of nitrogen (ppm)	Diesel particulate (EC mg/m³)
Load				

Results of Analysis:

Test	Carbon dioxide (%)	Carbon monoxide (ppm) Limit 1150 ppm*	Oxides of nitrogen (ppm) Limit 750 ppm	RPM	Diesel particulate (EC mg/m³)
Load	12.6	1840	480	2000	

Comments: Failed statutory limit for carbon monoxide.

Testing officers: T Wilson
P Hart

* Limits: Coal Mines Regulations (Transport - Underground Mines), 1984
Method: TMDE-01

* Tachometer and diesel particulate data readings. CMTS NATA accreditation does not cover the performance of this service

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Signatory

T Wilson P Hart R Strong P Mason

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Certificate of Analysis

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Tahmoor Colliery
Old Hume Highway
Tahmoor NSW

Diesel Exhaust Emissions Sample Job N°: D14268

Test Location: Tahmoor

Engine Details:

Engine number: U314939N8
Engine type: Perkins
Model: 1104C-44
Machine type: PJB Minecruiser DE022
Approval N° (MIR): 08232
Approval N° (MDADES):
DEV/DEL/DEE N°:
Flight RPM: 2480
Hour meter reading: 4333

Date of test: 12 October, 2011
Date of previous test: 10 October, 2011
Test type: Three monthly

Test Conditions:
Method of loading: Torque stall
Method of sampling: Direct

Re-test

Baseline:

Test	Carbon dioxide (%)	Carbon monoxide (ppm)	Oxides of nitrogen (ppm)	Diesel particulate (EC mg/m³)
Load				

Results of Analysis:

Test	Carbon dioxide (%)	Carbon monoxide (ppm) Limit 1150 ppm*	Oxides of nitrogen (ppm) Limit 750 ppm	RPM	Diesel particulate (EC mg/m³)
Load	12.1	820	400	2100	38.5

Comments: Cleaned air intake system.

Testing officers: T Wilson
P Hart

* Limits: Coal Mines Regulations (Transport - Underground Mines), 1984
Method: TMDE-01

* Tachometer and diesel particulate data readings. CMTS NATA accreditation does not cover the performance of this service

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TREND GRAPH

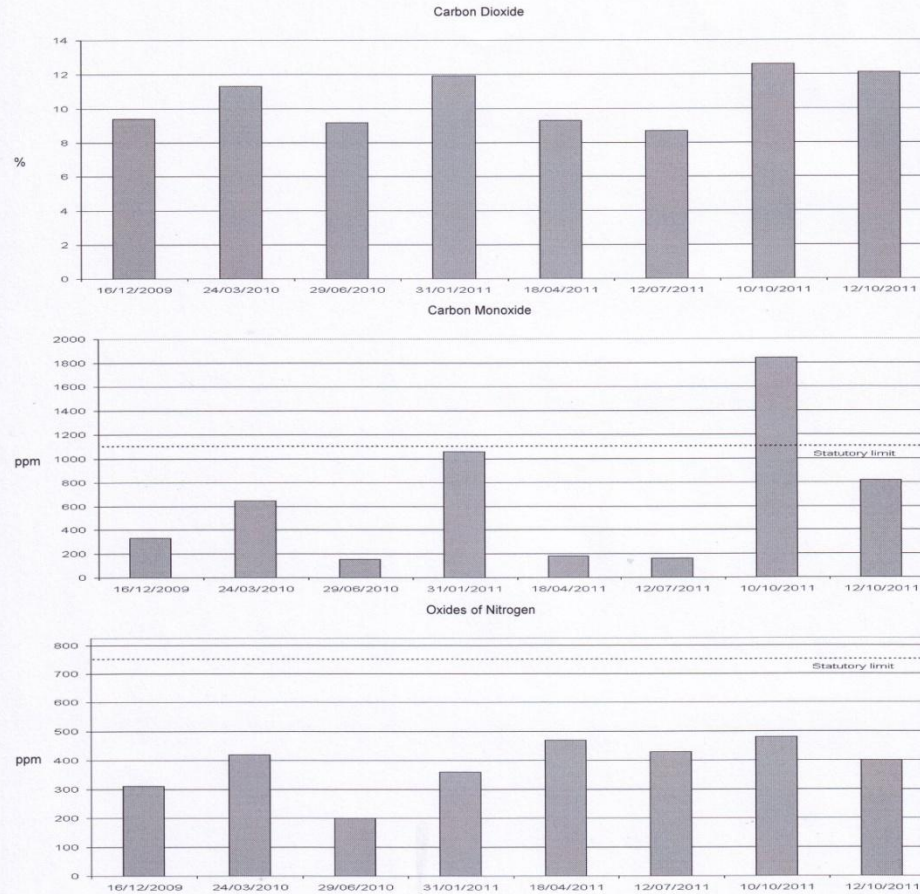
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Monday, 21 November 2011

Analysis trend for PJB Minecruiser DE022

Engine N°: U314939N8

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SAMPLING POINT ON SMV DRIFTRUNNER



SAMPLING FROM 130 EIMCO LOADER



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Plant check List Westcliff

DIESEL EQUIPMENT LIST - WESTCLIFF COLLIERY					
DATE:					
	DIESEL VEHICLE	ENGINE N ^o .	MIR #	CAP REPLACED	CAP CHECKED
	SMV BRUMBY				
	DE140	U821091K	07170		
	DE141	U821098K	07171		
	DE142	U823855	07172		
	EIMCO 913/915				
	1451	23C02710	08289		
	243 (A1038)	23C01951	07158		
	244 (A1144)	23C01900	07157		
	1432	23C02423	09237		
	1428	23C02304	10154		
	1319	9ZR03285	08353		
	1312	9ZR02980	08166		
	1420 (A1272)	23C02632	08186		
	1415	23C12836	10036		
	1422 (A1224)	23C02576	07256		
	3030	9ZR02989	08451		
	53	66D37764	07156		
	HM027	23C02969	08466		
	LS194	JTF-00343	40160		
	Jug-A-O SCM076	JINUD15124	11070		
	Jug-A-O VLGJ2	JIN-UD-12463	08001		
	Eimco 936 (3203)	23C02626	08221		
	Eimco 1418	23C02552	10157		
	Eimco 1339	9ZR04134	11052		
	LS151	E25N149457	11055		
	Coal Tram AMH70	JTF-04890	40076		
	1317	9ZR03367	11126		
	MYNE GRADER				
	GR01 (019)	02B18244	07153		
	Dozer 1505	66D50116	08178		



Engine Numbers Check List Appin

DIESEL EQUIPMENT LIST - APPIN EAST & WEST COLLIERY						
DATE:						
	DIESEL VEHICLE	ENGINE N ^o .	MIR	CAP REPLACED	CAP CHECKED	
APPIN EAST EIMCO LOADERS						
	7	02B18001	10135			
	8	02B18058	10114			
	9	02B18005	09023			
	1409	23C02784	10073			
	1446	23C02730	08329			
	027 (1561)	9ZR03816	08075			
	028 (1562)	9ZR03851	08076			
	25	23C45329	09087			
	1321	9ZR02646	08355			
	1020	2B9783	08347			
APPIN WEST EIMCO LOADERS						
	JUG TND 01	JIN UD12399	08202			
	JUG M07	66D37574	07197			
	JUG M12	JINUD12515	09170			
	JUG J69	JIQUD13478	08228			
	10	02B17518	09102			
	AE18	02B17854	10049			
	104	02B18063	10031			
	1008	2B10914	08332			
	1427	23C02661	07036			
	1310	9ZR02787	07282			
	1302	9ZR03157	10024			
	26	9ZR03247	07307			
	1315	9ZR03401	08017			
	1401	23C02591	09166			
MYNE GRADER						
	ARV GR018	02B18230	07300			
	AMH 52	02B17445	10036			
	FBL-10 (150)	9ZR03381	10078			



Tahmoor Engines list

DIESEL EQUIPMENT LIST - TAHMOOR COLLIERY					
DATE:					
MACHINE TYPE	DIESEL VEHICLE	ENGINE NO.	MIR	CAP REPLACED	CAP CHECKED
Eimco 913	DE113	02B17621	07391		
	DE116	02B17913	07392		
	DE139	02B18072	09093		
	AMH-26	02B18158	07185		
	DE189	02B18028	07402		
Eimco 915	DE123	23C01966	07394		
	DE133	23C01891	07397		
Eimco 130	DE108	23C02978	07388		
	DE140	23C02880	07400		
	DE160	23C02846	07401		
6 CYL Domino Pet	DE015	U355579N	09012		
	DE017	U406256P	09205		
	DE057	916-62-02617	07384		
	DE134	916-62-02372	07398		
Domino Grader	DE132	916-42-01490	07396		
	DE138	U499546U	11030		
PJB MK4.5	DE019	ZB-519389	07382	SURFACE VEHICLE ONLY	
	DE020	U322973N	08063		
	DE021	U315590N	08205		
	DE022	U314939N8	08232		
	DE023	U315422N	08392		
	DE052	U406254P	09176		
	DE134	ZB-501840	10016		
	DE027	U510811U	11057		
	DE030	U510840U	11080		
	DE029	U510838U	11067		
	DE028	U510814U	11066		



NEWCREST GOLD MINE (ORANGE N.S.W)



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NEWCREST LHD LOADER



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ATLAS COPCO TRUCK EXHAUST SAMPLING



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NEWCREST TRANSPORT PORTAL 1 IN 3 INCLINE



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TRANSPORT PORTAL



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Diesel testing mobile lab



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DIESEL TESTING MOBILE LAB



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NATA CERTIFIED GAS MIXTURES



NEW GENERATION LHD LOADERS



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LHD ED10 LOADER



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JUG-A-O LHD LOADER



Domino Pet



Domino Pet



Diesel Man Car



Diesel Man Car



NEW PARTICULATE FILTER TYPE FOR LHDS



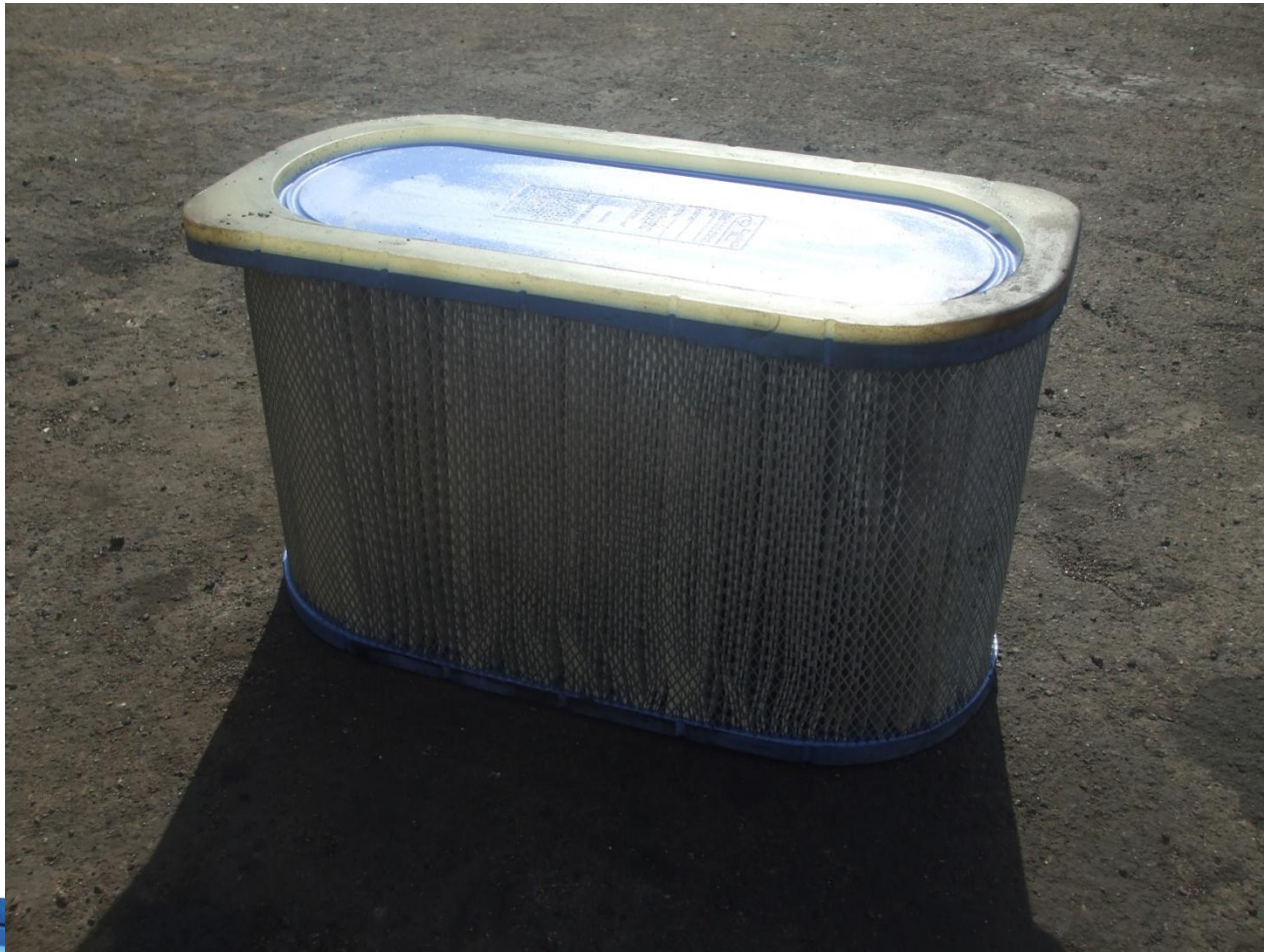
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TYPICAL PARTICULATE FILTER TYPE



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LHD PARTICULATE FILTER



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PARTICULATE FILTER ON 130 EIMCO LHD LOADER



JUG-A-O Particulate filter



Damaged Particulate filter (excessive heat)



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Damaged Particulate filter (excessive heat)



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***THANKYOU FOR
YOUR TIME***

Trevor Wilson

C.M.T.S

Direct contact 0417 557869



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