


Testing SMF diesel particulate filter in underground mining

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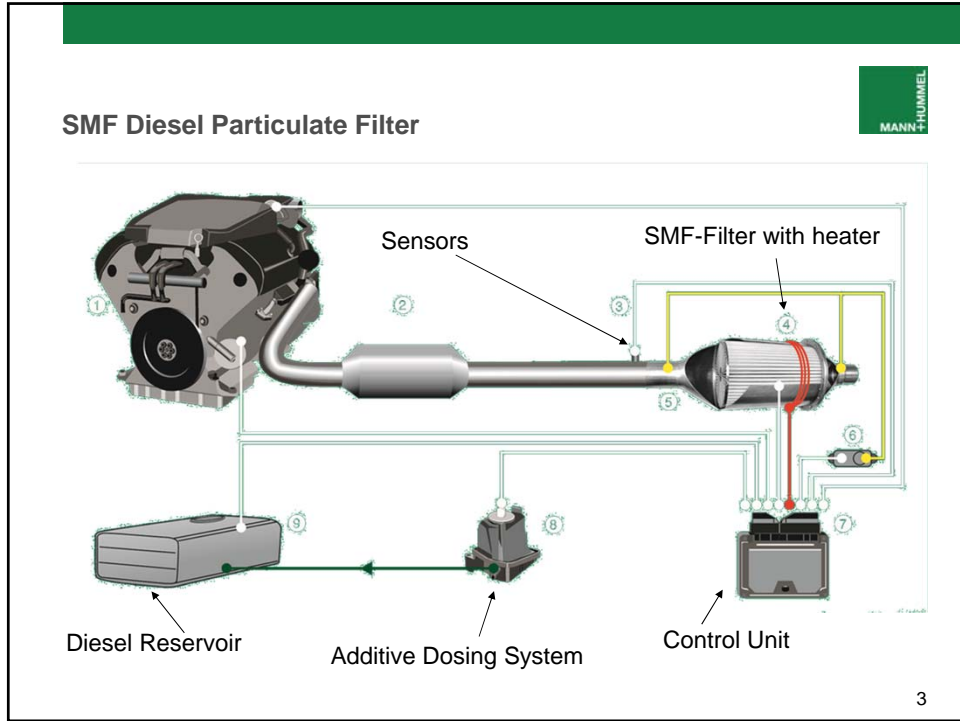
MDEC 2008



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Project History



- Kali+Salz has tested various DPF systems in the past
- Kali+Salz required an efficient system with long service intervals
- A GHH LHD (12.2) was selected for a 1,000 hour test
- Installation on 30. AUG 2007
- Final Report on 10. JAN 2008

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K+S System Requirements



- DPF must not increase NO and NO₂
- DPF resistant against salt dust in air
- Automatic regeneration during operation
- Long service interval min. 1,000 hours
- Ambient air temperature between 20 and 50°C (122 F max)

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System Description



Vehicle

- GHH Mining Loader with 25,848 registered operating hours
- Capacity: 4.8 m³ (170 cubic foot)
- Weight: 34,450 kg

Engine:

- Deutz F 12 L 413 FW (19.14 ltr. V)
- Power: 204 kW (273 HP) @2,300
- Cylinders: 12



Diesel Particulate Filter

- Dual SMF-FBC 8.1 m²
- 1 filter per engine bank
- Automatic Fe additive dosing

Test Results



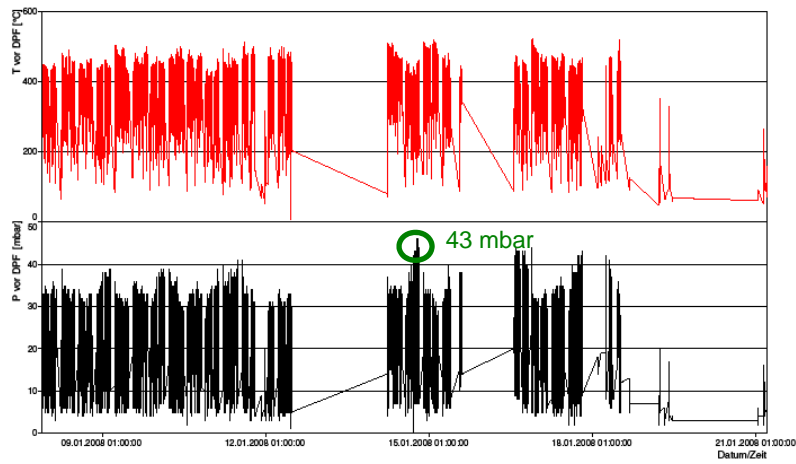
- 6 Samples were taken during load cycle of mining loader

<u>Average values</u>				
Measur. Cycle	RPM 1/min	p before mbar	T before °C	T after °C
1	1531	40,07	418	355
2	1461	40,57	429	382
3	1428	39,1	414	371
4	1434	37,15	410	371
5	1401	37,97	412	372
6	1355	37,45	412	377
gesamt:	1435	38,72	416	371

Test Results



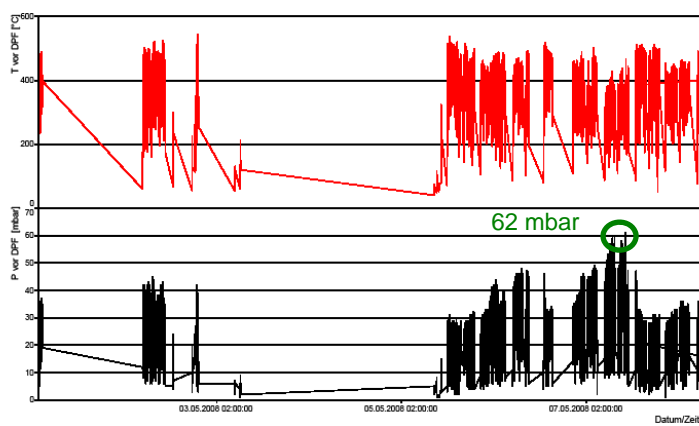
Upstream Temperature and Back pressure @ 1,114 operating hours

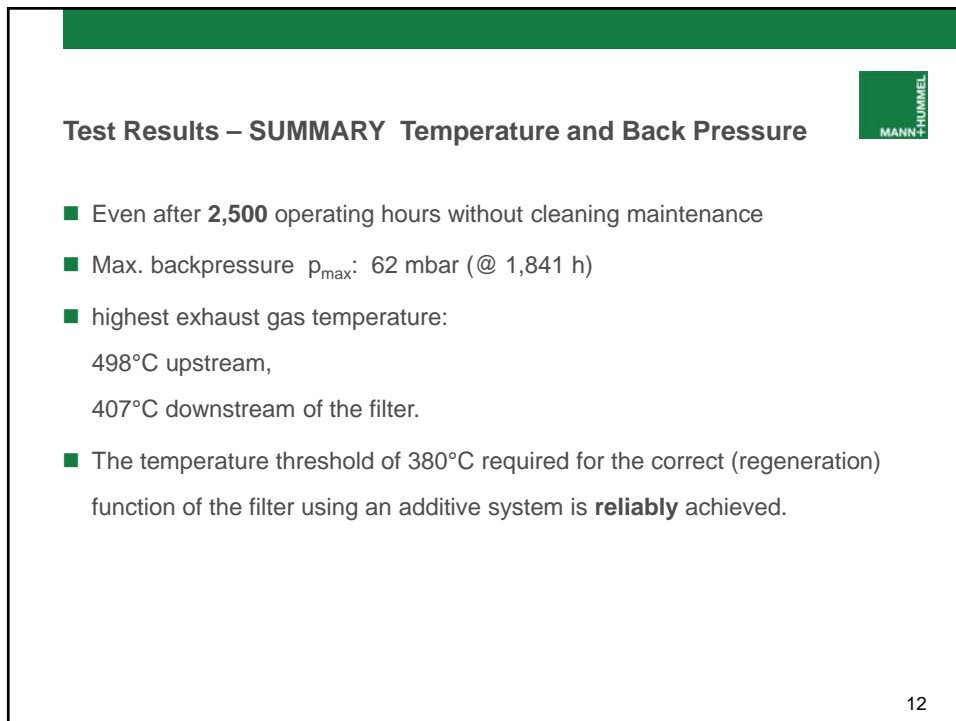
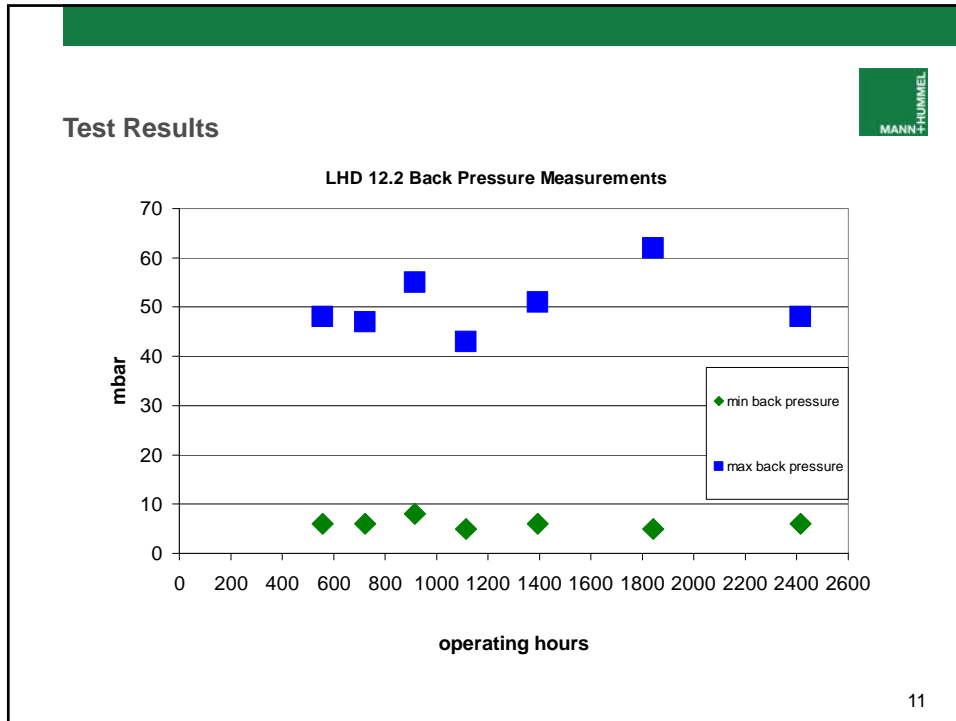


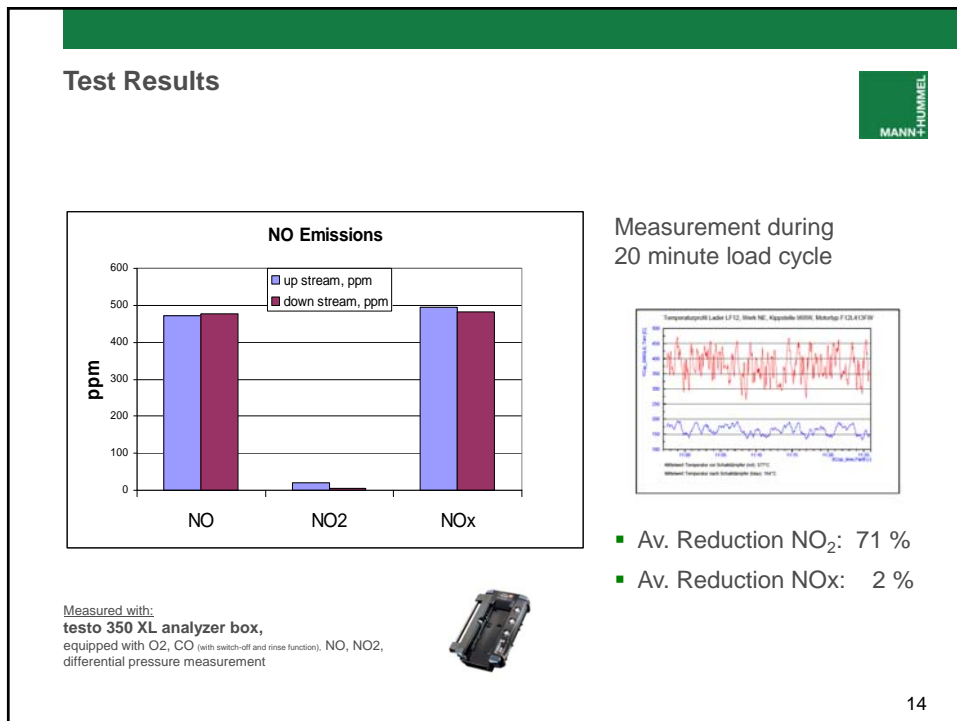
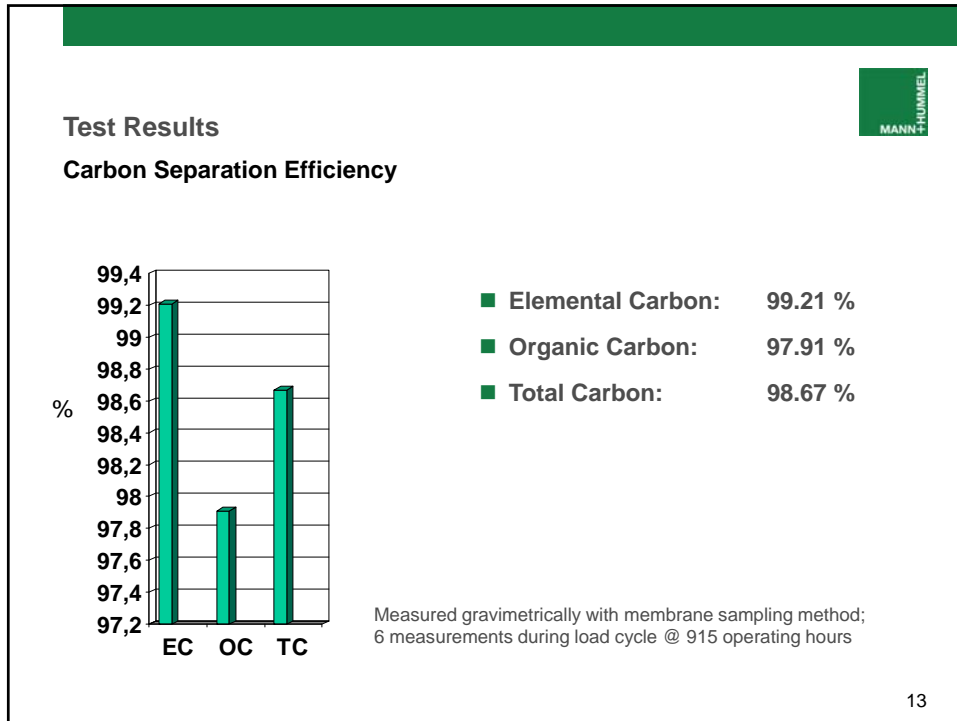
Test Results



Upstream Temperature and Back pressure @ 1,841 operating hours







Conclusion of Kali+Salz



- Increase average back pressure @ 1,841 h: 34 mbar only
- Separation Efficiency on Total Carbon: 98.67 %
- Reduction of NO₂
- After 2,500 hours no cleaning needed
- Reliable regeneration during operation

The FBC-SMF system installed by the company Mann-Hummel meets the requirements in all areas.

Test at CVRD INCO on Locomotive



Locomotive System Description



Vehicle

- Locomotive 368

Engine:

- Deutz; 60 kW (273 HP) @2,300

Diesel Particulate Filter

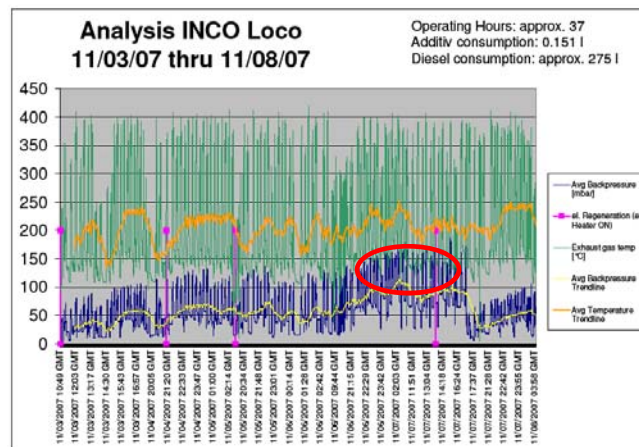
- Active SMF-AR 2.7 m²
- Automatic Fe additive dosing



Test Results



Reference at 37 h



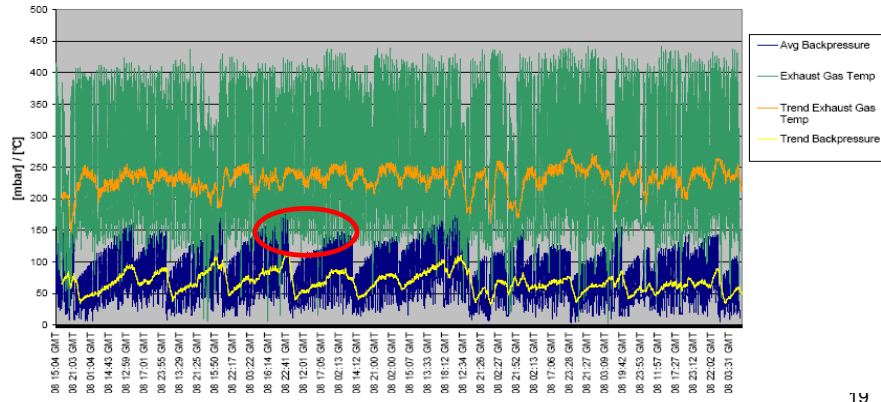
Test Results



9 months after installation, 1146 h

Analysis INCO Loco
05/26/08-06/20/08

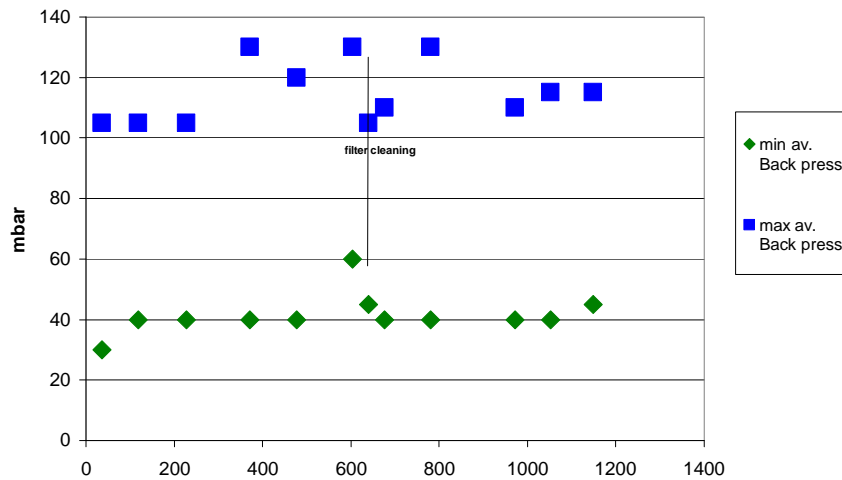
operating hours (approx)	162	Analysis Period	05/26/08 - 06/20/08	since installation	on 09/21/07
Additive consumption [l]	0.528				1148
Diesel consumption (calculated on 28ppm) [l]	1284				6,513
Backpressure [mbar] min/max/avg	3 / 193 / 68				10108
Exhaust Gas Temp [°C] min/max/avg	30 / 441 / 231				2 / 220 / 73
Diesel consumption 05/26/08 - 06/20/08 [l]	700				28 / 450 / 223
Filter cleaned / replaced after approx. 530 operating hours on 02/15/08					
Filter replaced / ECU replaced after approx. 677 operating hours on 04/03/08					
Operating hours filter element:	1003				



Test Results



Locomotive Back Pressure curves



Locomotive Conclusion



- Low exhaust gas temperature between
150 and 400°C (302 - 752 F)
- Average Back Pressure between
30 and 130 mbar (0.88 – 3.83 inch mercury)
- Reliable regeneration of the SMF- filter

Thank you

Vielen Dank



for your interest
für Ihr Interesse

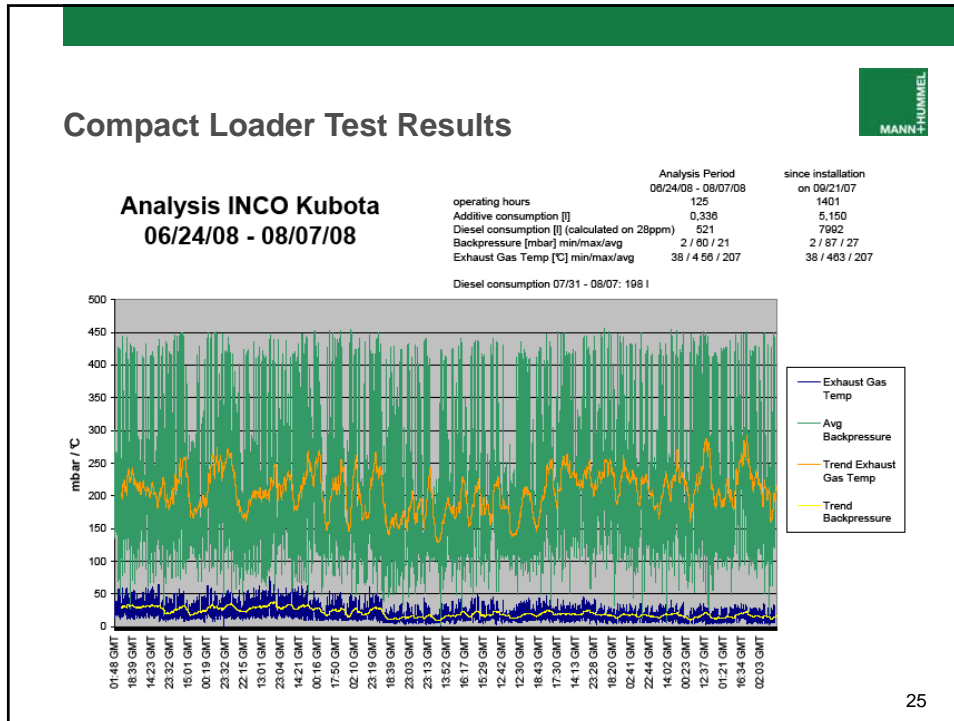





BACK UP

Test at CVRD INCO on 37 kW Compact Loader





- ### Compact Loader Test Results
- 
- Exhaust gas temperature between 80 and 450°C (176 - 842 F)
 - After 1.400 operating hours Max Average Back Pressure: 45 mbar
 - Reliable regeneration of the SMF- filter
 - Only 5 liter additive within 10 months (on 7.992 liter diesel)
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MANN+HUMMEL Group



MANN+HUMMEL Group:

- 9,300 Employees on 41 sites
- Turnover Total 1,35 Mrd. Euro
- 3 Business units

OEM Automotive - UBA	Filter elements and Systemes Industry und Dealer - UBS	Industrie Facilities and Components- UBI
Air filter	Cabin air filter Aftermarket	ProTec
Systems	Industrial filter (w/ Hydromatation)	
Liquid filtration		
Components		

Installation at KALI+SALZ

