McGinn | Integration

Exhaust Aftertreatment Technologies in Metal / Nonmetal Mines

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NvMA / NIOSH / MSHA DPM Workshop

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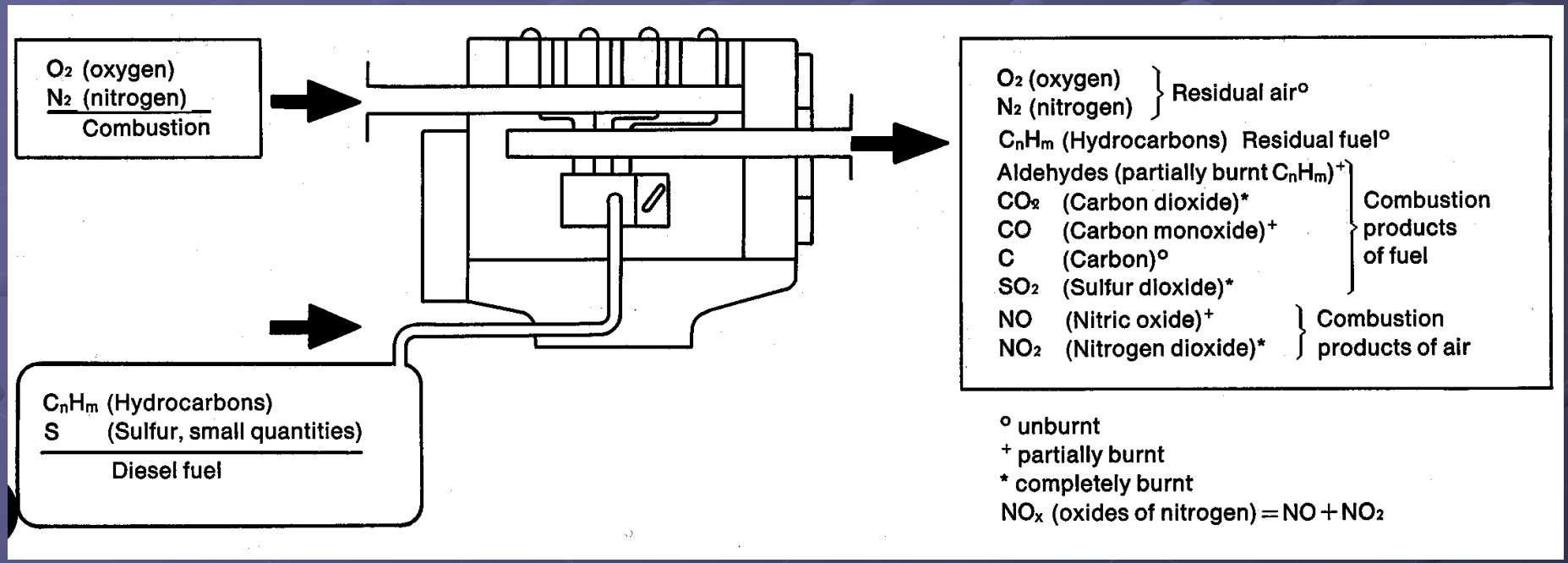
Managing and Maintaining Emission Controls

- Understand
- Identify
- Measurement
- Interpretation
- Act on Facts

Diesel Emissions Formation



Deutz AG

Reduction by Technology

	Typical Emission Reductions (%)				
Constituent	**DOC**	**DPF**	**CDPF**	**SCR**	**Water Scrubber**
CO2	0	0	0	0	0
CO	60 - 80	0	60 - 80	0	0
HC	60 - 80	0	60 - 80	0	0
NO	0	0	0	60 - 80	0
NO2	0 or increase	0	0 or increase	60 - 80	0
SO2	0	0	0	0	0
DPM	20 - 30	85 - 95	85 - 95	0	20 - 30

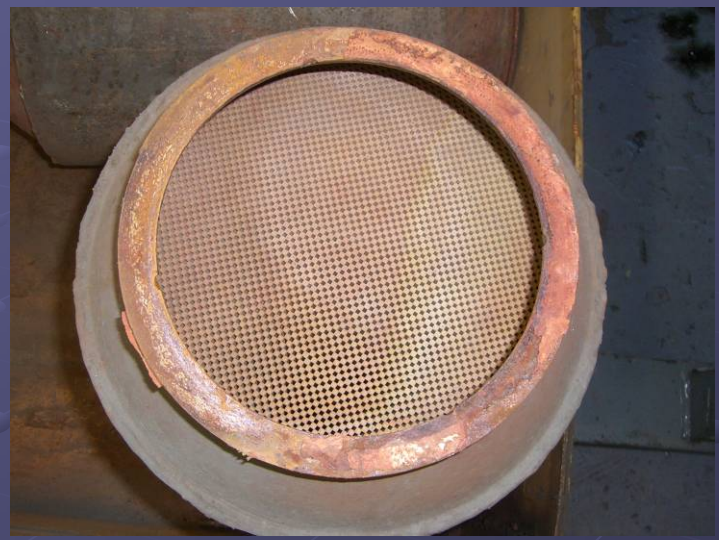
- DOC = Diesel Oxidation Catalyst
- DPF = Diesel Particulate Filter
- CDPF = Catalyzed Diesel Particulate Filter

Identification - External

- DOC's can be housed alone, built into a muffler body or put in series with a muffler
- DPF's are generally larger and more complex systems than DOC's

Identification - Internal

DOC



DPF

Flow Through Filter

Measurement

Measurement

Measurement System = Method / Mechanic + Instrument

Measurement System Must Be Precise – Mechanics and Method

Measurement System Must Be Accurate - Instrument

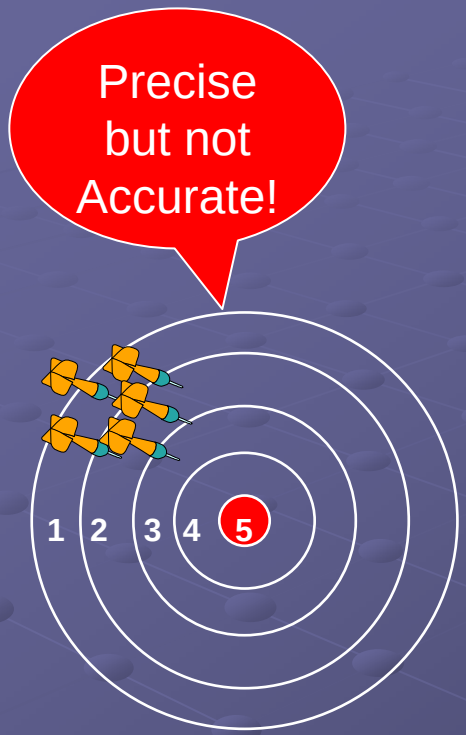
PRECISION

- Repeatability – is the variability when repeated measurements are made on the same machine under identical conditions – one operator
- Reproducibility - is the variation when different conditions are used to make measurements – more than one operator

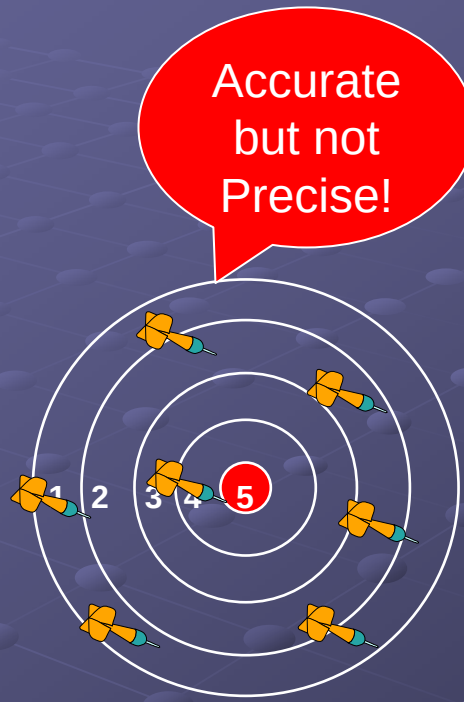
ACCURACY

- Bias – is the difference between the average of the measurements and the true actual average – calibration
- Linearity – is the difference in accuracy over the full instrument range - calibration
- Stability – is the difference in accuracy over time - calibration

Measurement



Instrument Error



Process / Mechanic Error

Measurements you can make good decisions with!

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TORO

40D

Interpretation - DOC

Series 60 12.7 L – 475 HP

Diesel Oxidation Catalyst

Hi Idle 2190 Trans Stall 1863 **RPM**

	INLET	OUTLET	
CO	65	12	**ppm**
NO	628	493	**ppm**
NO_2	19	114	**ppm**
O_2	11	11	**%**
CO_2	7	7	**%**
TGas	768	736	**°F**

Turbo Boost Press	28	**psi**
Intake Restriction	7	**inches water**
Backpressure	10	**inches water**
Fuel Pressure	65	**psi**

Interpretation - DOC

1HZ – 128 HP

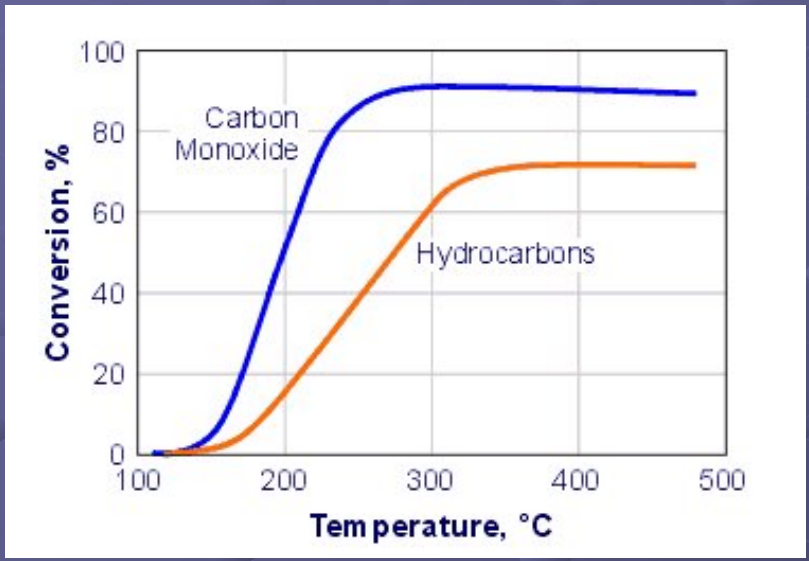
Diesel Oxidation Catalyst

Hi Idle 4200 **RPM**

	INLET	OUTLET	
CO	852	771	**ppm**
NO	103	149	**ppm**
NO_2	49	4	**ppm**
O_2	16.2	15.9	**%**
CO_2	3.5	3.7	**%**
TGas	407	286	**°F**

Intake Restriction	4	**iwg**
Backpressure	74	**iwg**

Interpretation - DOC



- Understand your application – what do you need to accomplish?
- Benefits vs Drawbacks
- “Glass full of water” analogy
- DOC’s are beneficial on some applications but are **NOT** for **EVERY** diesel engine working U/G

Interpretation - DPF

Hi Idle 2190 Trans Stall 2044 Trans+Hyd Stall 1710 **RPM**

ST8B

Series 60 11.1 L – 325 HP

Diesel Particulate Filter

	INLET	OUTLET	
Smoke #	9	6	**Bacharach**
CO	87	77	**ppm**
NO	553	545	**ppm**
NO_2	22	27	**ppm**
O_2	11	11	**%**
CO_2	7.1	7.3	**%**
TGas	822	743	**°F**

Turbo Boost Press	20	**psi**
Intake Restriction	9	**inches water**
Backpressure	95	**inches water**

Interpretation - CDPF

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0010

Hi Idle	2175	Trans Stall	2060	Trans+Hyd Stall	1600	RPM

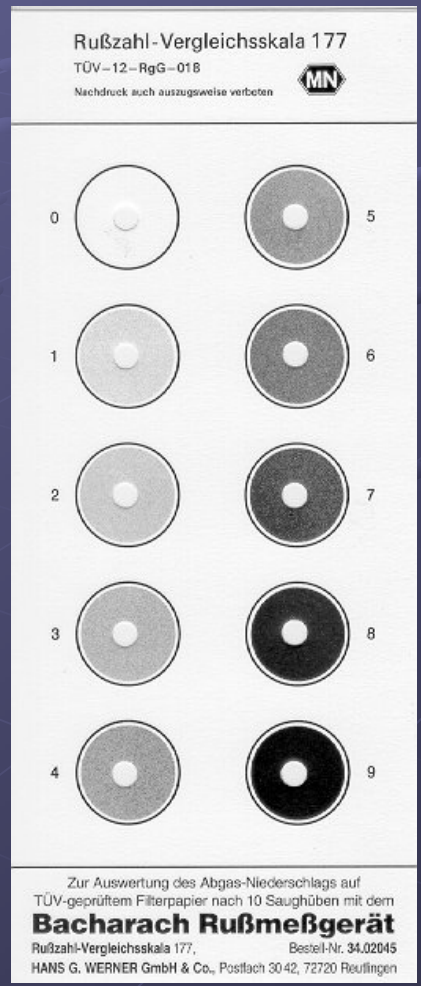
Series 60 12.7 L – 400 HP

Diesel Particulate Filter

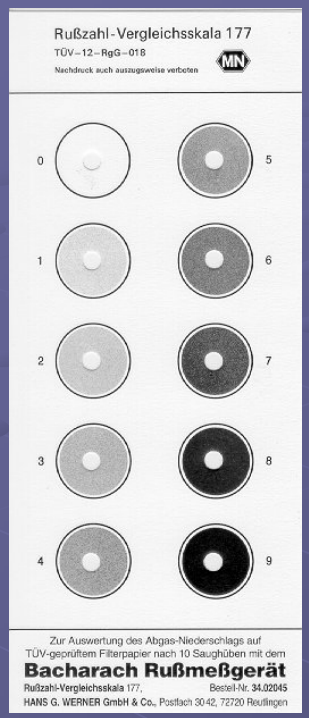
	INLET	OUTLET	
Smoke #	9	0	Bacharach
CO	550	28	ppm
NO	841	612	ppm
NO_2	25	149	ppm
O_2	11.3	11.6	%
CO_2	7.4	7.6	%
TGas	870	757	°F

Turbo Boost Press	25	psi
Intake Restriction	4	inches water
Backpressure	90	inches water

Interpretation - DPF



Interpretation - DPF



- Understand filtration efficiency
- Understand backpressure
- Know when to clean and when to discard
- Watch for NO_2 slip

Cleaning - DPFs

Cleaning - DPFs

Managing and Maintaining Emission Controls

- Understand – the what and how of control
- Identify – what you are dealing with
- Measurement – precision and accuracy
- Interpretation – what the numbers tell you
- Act on Facts – decisions by the numbers

THINK SAFETY AT EVERY STEP!