

NRMM retrofit and emission reduction system certification

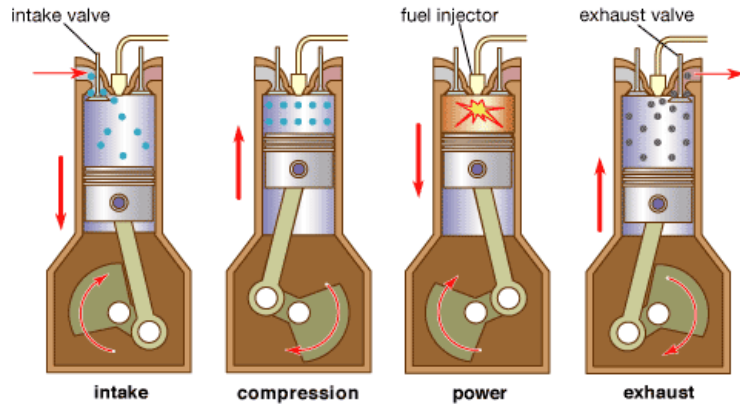
**NRMM Seminar
King's College
London
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Emissions formation – diesel engine combustion



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in

out



PM formed when fuel droplets are exposed to high temperatures with lack of local oxygen for combustion

NOx formed when oxygen reacts with Nitrogen at high combustion temperatures

Engine emissions testing

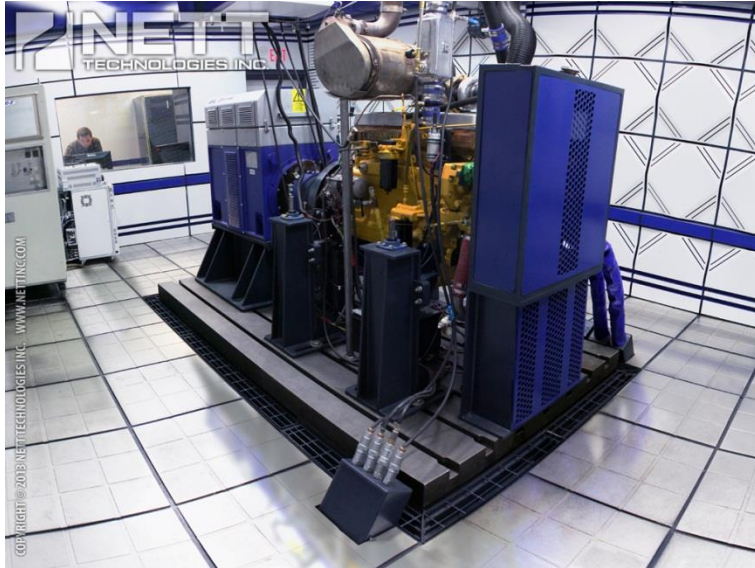


Table 2
Stage III A/B Emission Standards for Nonroad Diesel Engines

Cat.	Net Power	Date †	CO	HC	HC+NOx	NOx	PM
	<i>kW</i>						
Stage III A							
H	$130 \leq P \leq 560$	2006.01	3.5	-	4.0	-	0.2
I	$75 \leq P < 130$	2007.01	5.0	-	4.0	-	0.3
J	$37 \leq P < 75$	2008.01	5.0	-	4.7	-	0.4
K	$19 \leq P < 37$	2007.01	5.5	-	7.5	-	0.6
Stage III B							
L	$130 \leq P \leq 560$	2011.01	3.5	0.19	-	2.0	0.025
M	$75 \leq P < 130$	2012.01	5.0	0.19	-	3.3	0.025
N	$56 \leq P < 75$	2012.01	5.0	0.19	-	3.3	0.025
P	$37 \leq P < 56$	2013.01	5.0	-	4.7	-	0.025

† Dates for constant speed engines are: 2011.01 for categories H, I and K; 2012.01 for category J.

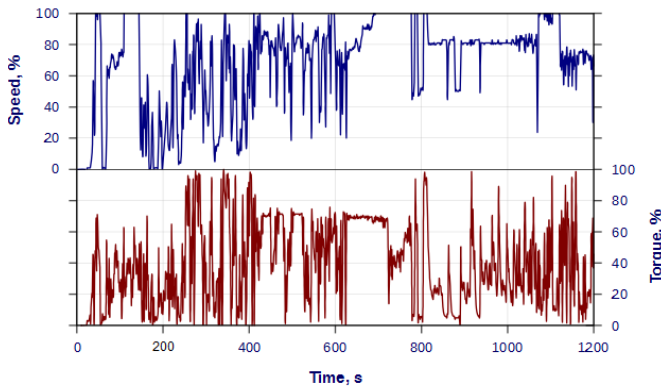


Figure 1. Normalized Speed and Torque over NRTC Cycle

Table 3
Stage IV Emission Standards for Nonroad Diesel Engines

Cat.	Net Power	Date	CO	HC	NOx	PM
	<i>kW</i>					
Q	$130 \leq P \leq 560$	2014.01	3.5	0.19	0.4	0.025
R	$56 \leq P < 130$	2014.10	5.0	0.19	0.4	0.025

How much pollution comes from construction?

Emission limits PM

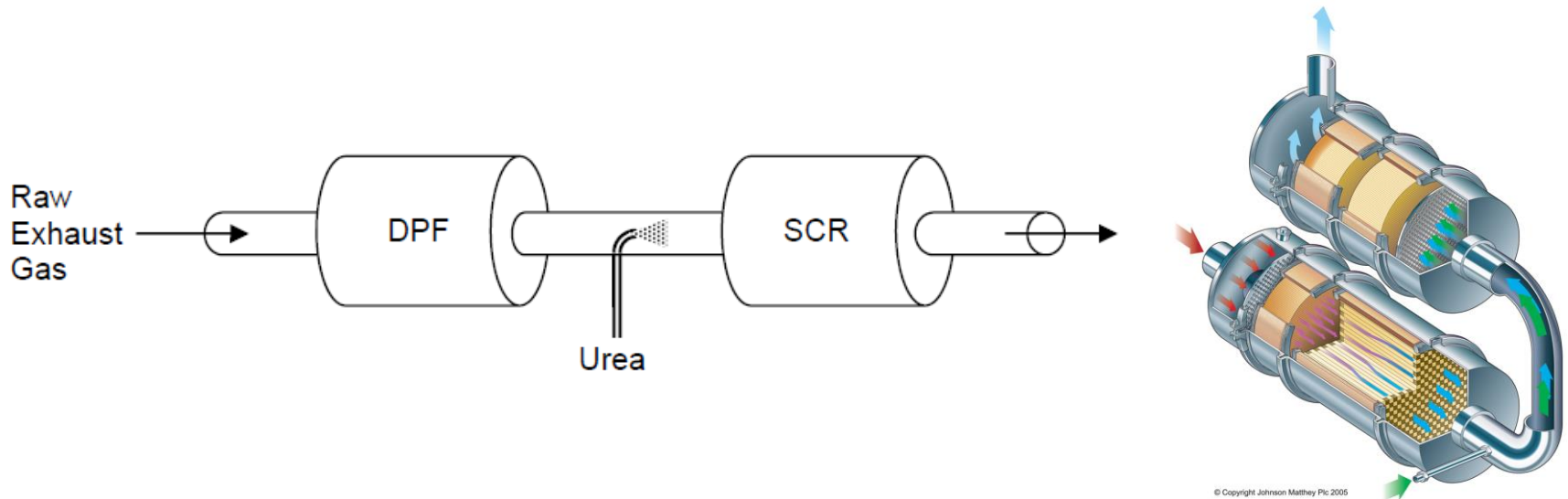
Euro IV truck/bus (LEZ compliant) = 0.02g/kWh

Stage IIIA Excavator = 0.30g/kWh



Retrofit as a compliance option

NOx reduction – Selective Catalytic Reduction (SCR)



NOx reacts with ammonia over the catalyst and reduces it to nitrogen and water



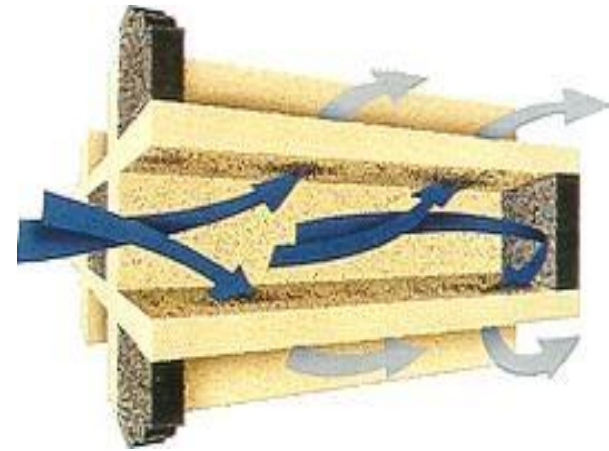
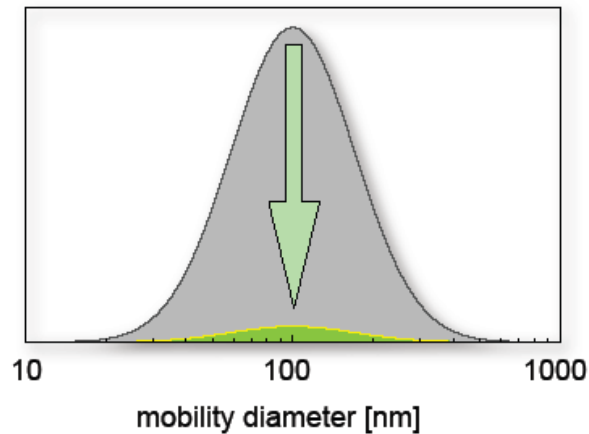
Secondary emissions of nitrous oxide and ammonia need to be controlled

Unfortunately not very well developed for the NRMM sector..... yet!

Retrofit as a compliance option

PM reduction – Diesel Particulate Filter

Mass: -95%
Number: -95%



Trapped carbon particulate oxidised to CO₂ at high temperatures

Fortunately very well established for the NRMM sector

Emission reduction system certification



The reasons for certification

Major construction projects have an aim to reduce their impact on the local environment e.g. Crossrail

- Reduce local air quality impact by setting requirements
- Retrofit of NRMM as a compliance option
- Creating a market opportunity for retrofit system suppliers

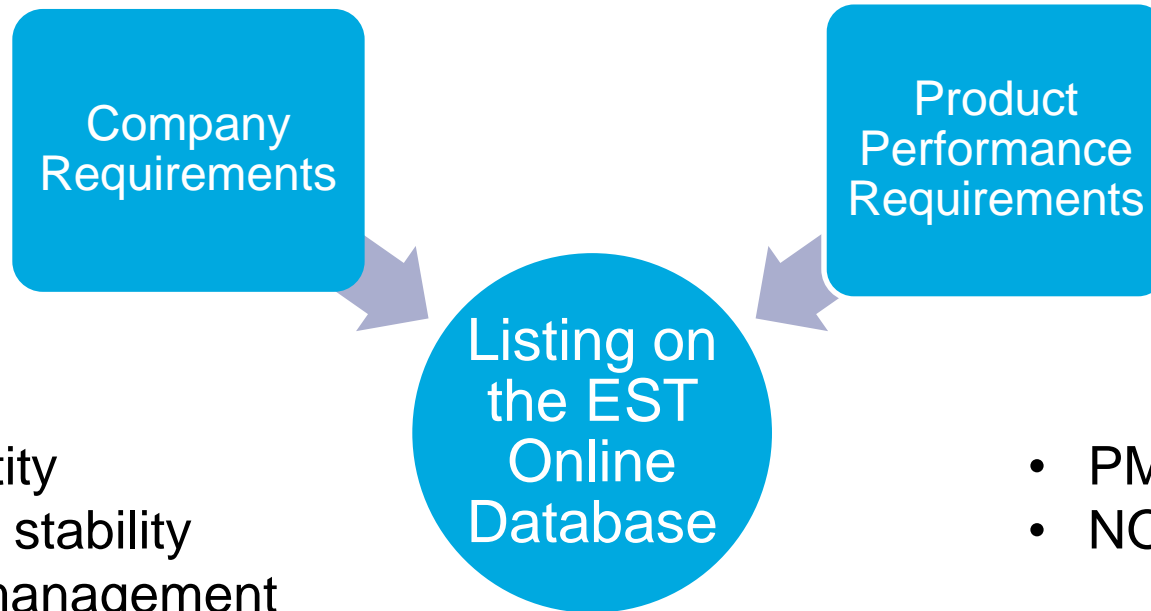
A need for an assurance scheme to

- support the project delivery body
- help contractors choose wisely
- differentiate suppliers of DPFs

The **EST Endorsed Product** scheme was designed for this purpose

EST Endorsed Product - certification of emission reduction systems for NRMM

A list of suppliers and products that meet the requirements of the scheme



- Legal entity
- Financial stability
- Quality management
- Insurance cover
- Warranty provision
- Licensing agreements

- PM reduction
- NO₂ “slip”

Companies certified by EST



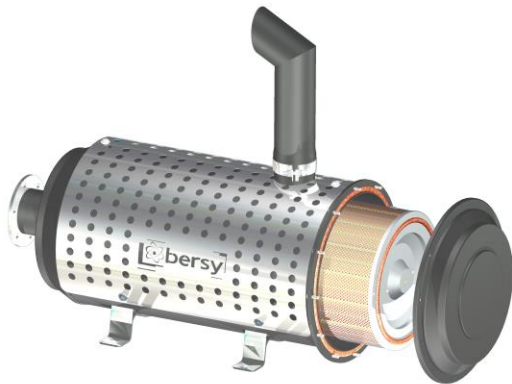
Eminox



AGRIEMACH LTD

Smarter, Safer, Greener

Emission reduction systems certified by EST



What to look for when out on site?

- Before going on site check out the NRMM Site and Machinery Register
- Machinery inventories and the degree of understanding of policy by site personnel
- Machinery with visible emissions of soot
- Engine type approval plates to determine the level of compliance
- The logos of EST listed suppliers on exhaust systems
- Certificates of installation with dates



This not this!



Thank you for your attention

