

NRMM retrofit and emission reduction system certification

**London Low Emission
Construction Partnership - NRMM
Seminar
City Hall - London
Friday 3rd February 2017**

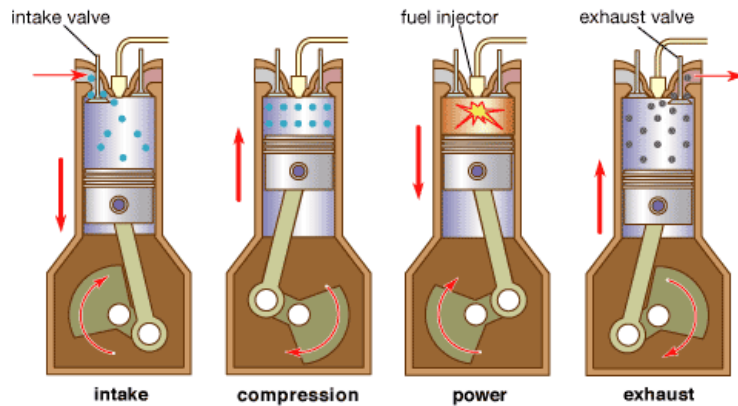


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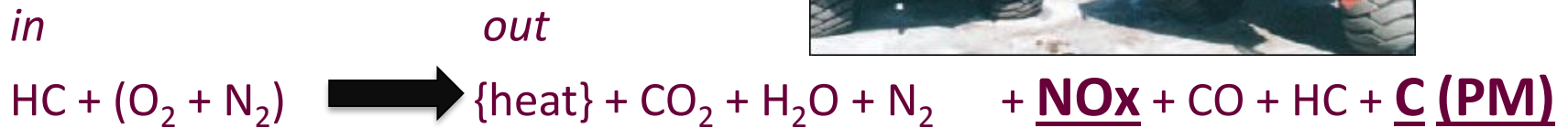
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**endorsed
product**

Emissions formation – diesel engine combustion



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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

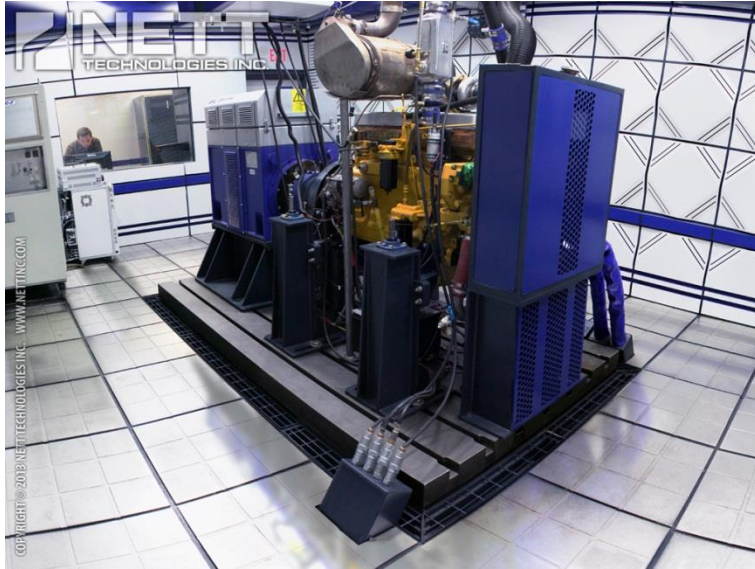


Table 2
Stage III A/B Emission Standards for Nonroad Diesel Engines

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

Table 3
Stage IV Emission Standards for Nonroad Diesel Engines

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

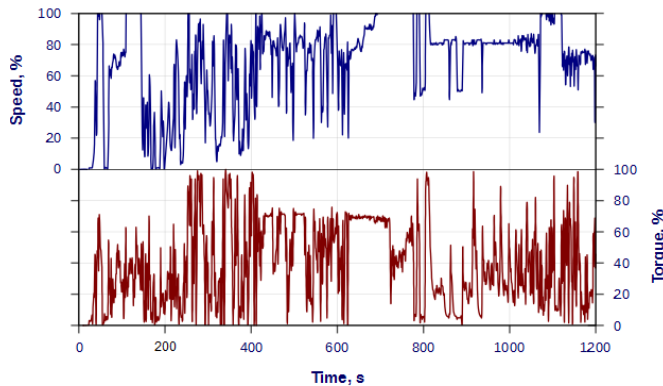


Figure 1. Normalized Speed and Torque over NRTC Cycle

How much pollution comes from construction?

Emission limit for Particulate Matter (PM)

Euro IV truck/bus (LEZ compliant) =

0.02g/kWh

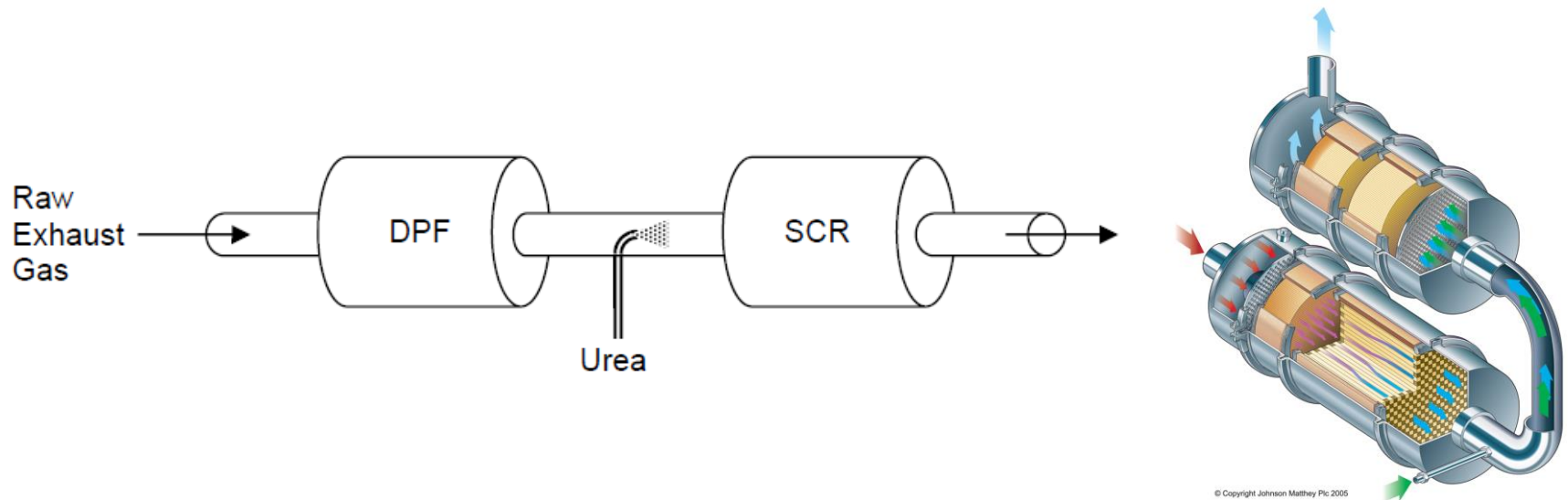
Stage IIIA Excavator (NRMM LEZ Greater London) =

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

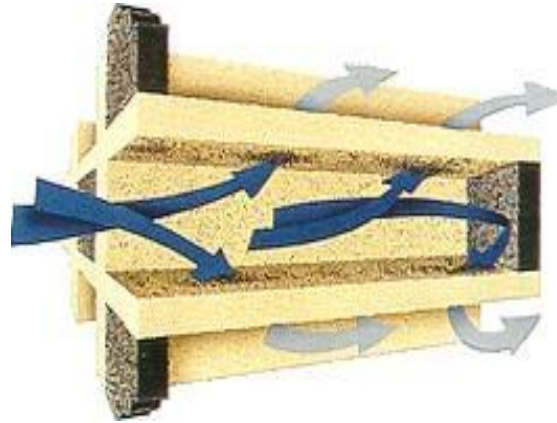
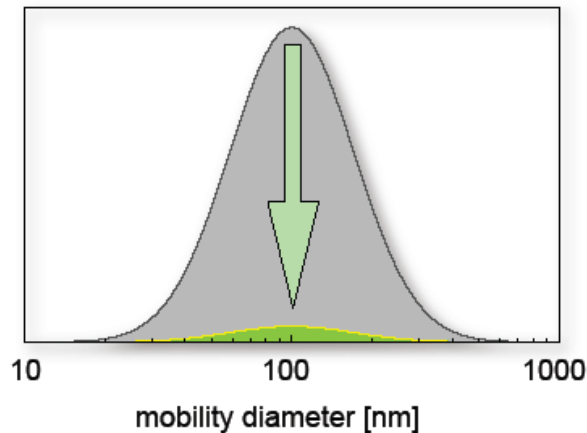
Unfortunately not very well developed for the NRMM sector..... yet!

Retrofit as a compliance option

PM reduction – Diesel Particulate Filter (DPF)

Mass: -95%

Number: -95%



Trapped carbon particulate oxidised to CO_2 at high temperatures



Fortunately very well established for the NRM 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. HS2

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

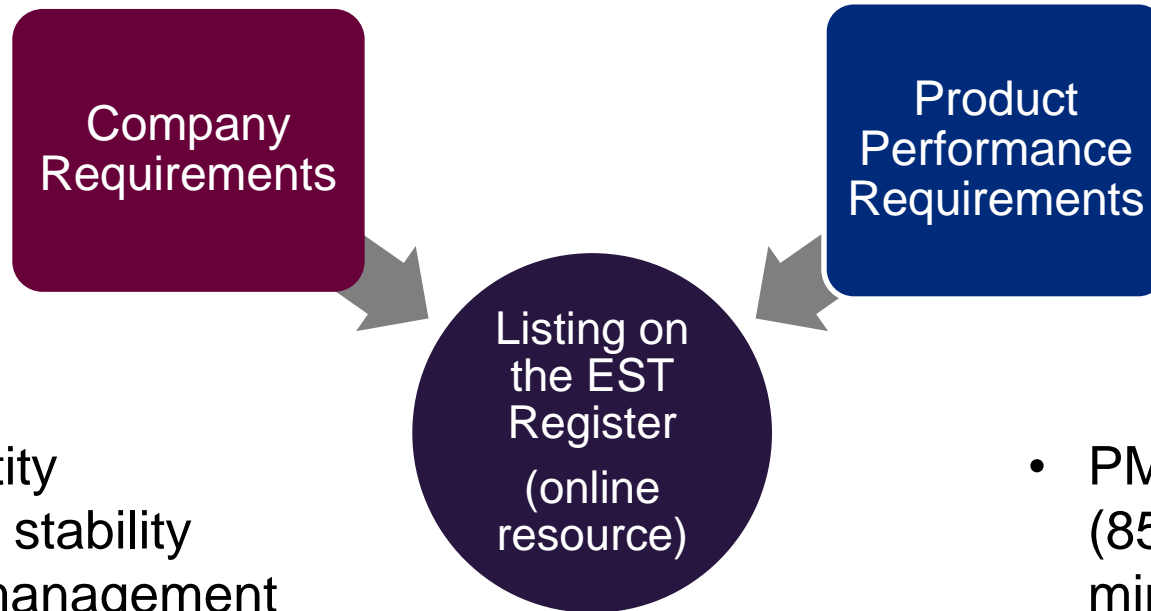
A need for an assurance scheme to help

- support the project delivery body
- contractors choose wisely
- differentiate suppliers of emissions reduction systems

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

EST Endorsed Product - certification of emission reduction systems for NRMM

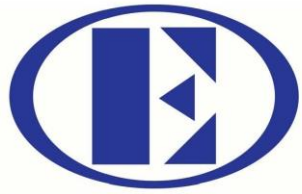
A list of suppliers and products that meet the requirements of the scheme



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

- PM reduction (85% minimum)
- NO₂ “slip”

Companies certified by EST



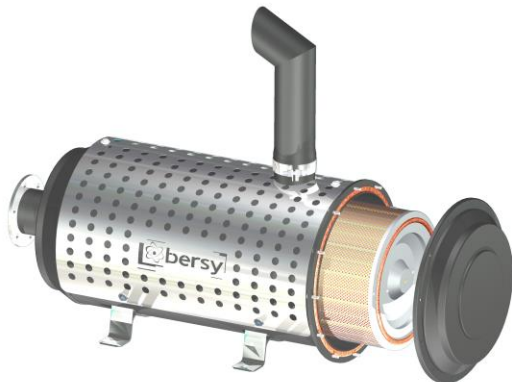
Eminox



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



LONDON LOW EMISSION
CONSTRUCTION PARTNERSHIP

This

... not this!



Example area of interest

- Generators

- Generators generally use constant speed engines
 - Currently enjoy an exemption
- Engines are subject to less stringent emission regulations
- Generators tend to be over sized due to “just in case” and “what’s available”
 - Leading to engines running at low loads and inefficiently
 - Higher emissions than necessary
 - Emission control systems struggle to work

Potential solution

- Correctly size the generator
- Use generators with variable speed engines, hybrid or energy storage capability



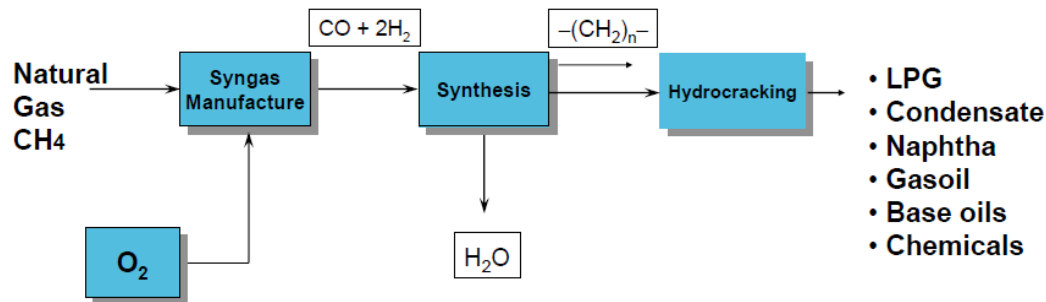
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Example area of interest

- Paraffinic diesel fuels (e.g. GTL or HVO)

- “Gas to Liquid” fuels or “hydrotreated vegetable oil”
- Use of paraffinic diesel may reduce emissions of PM and NOx
- Will not be enough to get from one stage level to the next on its own
- A best practice that may help with emission reduction



Awaiting definitive test data



Thank you for your attention

