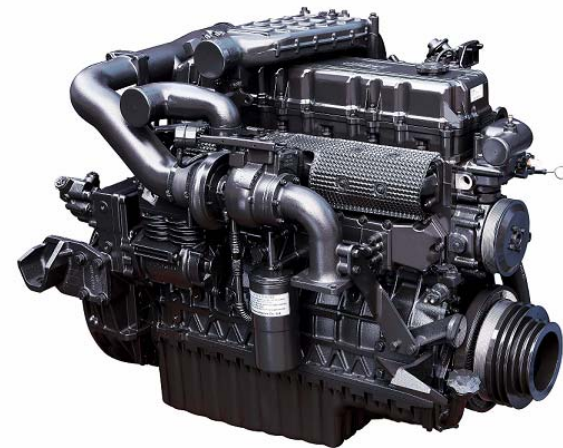




Doosan Infracore  
Engines & Materials



# DL08 S Engine service training

Customer Satisfaction Team  
2008. 9.22

# **Contents**

- 1. Common Rail System**
- 2. Common Rail Engine**
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- 5. Common Rail**
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- 7. Sensors**
- 8. Valve Gap Adjusting & Maintenance**
- 9. SCR System**
- 10. Fault Code**
- 11. Trouble Shooting**

# 1. Common Rail System

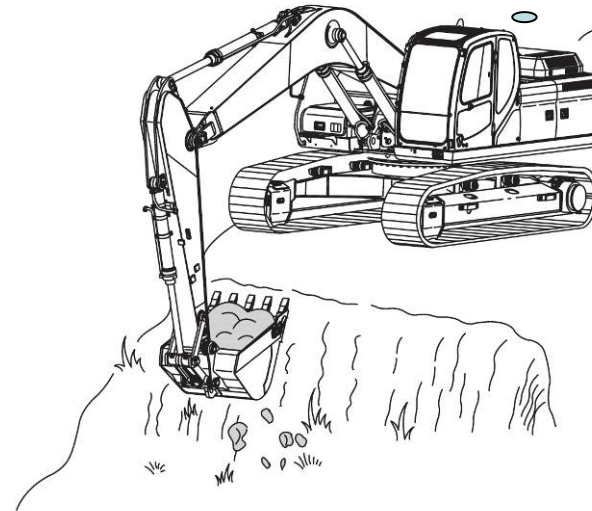
**DL08 S/DV11 S  
(Euro-3,4)**

## Issues of Diesel Engine

- Nitric oxide (NO<sub>x</sub>)
- Particulate matter (PM)
- Power density
- Noise
- .....

**Emission  
Regulation**

NO<sub>x</sub>, PM, ...



## Emission Regulation (EU) - 1

### Off-Road Engines

(g/kWh)

Net Power kW(HP)		Regulation	Effective from	CO	HC	NOx	PM	Engine
75 (100)	130 (175)	Stage2	Jan. 2003	5.0	1.0	<b>6.0</b>	<b>0.3</b>	DB58TIS
		Stage3A	Jan. 2007	5.0	<b>4.0</b>		<b>0.3</b>	DL06
		Stage3B	Jan. 2012	5.0	0.19	<b>3.3</b>	<b>0.025</b>	
		Stage4	Oct. 2014	5.0	0.19	<b>0.4</b>	<b>0.025</b>	
130 (175)	560 (750)	Stage2	Jan. 2002	3.5	1.0	<b>6.0</b>	<b>0.2</b>	DE08TIS, DE12TIS
		Stage3A	Jan. 2006	3.5	<b>4.0</b>		<b>0.2</b>	DL08, DV11
		Stage3B	Jan. 2011	3.5	0.19	<b>2.0</b>	<b>0.025</b>	
		Stage4	Jan. 2014	3.5	0.19	<b>0.4</b>	<b>0.025</b>	

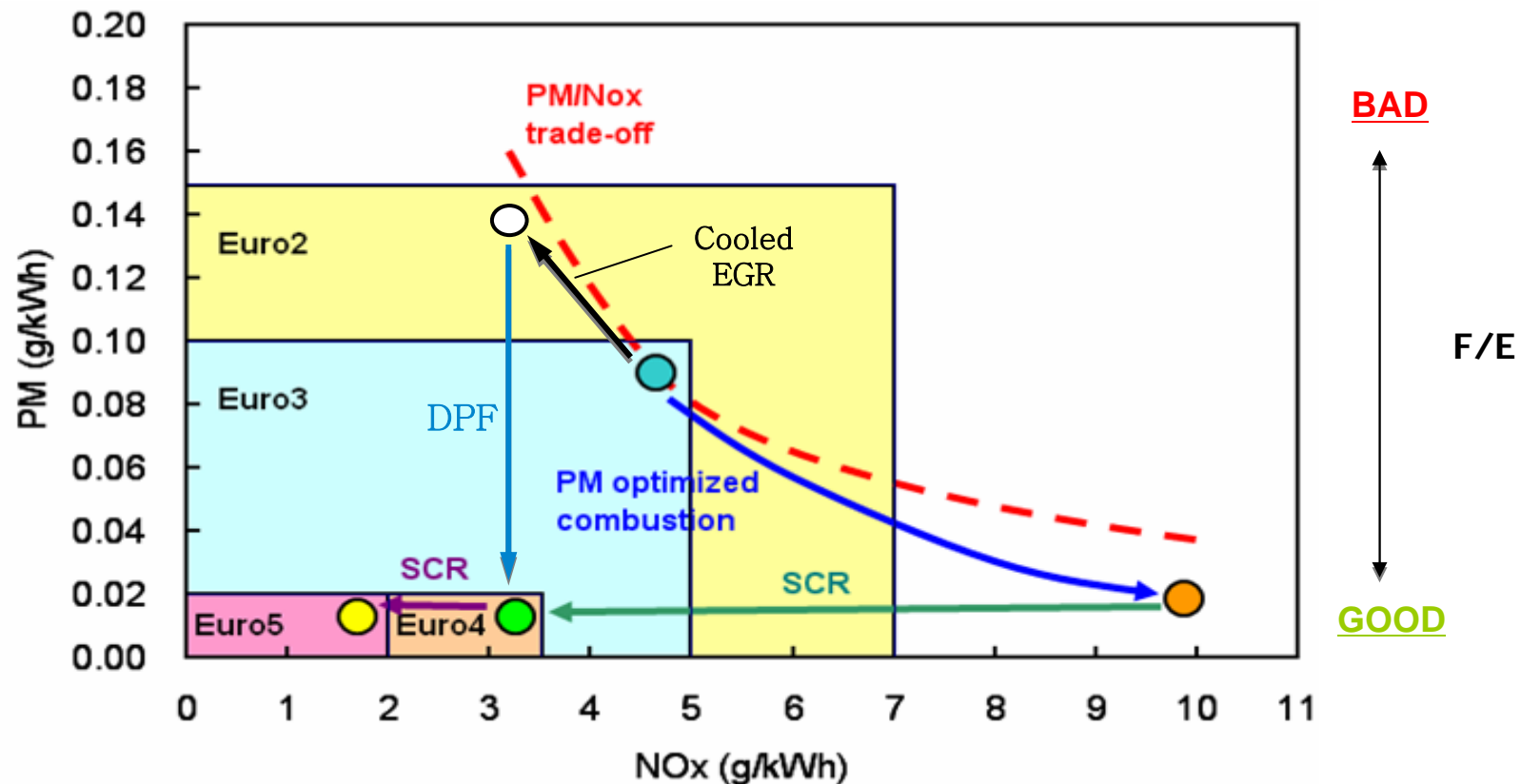
### On-Road Engines (Heavy Duty)

(g/kWh)

Regulation		Effective from	CO	HC	NOx	PM	Engine
Euro-3		Oct. 2000	2.1	0.66	<b>5.0</b>	<b>0.10</b>	DL06/DL08/DV11
Euro-4		Oct. 2005	1.5	0.46	<b>3.5</b>	<b>0.02</b>	DL06 S/DL08 S/DV11 S
Euro-5		Oct. 2008	1.5	0.46	<b>2.0</b>	<b>0.02</b>	

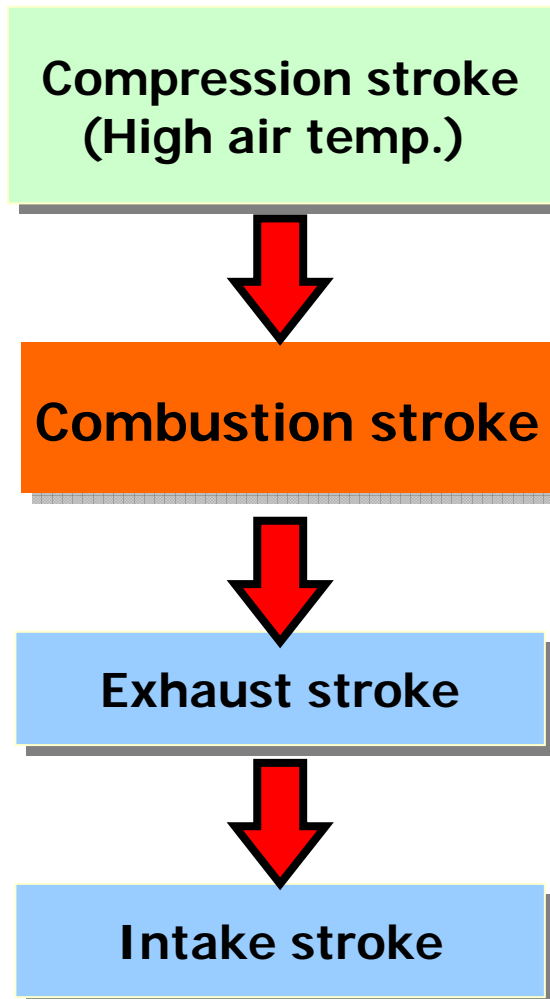
## Emission Regulation (EU) - 2

To meet EURO-4 / EURO-5 emission standard, use SCR or EGR + DPF system

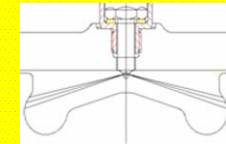


- SCR : Selective Catalytic Reduction
- EGR : Exhaust Gas Recirculation
- DPF : Diesel Particulate Filter

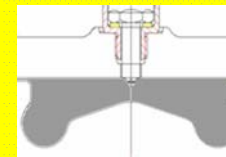
## Diesel engine combustion process



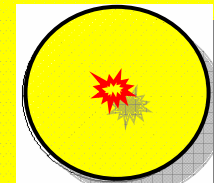
### 1. Fuel injection



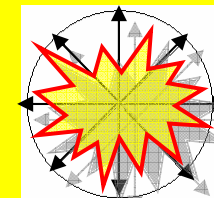
### 2. Fuel evaporate and mix air → Ignition delay



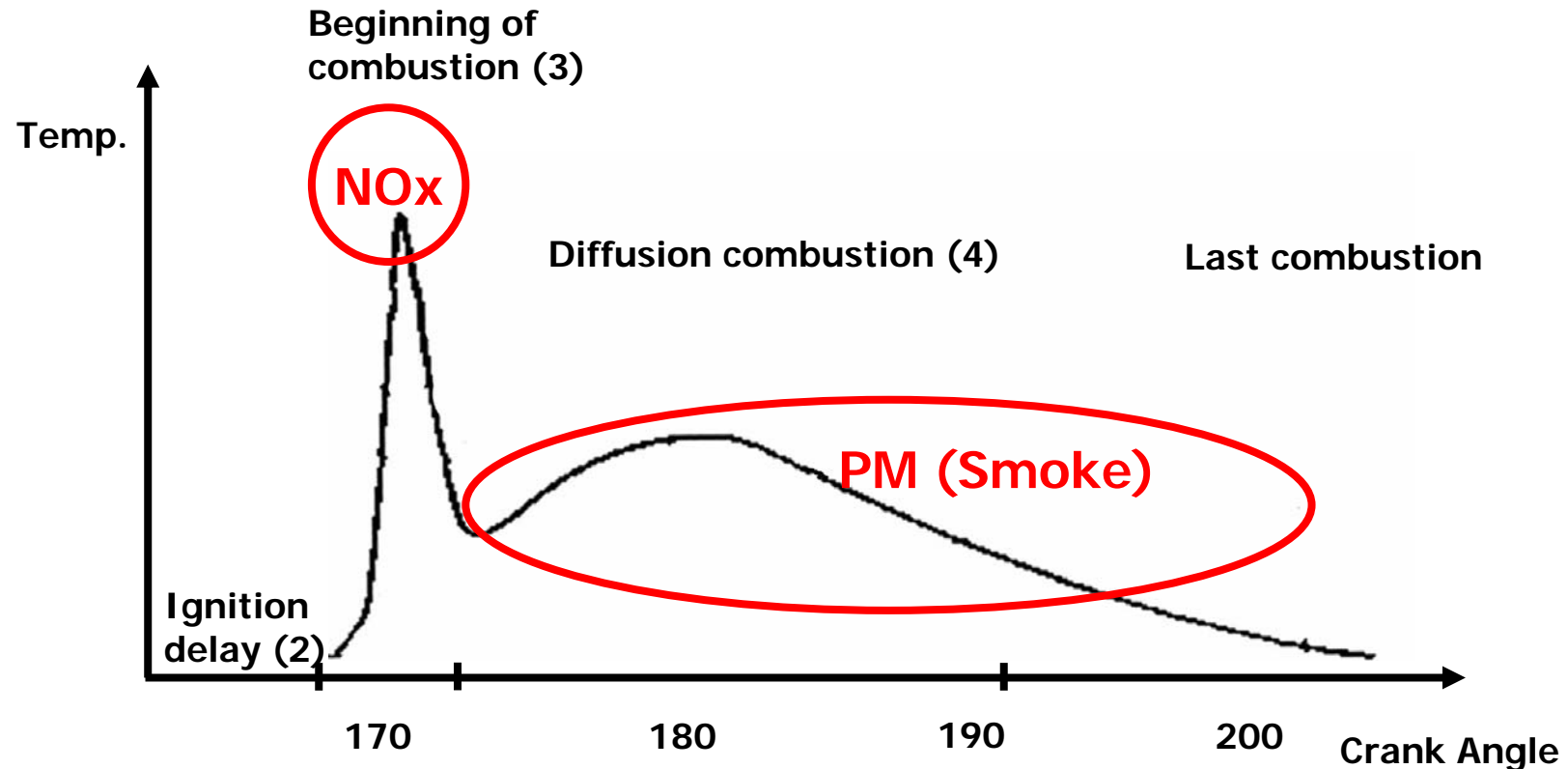
### 3. Combustion → Beginning of combustion



### 4. Diffusion combustion



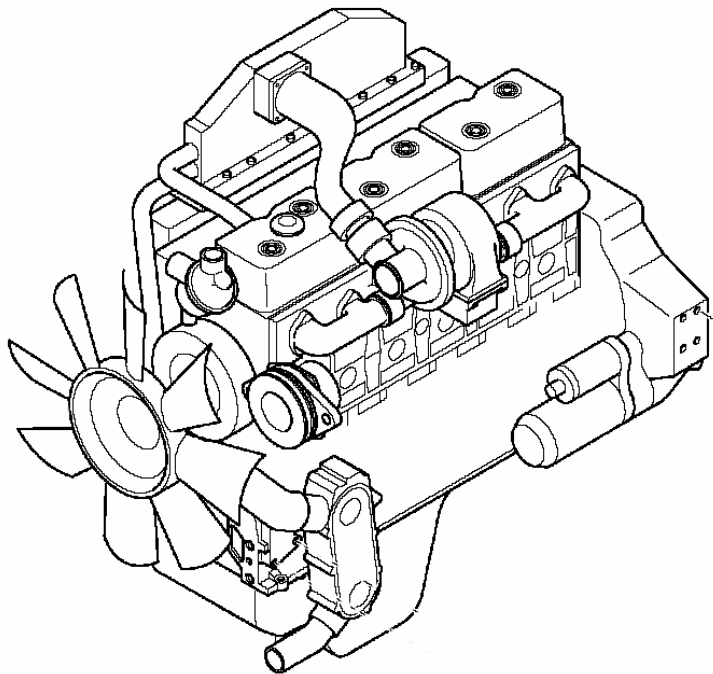
## Rate of heat release diagram



- To reduce NOx      **Combustion temperature ▼**
  - Common rail system : Pilot injection, EGR
- To reduce Smoke    **Fuel injection pressure ▲ (for perfect combustion)**
  - Common rail system : Fuel atomization



## Mechanical Fuel Injection System

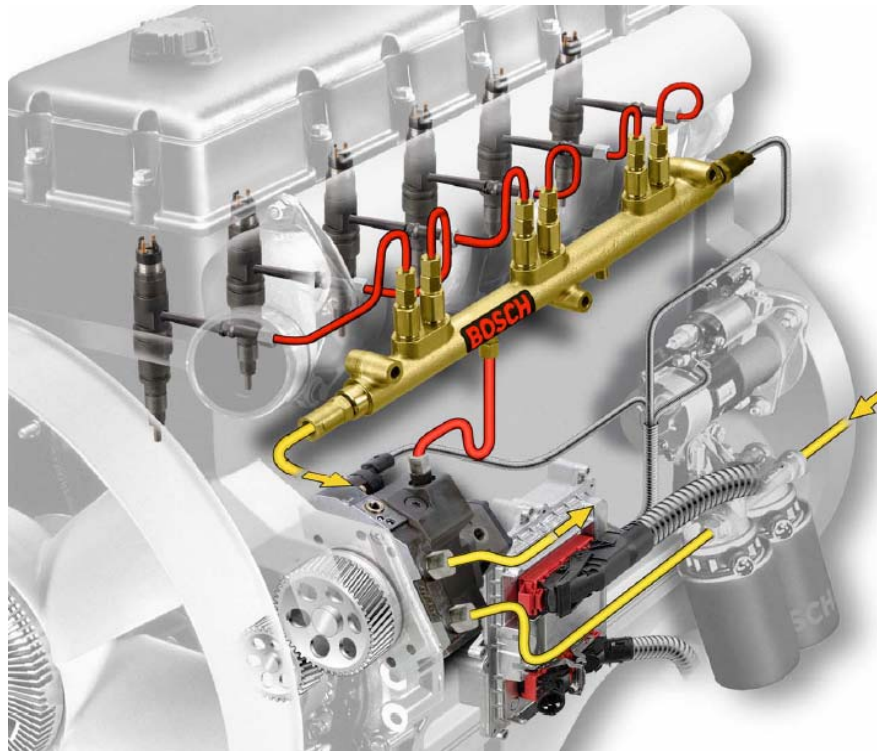


**Fuel injection is controlled  
by mechanical system.**

- Fuel injection pressure is limited  
(100 ~ 500 bar)
- Fuel injection timing is limited  
(BTDC 20 ~ ATDC 10)
- Fuel injection frequency is limited  
(Max. 2 times by 2 stage nozzle)
- Fuel injection quantity is limited  
(Plunger capacity)

**Mechanical fuel injection system is insufficient  
for satisfying the severe emission regulations.**

## Common Rail System



### Fuel injection is controlled electronically

- Fuel injection pressure can be increased (400 ~ 1,600 bar)
- Fuel injection timing is more flexible
- Fuel injection frequency is more flexible
- Fuel injection quantity is more flexible

Common rail system can overcome the several limitations of mechanical fuel injection system.

**Common Rail System is the better solution to meet the stronger emission regulations.**