

# Overcoming Tier 4 With High Performance System Solutions

# Tier 4: The Ultimate Threat for the Off Highway Market



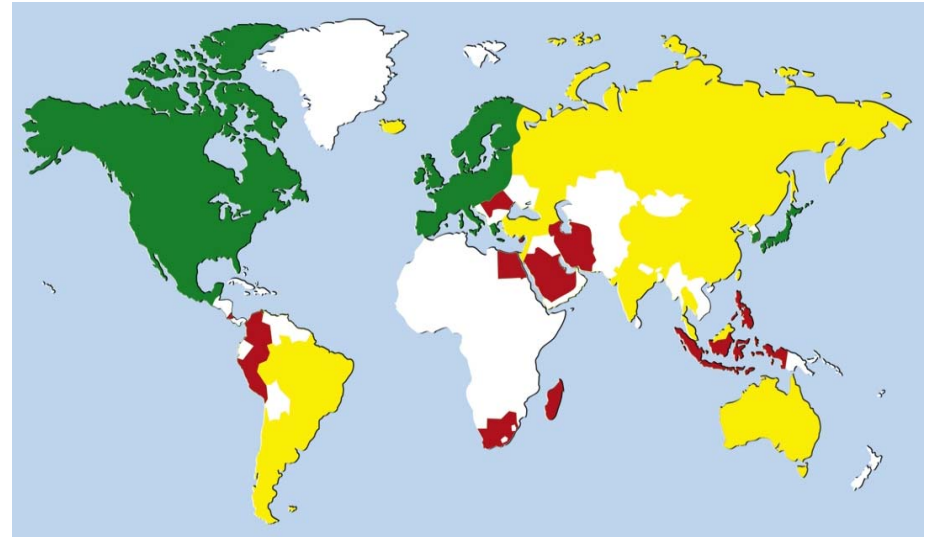
Prated - kW	YEAR												
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
<b>Europe</b>	Emission Limits - NO <sub>x</sub> +HC(NO <sub>x</sub> )/PM g/kWh												
19 - 37	8.0/0.8			<b>Stage 3A</b>			7.5/0.6						
37 - 56	7.0/0.4				4.7/0.4				4.7/0.025				
56 - 75	6.0/0.3			4.0/0.3			<b>Stage 3B</b>		3.3/0.025		0.4/0.025		
75 - 130	6.4/0.2			4.0/0.2			4.0/0.3			2.0/0.2			
130 - 560	6.4/0.2			4.0/0.2			4.0/0.2			<b>Stage 4</b>		0.4/0.025	

Prated - HP	YEAR												
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
<b>USA</b>	Emission Limits - NO <sub>x</sub> +HC(NO <sub>x</sub> )/PM g/kWh												
< 25	9.5/0.8		7.5/0.8		<b>Tier 4</b>				7.5/0.4				
25 - 50	<b>Tier 2</b>		7.5/0.6		7.5/0.3				4.7/0.03				
50 - 75	7.5/0.4				<b>Tier 4 interim</b>				4.7/0.3				
75 - 100	6.6/0.3			4.0/0.3			4.0/0.3			3.4/0.02		0.4/0.02	
100 - 175	6.4/0.2			4.0/0.2			4.0/0.2			2.0/0.02			
175 - 750	6.4/0.2			<b>Tier 3</b>			4.0/0.2			2.0/0.02			
> 750	9.2/0.54		6.4/0.2		6.4/0.2				3.5/0.1				

Technologies	no EGR, no SCR	EGR no SCR	no EGR, DPF	EGR, DPF	EGR, DPF, SCR
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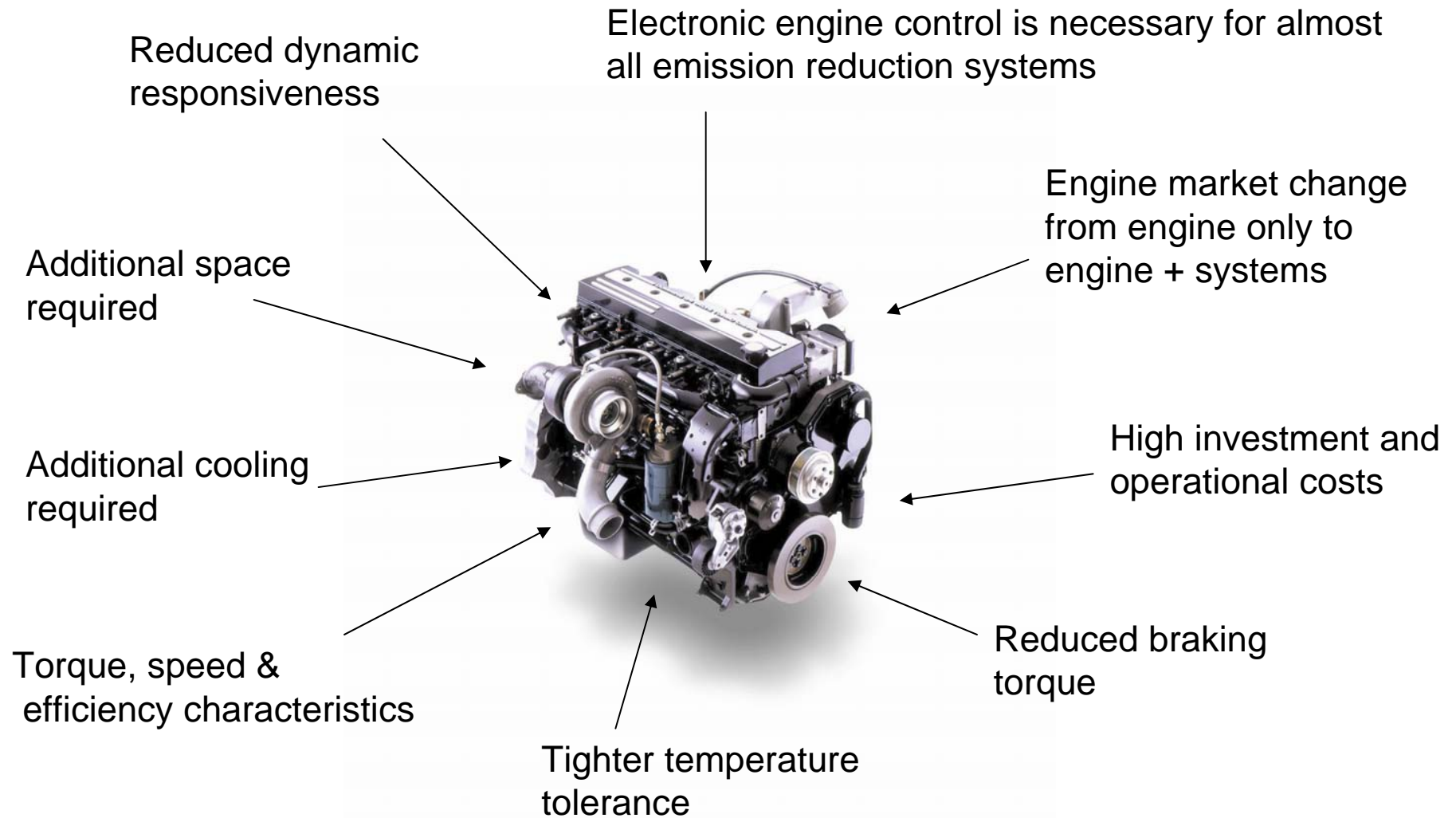
# Tier 4 Off Highway Emission Legislation – Global Impact

- The emission legislations are harmonized between Europe, US and Japan
- Reduction of Emission limits up to 90% compared with Tier III in 2013
- Affects / Impacts – Globally
- Small, medium, large machines will be impacted



- (c)EGR: (cooled) Exhaust Gas Recirculation
- DPF or PT (catalyzed Diesel Particulate Filter with regeneration function or Particle trap )
- SCR Selective Catalytic Reduction

# Impact on Diesel Engine / Machine Behavior



- Higher efficiency components
- Improved systems designs
- Off the shelf solutions
- Electro – Hydraulics

# Bosch Rexroth Approach

