Indian Diesel Engine Manufacturers' Association

Off-Road Engines: India Emission Landscape

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&

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Indian Diesel Engine Manufacturers' Association

- Diesel Engine manufacture started in India in 1947, IDEMA started in 1967.
- It is affiliated to Confederation of Indian Industries (CII)
- IDEMA represents - non-road stationary and mobile use Internal Combustion Engine (ICE) Industry.
- IDEMA works proactively with government to develop legislation on emission, safety, fuel efficiency, and such matters.

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Mission

To be the acknowledged voice of the Internal Combustion Engine industry in India, and thereby, be called upon by regulatory agencies and user industry for open and fair dialogue. And, be the credible source of information, affecting ICE industry.

Members

32 ICE manufacturers, 15 Small manufacturers and 4 major importers

Pro-active Approach

IDEMA works proactively with government to develop legislation on emission, safety, fuel efficiency, and such.

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Proactive initiatives (Approach) of IDEMA for developing Regulations:

1. There should be 10- Year road map available
2. Align / Harmonize with existing international regulations
3. Future norms should be known well in advance - 4 years - This will help for product development, switch-over, certification tests etc.
4. Norms should last for minimum four years
5. Fuel Specifications : Fuel specifications should be decided and the same should be available at least one year in advance, *across* the country.

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Current Emission Regulation Summary

Application	Current Emission Norms	Controlling Body
	In select Cites : BS IV In rest India : BS III	MoRTH
	CPCB 2 (Upto 800 kW)	CPCB / MoEF
	CPCB Stack 3 (Above 800 kW)	CPCB / MoEF
	TREM III A	MoRTH
	TREM III	MoRTH
	TIER II	IMO

No norms for Mining,
Non-roadable construction equipment, Inland marine engines , Water pumps etc.

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- Draft GSR Published regarding Emission Standards for CEV and Tractor

~ EU Stage IV Emission v

Bharat Stage (CEV/TREM) -IV
Applicable emission limit for Non Road Steady Cycle (NRSC) and Non Road Transient Cycle (NRTC)test cycle

	Applicable with effect from	CO	HC	NOx	PM	Test Cycle*
Category, kW		g/ kWh				
37 ≤P < 56	1st October, 2020	5.0	4.7 (HC+NOx)		0.025	NRSC & NRTC
56 ≤P < 130		5.0	0.19	0.4	0.025	
130≤P < 560		3.5	0.19	0.4	0.025	

*Test cycle as described in AIS: 137and as amended from time to time.

~ EU Stage V Emission

Table 2
Bharat Stage (CEV/TREM)- V
Applicable emission limit for Non Road Steady Cycle (NRSC) and Non Road Transient Cycle (NRTC)test cycle

	Applicable with effect from	CO	HC	NOx	PM	PN	Test cycle
Category, kW		g/ kWh				#/kWh	
P < 8	1st October, 2023	8.0	7.5 (HC+NOx)		0.4	----	NRSC
8 ≤P < 19		6.6	7.5 (HC+NOx)		0.4	-----	
19 ≤P < 37		5.0	4.7(HC+NOx)		0.015	1×10^{12}	NRSC and NRTC
37 ≤P < 56		5.0	4.7 (HC+NOx)		0.015	1×10^{12}	
56 ≤P < 130		5.0	0.19	0.4	0.015	1×10^{12}	
130 ≤P < 560		3.5	0.19	0.4	0.015	1×10^{12}	
P > 560		3.5	0.19	3.5	0.045	-----	NRSC

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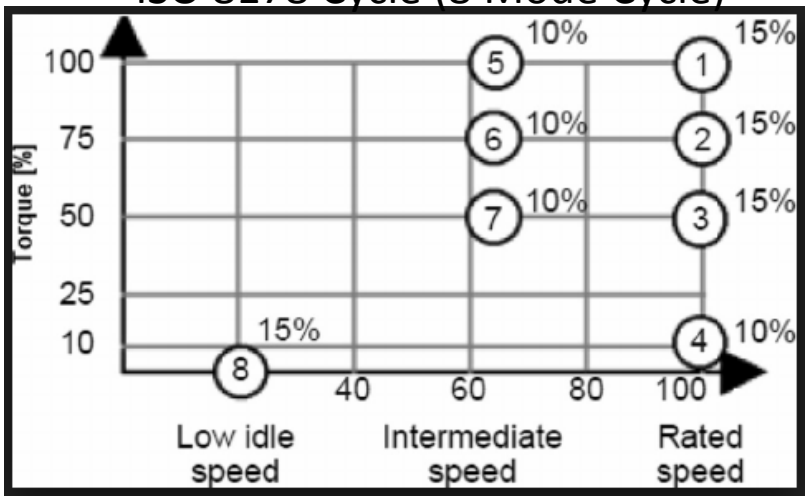
Test Cycles

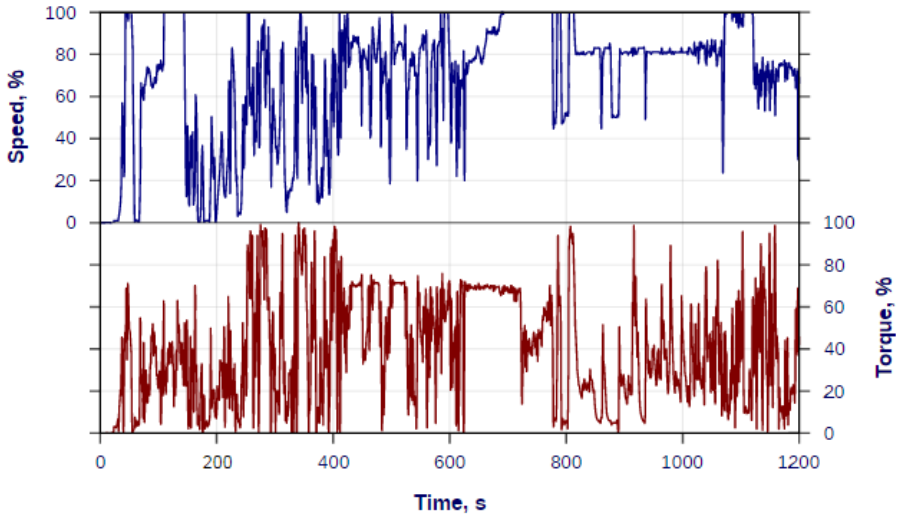
Current

ISO 8178 Cycle (8 Mode Cycle)



Future

Non Road Transient Cycle (NRTC)



Emissions = 10% Cold NRTC + 90 % Hot NRTC

Also includes a hot RMC 8 Mode

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Genset Emission regulations comparison with EU and USA

				EPA	
Power band	**CPCB-II**	**Existing EU constant speed NRMM**	**Proposed EU - Stage V**	**Non-Emergency Tier 4 Final**	**Emergency**
P < 8	7.5, 3.5, 0.3	Unregulated	7.5 8.0, 0.4	7.5 8.0, 0.60	7.5 8.0, 0.60
8 ≤ P < 19		Unregulated	7.5 6.6, 0.4	7.5 6.6, 0.40	7.5 6.6, 0.40
19 < P ≤ 37	4.7, 3.5, 0.3	7.5 5.5, 0.6	4.7 5.5, 0.015 / 1E12	4.7 5.5, 0.03	7.5 5.5, 0.30
37 < P ≤ 56	4.7, 3.5, 0.3	4.7 5.0, 0.4	4.7 , 5.0, 0.015 / 1E12	4.7 , 5.0, 0.03	4.7 , 5.0, 0.41
56 < P ≤ 75	4.7, 3.5, 0.3	4.7 5.0, 0.4	0.4 , 0.19 , 5.0, 0.015 / 1E12	0.40, 0.19 , 5.0, 0.02	4.7 , 5.0, 0.40
75 < P ≤ 130	4.0, 3.5, 0.2	75 ≤ P < 130 ---- 4.0 , 5.0 , 0.3	0.4 , 0.19 ,5.0, 0.015 / 1E12	0.40, 0.19 , 3.5, 0.02	4.0 ,5.0, 0.30
130 < P ≤ 560	4.0, 3.5, 0.2	130 ≤ P < 560 --- 4.0 , 3.5, 0.2	0.4, 0.19 , 3.5, 0.015 / 1E12	0.40, 0.19 , 3.5, 0.02	4.0 ,3.5, 0.30
560 < P ≤ 800	4.0, 3.5, 0.2	Unregulated	P > 560 ----- 0.67, 0.19 , 3.5, 0.035	P > 560 ----- 0.67, 0.19 , 3.5, 0.03	6.4,3.5, 0.20

NOx+HC,
CO, PM (g/kW-hr)

NOx, HC
CO, PM (g/kWh) /
PN (#/kWh)

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Early discussions on Future Regulations

- Non-CEV applications
- CPCB-III regulations for Generator sets
- Water Pumps
- Locomotives

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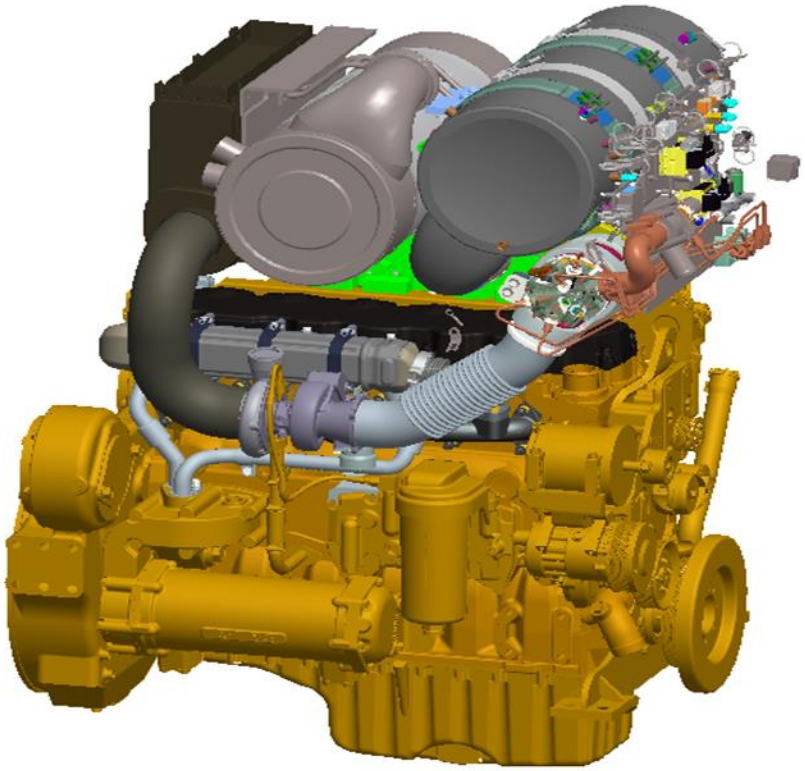
CEV BS4 and CPCB-III Challenges



- Further Emissions Reductions
- Increased Power Density
- Competitive Cost
- Fuel (Fluid) Economy
- Duty Cycle dependent
- …..

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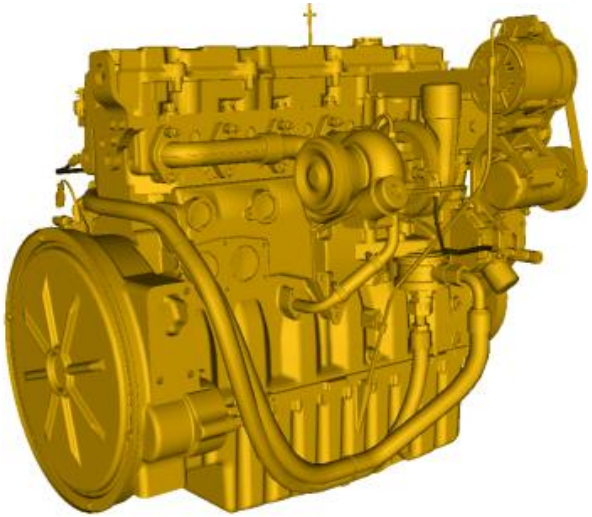
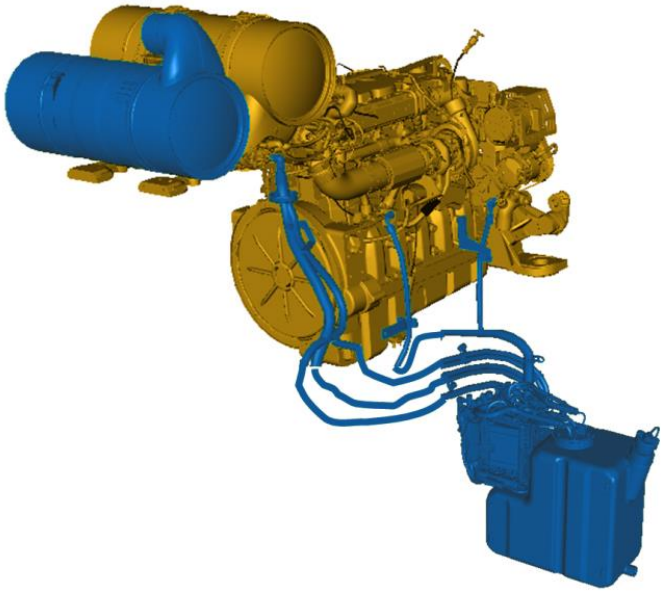
Stage IV Engine Technology

BS III



- Low Sulfur Diesel (500 ppm)

BS-IV



- Ultra Low Sulfur Diesel (10 ppm)
- NOx reduction (EGR)
- PM aftertreatment (DOC/DPF)
- SCR NOx reduction
  - Diesel Exhaust Fluid (DEF) Tank

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India Market Readiness

- Fluid Availability
  - Fuel, Lube, DEF
- Ease of operation
- Cost/Value
- Dealer Readiness and Maintenance
- Operator Training
- Equipment migration plans
  - Details need to be managed

Thanks