

November 27, 2022

NRMM Emissions under the Spotlight in China and India with Tier 5 Proposed in California

Stratas Advisors

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Diesel remains an important fuel for the off-road sector including construction, agricultural, mining, heating, power generation, maritime, locomotives, heavy industries etc., especially in the developing regions. Similarly with on-road fuels, harmonization of off-road diesel specifications and vehicle emission standards has yet to be achieved. This is because countries are at different stages of economic and socio-political development especially in Asia Pacific which is currently the highest user of off-road diesel. There are a number of countries that already use a single diesel grade for both their on-road and off-road sectors, while others aim to eventually harmonize specifications of off-road diesel with on-road diesel to avoid possible adulteration and distribution issues.

However, before harmonization can be achieved, countries are currently using various methods to avoid supply of illegal and off-spec products:

- Use of dyes, markers and tax incentives to differentiate multiple diesel grades by color;
- Encourage supply of better off-road diesel quality; or
- Put into place a fuel quality monitoring legislation and system.

In analyzing the trends in off-road diesel quality and vehicle emissions, Stratas Advisors compared the world's top 10 off-road diesel markets (see figure below). There are no changes from last year's ranking. It is also worthwhile to note that generally, the industrial sector comprises majority of off-road diesel demand, followed by agriculture and domestic navigation and bunkers.

Top 10 Off-Road Diesel Markets

Source: *Stratas Advisors, November 2022*

In this year's report, Stratas Advisors found new information on specifications for off-road diesel and heating oil grades in Antarctica and Germany. Looking at the sulfur outlook for off-road diesel, Brazil plans to phase out 1,800 ppm sulfur grade

used by the off-road sector in the coming years, along with a couple other countries in the CIS region. Looking at emission requirements, only China and India have plans to further tighten their NRMM emission requirements. In India, the latest deadline set for Bharat Stage (BS) IV for tractor emission norms (TREM) was Oct. 1, 2022, but enforcement is yet to begin at this stage with BS (CEV/TREM) V planned for 2024 (see table below). In addition, China IV will be implemented for diesel engines of NRMM from Dec. 1, 2022 through 2025 depending on engine rating.

The full report also presents three case studies on California, U.S., India and Lebanon discussing proposed amendments to the in-use off-road diesel-fueled fleets regulation with potential Tier 5 rulemaking in California, a two-year implementation delay for BS (TREM) IV emission standards in India, and Lebanon prioritizing security over quality of diesel fuel for power generation. The proposed Tier 5 rulemaking will target the reduction of NOx and PM emissions from new, off-road compression-ignition (CI) engines in comparison to what is established under the current Tier 4 final emission standards. The Tier 5 rulemaking is expected to include more stringent exhaust standards for all power categories, including those that do not currently utilize exhaust aftertreatment such as diesel particulate filters (DPFs) and selective catalytic reduction (SCR).

Current Emission Requirements for New Off-Road Diesel Vehicles and Mobile Machinery in China and India

Country	Vehicle/Engine Type	Standard/ Legislation Name	Stage	Implementation Date
China	Diesel engines of NRMM	GB 20891-2014	China III	Oct. 1, 2015
India	Agricultural machinery	ExtraOrdinary Gazette Notification No. 114 [G.S.R. 201(E)]	Bharat Stage (TREM) IV	Oct. 1, 2022
	Construction equipment vehicles (CEV)		Bharat Stage (CEV) IV	Apr. 1, 2021
	Diesel engines of generator sets (≤800 kW)	ExtraOrdinary Gazette Notification No. 149 [G.S.R. 281(E)]	-	July 1, 2014- May 1, 2015
	Diesel engines of power plants, generator sets and other applications (>800 kW)	ExtraOrdinary Gazette Notification G.S.R. 489(E)	-	July 1, 2005

Source: *Stratas Advisors, November 2022*

The full report updates the previous report (see Insights, [Nov. 30, 2021](#)), and examines key developments in off-road diesel quality and vehicle emissions. The report primarily focuses on issues regarding sulfur and FAME because of the legislative and regulatory developments occurring globally for these two parameters.

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