

Information about EPA Strategies to Reduce Air Pollution from Locomotives

These technical highlights provide a basic overview of EPA's regulations for locomotives in the United States, as well as information regarding EPA's voluntary measures to reduce emissions from locomotives.

Regulatory History

EPA has adopted two sets of regulations mandating emission reductions from new locomotives and new locomotive engines.

First Emissions Standards for Locomotives

In 1998, EPA adopted its first regulation to control the emissions from new locomotives and their engines. In that 1998 rule, we adopted three tiers of emission standards: Tier 0, Tier 1, and Tier 2. The Tier 2 standards began phasing in for new locomotives and engines built in 2005. This rulemaking action included requirements at the time of remanufacturing, as well as in-use testing requirements.

Most Recent Emissions Standards for Locomotives

In 2008, EPA adopted standards to reduce emissions of diesel particulate matter (PM) and nitrogen oxides (NO_x) from new locomotives and engines. The three-part program aimed to:

1. tighten emissions standards for existing locomotives when they are remanufactured, which under EPA's rule makes them new again;

2. set near-term engine-out emissions standards, referred to as Tier 3 standards, for newly-built locomotives and engines; and
3. set longer-term standards, referred to as Tier 4 standards, for newly-built locomotives and engines that reflect the application of high-efficiency aftertreatment technology.

EPA estimates that use of a Tier 4 locomotive or engine represents a 90 percent PM emissions reduction and an 80 percent NO_x emissions reduction, compared to a locomotive engine meeting the Tier 2 standards.

In this rule, EPA also finalized new idle reduction requirements for newly-built and remanufactured locomotives and engines and adopted provisions to encourage a new generation of clean switch locomotives, based on clean nonroad diesel engine standards. EPA estimated significant emission reductions would accrue beyond 2030 due to fleet turnover. This rule was an important step in EPA's National Clean Diesel Campaign.

Key points:

- Freshly manufactured new locomotives and engines since 2015 must meet Tier 4.
- Locomotives and engines become new when remanufactured, and must install certain components during remanufacturing.
- Both freshly manufactured and remanufactured locomotives and engines must employ anti-idle technology.

Requirements for Idle Reduction

Since 2008, it has been required that all new locomotives and engines be equipped with idle control systems such as automatic engine stop/start technology that is activated after 30 minutes or less of idle. The main engine(s) designed with stop/start technology should be capable of restarting at least six times per day without causing damage to the engine and impacting the expected intervals for remanufacturing. The engine(s) may be restarted and continue idling beyond the designated time limit to prevent engine damage such as coolant from freezing, maintain brake or start system pressure or recharge locomotive battery, perform necessary maintenance, heat or cool the cab if necessary, or comply with federal regulations. The idle controls are disclosed and included in the certification of the locomotive or engine and may also be certified separately from the locomotive certification.

Requirements for Remanufacturing

Remanufactured locomotives and engines must also meet Tier standards based on the date of original manufacture of the locomotive or engine. Locomotives and engines are considered remanufactured if all the power assemblies have been replaced or requalified within a five-year period. Typically, pre-1973 locomotives are exempt from these standards unless certain conditions have been met. Remanufactured locomotives and engines are required to stay as clean as they were when new but it's also possible to upgrade an older Tier unit to a cleaner Tier. There is currently a credit program in place to provide incentives for doing so. Remanufactured locomotives and engines must use an EPA certified remanufacture kit and adhere to associated maintenance requirements.

Voluntary Measures

SmartWay

As of June 2022, there are 20 rail carriers who are SmartWay partners. SmartWay Carriers submit operating data into EPA's tool, which calculates efficiency and air quality performance data. These data, including emissions of NOx and PM in grams per mile, are published on EPA's SmartWay Carrier Performance Ranking web page. In addition to collecting their data, SmartWay staff assist partners with strategies to reduce their emissions.

Ports Initiative and Diesel Emissions Reduction Act (DERA) Programs

EPA's Ports Initiative provides resources to help accelerate adoption of cleaner technologies and planning practices – such as emissions inventories and community engagement – to reduce diesel engine emissions at ports and railyards across the country. These resources include a webpage on rail facility best practices to improve air quality with technical resources and real-world examples related to upgrading older locomotives, reducing idling, and minimizing locomotive activity near at-risk populations. Additionally, EPA's Diesel Emissions Reduction Act (DERA) Program offers funding for locomotive upgrades and idle reduction technologies.

Verified Technologies for Clean Diesel

EPA has verified retrofit technologies that may be installed to further reduce emissions from certified locomotive configurations and from idling locomotives. Stakeholders may learn more about these verified technologies for locomotives by visiting the EPA web pages listed below.

For More Information

You can access the rule-related documents on the U.S. Environmental Protection Agency, Office of Transportation and Air Quality webpage at:

[www.epa.gov/regulations-emissions-vehicles-and-engines/
regulations-emissions-locomotives](http://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-emissions-locomotives)

You can view certification data published by the U.S. Environmental Protection Agency for locomotive engines, idle control systems, and non-OEM components at:

[www.epa.gov/compliance-and-fuel-economy-data/
annual-certification-data-vehicles-engines-and-equipment](http://www.epa.gov/compliance-and-fuel-economy-data/annual-certification-data-vehicles-engines-and-equipment)

You can view U.S. Environmental Protection Agency's rankings of SmartWay partners at:

www.epa.gov/smartway/smartway-carrier-performance-ranking

You can view U.S. Environmental Protection Agency's verified clean diesel technologies at:

www.epa.gov/verified-diesel-tech/verified-technologies-list-clean-diesel

You can view U.S. Environmental Protection Agency's verified locomotive idle-reduction technologies at:

www.epa.gov/verified-diesel-tech/learn-about-idling-reduction-locomotives

You can read more about U.S. Environmental Protection Agency's Rail Facility Best Practices to Improve Air Quality at Ports at:

www.epa.gov/ports-initiative/rail-facility-best-practices-improve-air-quality