The Midwest Clean Diesel Initiative:

Locomotive Switcher Idling and Idle Control Technology

Overview

The locomotive industry plays an important role in the nationwide transport of people and products. There are two types of locomotives commonly used by railroads - line-haul engines, which move freight or people across long distances, and switchyard locomotives (or switchers), which move rail cars around a rail yard. Of the 20,000 large-scale locomotive engines currently in operation, 5,000 are estimated to be switchers. In addition, smaller railroads also operate switcher locomotives. These switchers are powered by large diesel engines that are frequently left idling when not in use, releasing pollution into the air. Switcher engines idle between 2,500 and 3,000 hours per year, consuming 60 million gallons of fuel annually. While line-haul engines also idle, their estimated idling times are far less than switchers. Fortunately, new idle control technologies have been developed to reduce switcher idling without loss to productivity. Such products automatically shut down or start up an engine based on temperature or a set period of time. These products can also provide engine warmth in cold temperatures through the use of a smaller auxiliary engine or an electrical connection.

Switchers can spend more than 3,000 hours idling per year

Idling switchers use 3 to 11 gallons of fuel per hour depending on the outside temperature

Nationally, idling switchers emit 13,000 tons of NOx and 500 tons of PM per year

Why Do Switchers Idle?

Switchers idle for several reasons. Some of the most common reasons include ensuring the engine is ready for immediate use, avoiding difficult start-ups due to a cold engine or a weak battery, and preventing freezing inside the engine. Locomotive engines do not use antifreeze. Therefore, temperatures below 40°F can damage the engine. Due to severe winter temperatures, idling is of particular concern in the Midwest states. Idling the engine maintains the temperature of the fuel, oil, and water circulating throughout the engine. Idle control technologies, however, can maintain these temperatures more efficiently and eliminate the need for idling.

What are Some of the Problems With Idling?

Idling locomotives emit significant amounts of pollution into the air, including: carbon dioxide, which contributes to global climate change; nitrogen oxides and volatile organic compounds, both of which contribute to the formation of ozone smog; carbon monoxide; and particulate matter, which contributes to asthma, heart disease, lung damage, and possibly cancer. In addition to creating air pollution, idling locomotive engines are loud and waste fuel.

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Benefits of Installing Idle Control Technology:

1) Reduce fuel consumption
2) Save money
3) Reduce air pollution
4) Reduce noise pollution
5) Improve community relations

Where do Switchers Idle?

In Region 5, all seven major railroad companies (BNSF Railway Company, CSX Corporation, Grand Trunk Corporation, Kansas City Southern Railroad Company, Norfolk Southern Corporation, Soo Line Railroad Corporation, and Union Pacific Railroad Corporation) operate in addition to roughly 55 switching and terminal railroad companies. In Chicago alone, there are about 250 switch engines at 40 rail yards. Assuming that each of these locomotives spend 3,000 hours per year idling, they annually emit 679 and 22 tons of nitrogen oxides and $PM_{2.5}$, respectively. Installing anti-idling devices on each of these locomotives could reduce these emissions by up to 90%. Based on the reduction in emissions of $PM_{2.5}$, these installations would accomplish an improvement in air quality similar to removing over 300,000 cars from the road!

Solutions for Railroad Companies: How Does Idle Control Technology Work?

Idle control technologies allow the main engine on a locomotive (typically between 1,500 and 3,000 horsepower) to be shut down when not in use, without risking damage to the engine regardless of the ambient temperature. When the main engine is shut down, a smaller, more efficient diesel engine, known as an auxiliary power unit, between 20 and 40 horsepower, operates instead of the locomotive engine. This smaller engine can provide power to maintain the fuel, oil, and water temperatures necessary for safe and efficient operation of the locomotive. Some systems also aid in automatically shutting down or restarting the engine based on ambient temperature or a set period of time.

What Are Some of the Benefits of Idle Control Technology?

Reduced Fuel Consumption

Idling switchers use between 3 and 11 gallons of fuel per hour depending on the ambient temperature. If a switcher idles 12 hours a day in warm weather and burns 3 gallons of fuel per hour, it would consume 36 gallons of fuel per day. To protect the engine in cold weather, switchers idle at a higher engine speed, consuming even more fuel. If a switcher idles 12 hours a day in cold weather and burns 11 gallons of fuel per hour, it would consume 132 gallons of fuel per day. Over the course of a year, this could amount to over 30,000 gallons of fuel per year. Installing an auxiliary power unit can reduce fuel consumption to 0.8 gallons per hour, saving over 26,500 gallons of fuel per year. Installing an auxiliary power unit in combination with an automatic shut-down/start-up system can save an additional 14,000 gallons of fuel per year and reduce idle time by 80 percent.

Reduce Air Pollution

The emissions resulting from the operation of just one switcher can produce 200 pounds of particulate matter (PM) per year and three tons of nitrogen oxides (NOx) per year. Nationally, idling switchers emit about 13,000 tons of NOx and 500 tons of PM annually. Additionally, switchers emit large quantities of other air pollutants. Installing idle control technology can, in some cases, reduce these emissions by 90 percent.

Reduce Unwanted Noise Pollution

Excessive noise from locomotive yards can lead to poor relationships between railroad companies and local communities. The use of idle control technologies can reduce engine noise by 84 to 97 percent (or by as much as fifteen decibels).

How Much Does Idle Control Technology Cost?

The cost of idle control technology depends on its manufacturer. In general, devices for locomotives cost between $27,000 and $40,000. This initial investment, however, is more than offset by the fuel saving benefits of the technology. If we conservatively assume switchers burn 3 gallons of fuel per hour and idle 3,000 hours per year, at roughly $2.50 per gallon of fuel, owners can pay for idle control technology through fuel savings in less than 18 months.

Who Makes Idle Control Technology?

There are currently several companies throughout the country manufacturing and selling idle control technology. For a list of vendors and more detailed product information visit: www.epa.gov/smartway/idlingtechnologies.htm

Case Studies

The following case studies provide important information about EPA's experience with locomotive idle control technologies: www.epa.gov/smartway/idle-demo.htm

The average cost of idle control technology is $33,000

Switchers using idle control technology can save as much as 26,500 gallons of fuel per year and reduce emissions by 90 percent

The cost of installing idle control technology is usually offset by fuel savings within 18 months

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