



BUILDING AMERICA®

Operations

Union Pacific strives to be a leader in developing technology and conscientiously using resources to reduce our environmental impact. Railroads are the most environmentally responsible way to transport ground freight. Each year, Union Pacific helps customers eliminate more than an estimated 30 million metric tons of greenhouse gas emissions by choosing Union Pacific over truck transportation for their shipping needs. We've achieved this by making sustainability a priority, developing new technologies and methods to improve fuel efficiency, reducing emissions and working smarter to minimize our environmental impact.

Fuel Conservation

Union Pacific improves its fuel efficiency through improvements in locomotive technology, engineer training and employee involvement. The result: From 2000 to 2014, Union Pacific achieved a 18 percent improvement in fuel efficiency. See our Sustainability & Citizenship Report for additional fuel information.

Fast Facts

Union Pacific can move one ton of freight 475 miles on a single gallon of diesel fuel. Freight trains are four times more fuel efficient than trucks on a ton-mile basis.

Greenhouse Gas Emissions

According to the U.S. Environmental Protection Agency [<http://www.epa.gov/otaq/locomotives.htm>] (EPA), freight railroads account for just 2.1 percent of U.S. greenhouse gas emissions from transportation. Cars, light trucks and motorcycles combined produce nearly 66 percent, while trucking generates more than 20 percent. Union Pacific produced a total of 11,953,871 metric tons of greenhouse gas emissions from fossil fuels in 2013.

Locomotives account for nearly all of our greenhouse gas emissions, and we have reduced those emissions by investing in more fuel-efficient locomotives, retrofitting older locomotives to be more environmentally friendly and adopting more efficient operating practices.

In 2011, Union Pacific announced a goal to reduce our fuel consumption rate by 1 percent annually from 2011 to 2015, as measured on a gross-ton mile basis. Attaining this goal would represent a 23 percent fuel-efficiency improvement since 2000.

See the Greenhouse Gas Emissions section of our Sustainability & Citizenship Report for additional emissions information.

Locomotives

We operate two primary types of locomotives – high-horsepower locomotives that pull freight over long distances and low-horsepower switch locomotives that work in train yards, sorting and delivering cars. We are committed to emissions reductions and are constantly conducting research to further reduce emissions.



Union Pacific works with locomotive manufacturers to develop technologies that meet or exceed EPA standards. Since 2000, Union Pacific has spent approximately \$6.75 billion to purchase new, more fuel-efficient locomotives. Since that time, more than 4,100 of these locomotives have been added to Union Pacific's fleet, more than 3,000 older locomotives were retired and more than 5,800 locomotive diesel engines were overhauled or rebuilt with emissions control upgrades. See our Technology section to learn about Union Pacific's pioneering locomotive initiatives.

There are five tiers of locomotive emission standards set by the EPA, which are progressively more stringent. These standards require continuing reductions in locomotive exhaust emissions of nitrogen oxide (NOx), particulate matter (PM) and other pollutants. The highest standards, called Tier 4, take effect in 2015 for newly-built locomotives that reflect the application of high-efficiency aftertreatment technology; EPA estimates this technology, when available, will result in PM reductions of about 90 percent and NOx reductions of about 80 percent compared to older switch locomotives.

Locomotive Idling and Operating Practices

Our employees commit to using techniques that eliminate unnecessary fuel consumption.

In a railroad operating environment, locomotive engines may be kept idling for several reasons:

- › In a yard, they idle between work events;
- › On the main line, they idle while meeting or passing other trains and to maintain air brake pressure;
- › In cold temperatures, they idle to keep their fuel and water lines from freezing.

Union Pacific has a comprehensive plan to reduce the amount of time locomotive engines idle. Part of the plan involves using automatic stop-start equipment on newer locomotives to eliminate unnecessary idling. Older locomotives are being retrofitted with similar technology. More than 75 percent of Union Pacific's locomotive fleet is equipped with this technology. Locomotive shutdowns can save 15-24 gallons of fuel per locomotive, per day.

Operating practices that improve fuel efficiency and reduce fuel consumption include:

- › Managing train speeds to maximize miles per gallon;
- › Integrating our network and interchange operations with those of other railroads to minimize delays and reduce locomotive emissions;
- › Implementing our Tons Per Axle (TPA) process, which uses horsepower more efficiently than before. TPA helps us build longer, more fuel-efficient trains.

Fuel Masters Unlimited

Fuel Masters Unlimited is an award-winning, employee-driven program that rewards locomotive engineers. More than 6,000 engineers participate in the volunteer program, with the best fuel-consumption efforts rewarded with fuel cards for personal use. Our Fuel Masters Unlimited program is so successful that other railroads have implemented versions of it.

Rail Cars

How we manage rail cars has tremendous environmental value. Actions include:

- › Building a transportation plan to optimize performance, with initiatives such as maximizing train tonnage for the route structure and adjusting how we switch rail cars on trains to minimize blocked crossing time, which leads to reduced idle time for drivers in the communities we serve;
- › Using proprietary software to route cars with as few miles and handlings as possible;
- › Increasing carrying capacity; increased allowable weight and reduced tare weight from lighter materials have increased freight car carrying capacity by more than 25 percent since 1980, which reduces the number of cars and fuel required to move the same freight;
- › Working with participating North American railroads to create national pools of high quality freight cars with the same general characteristics, reducing empty miles and freight cars required to meet customer needs;
- › Upgrading refrigerated boxcars to reduce diesel particulate matter emissions by 50 percent;
- › Collaborating with shippers to increase car capabilities, improving integrity and safety;
- › Extending the life of new rail cars from 40 years to 50+ years by improving design and construction;
- › Reusing parts when we scrap rail cars;
- › Reducing the wind resistance of intermodal trains by matching the rail car length with container length, and reducing the number of empty slots.

Resource Use

Union Pacific reduces waste and encourages reusing and recycling materials. Minimizing resource requirements is central to our environmental initiatives. Of the 1.1 million tons of waste we generated in 2013, we diverted an estimated 77 percent from landfills.

Union Pacific has a sophisticated system to monitor our railroad tie replacement cycle to ensure ties are replaced only when the limits of their useful life have been reached. Union Pacific reuses railroad ties on our 32,000-mile network. Of the millions of wood railroad ties we replace annually, nearly 85 percent are re-used in some manner.

Union Pacific uses concrete ties in high-tonnage, high-traffic areas where wear and tear is much greater. Because concrete ties last much longer than wooden ones, they require fewer materials and generate much less waste. We also use composite ties, made from 100 percent recycled plastic, in areas such as the Gulf Coast where wet weather reduces the lifespan of wood ties.

A primary focus of the company's environmental stewardship program is providing education to reduce resource consumption. Suggestions have reduced paper consumption and brought changes to facility lighting, watering practices and other resources.

In a typical year, Union Pacific recycles:

- › 400,000 pounds of electronic equipment;
- › One million pounds of signal batteries;
- › More than 250,000 tons of metal - the equivalent Greenhouse Gas emissions to power more than 125,000 homes for a year;
- › More than 4 million gallons of oil and diesel fuel, 100% of the oil captured at fueling and servicing facilities;
- › More than 3,000 tons of solid waste, the equivalent Greenhouse Gas emissions as burning nearly 14,000 barrels of oil.

Where possible, Union Pacific looks for re-use opportunities in the community for items which have a remaining useful life but Union Pacific no longer needs. For instance, the company has provided used computers and monitors to those who don't have access to them, including sending laptops to nonprofit organizations for use in developing countries.