

Safest network ever Interconnected and smart Lifting other industries

Privately-owned freight railroads have spent more than \$685 billion on upgrades to their infrastructure and equipment since 1980. Much of these funds have been dedicated to the development and implementation of cutting-edge new technologies aimed at making freight rail safer, more environmentally friendly and more efficient.

Safest network ever.

There is a direct correlation between the increase in rail network investments and enhanced safety performance. With record levels of spending on capital improvements and maintenance over the last five years and more than \$25 billion annually on average, America's freight railroads are at the forefront of advancing safety. 2018 rail safety data shows that recent years continue to be among the safest on record.

- According to the Federal Railroad Administration, railroads continue to become even safer. Since 2009, the:
 - Train accident rate is down 10 percent.
 - Equipment-caused accident rate is down 11 percent.
 - Track-caused accident rate is down 26 percent.
 - Derailment rate is down 9 percent.
 - Employee injury rate is down 16 percent.
- From 2008 to 2017, the hazmat accident rate fell 48 percent; the grade crossing collision rate fell 37 percent between 2000 and 2018.
- From chlorine to fertilizer, more than 99.999 percent of all hazardous materials moved by rail reaches its destination without a release caused by an incident.
- Freight railroads help train tens of thousands of emergency responders each year with programs and outreach efforts, including at the Transportation Technology Center, Inc.
- Positive Train Control (PTC), a transformative set of technologies designed to automatically stop a train before certain accidents related to human error occur. It will also serve as the foundation for future innovation to enhance the safety and efficiency of the network.

By the end of 2018, railroads had all PTC hardware installed, all spectrum in place, all employees trained and PTC was in operation on 83.2 percent of Class I PTC route-miles network-wide, with some railroads having fully implemented PTC. All railroads are committed to having PTC fully operational and interoperable by the end of 2020.

A high-tech, interconnected and smart network.

Using a combination of smart sensors, industry-wide data sharing and advanced analytics software, railroads monitor the health of the rail network and equipment in real-time. This data enables railroads to spot patterns, predict problems and improve safety.

- Tiny flaws imperceptible to the human eye can lead to accidents, so railroads rely on technologies like ultrasound and radar to look deep inside a track. Similarly, ground-penetrating electromagnetic radar allows railroads to assess the health of ballast and detect any abnormalities, such as water intrusion, which can cause erosion.
- The Asset Health Strategic Initiative (AHSI) was launched by railroads to track the health of the nation's 1.6 million railcars. Thousands of smart sensors monitor the integrity of railcars and, as part of AHSI, this data is fed to Railinc, an industry-owned information technology and services company. Railinc uses software to glean insights, taking a big-picture view to identify patterns, predict problems and guide component manufacturing.
- Thousands of state-of-the-art locomotives are now operating on U.S. railroads. These new locomotives are more reliable, stonger, more fuel efficient and greener. One locomotive may utilize 20 or more microprocessors to monitor critical functions and performance.
- In rail yards, anti-idling technologies minimize fuel consumption and pollution. Start-stop systems, for instance, turn off a locomotive if they sense it has been idle too long.
- Since 1980, freight railroads have nearly doubled the amount of freight moved while using about the same amount of fuel.

Rail technology lifts other industries.

Rail technology allows railroads to move more goods faster and more affordably than ever before, providing clear benefits to customers.

- Software calibrates train trips by the minute. Freight rail dispatchers use advanced trip-planning software to develop ideal routes for trains traveling in a region. The software analyzes a train's schedule, the area's topography, speed restrictions, the crew's schedule and other factors, using an algorithm to determine the best plan for each train to follow over the next eight hours — and shares it with dispatchers.
- Preventative maintenance keeps trains moving. With wayside detectors identifying problems on passing trains, railroads can react quickly, preventing bigger fixes or even accidents. By performing maintenance early, railroads are able to prevent disruptions in service and create a fluid, seamless system.
- Maximizing efficiency minimizes costs. North American rail rates are the lowest in the world. U.S. freight rail rates (measured by revenue per ton-mile) are well below those in Europe, China and Japan. This gives U.S. industries a significant competitive edge in the global marketplace.
- Average U.S. freight rail rates were 46 percent lower in 2017 than in 1981, even as the volume of cargo moved by rail has nearly doubled over the last 35 years.

Railroads **reinvest** into the nationwide rail network at **six times the rate** of the average manufacturer.



To identify problems **before** they happen, railroads invest in **new technologies** — from track-side detectors to ultrasound, big data and drones.



A **single train** can carry as much freight as **several hundred trucks**, greatly reducing highway gridlock.

