High Tech Advances Improve Freight Railroad Safety & Efficiency

Statistics show that we are living in the safest, most productive era in the history of America's freight rail industry. Robust investment across the network has dramatically improved nearly every aspect of railroad operations. The train accident rate is down 30% from 2000 and a single train can move one ton of freight an average of 470 miles on a single gallon of fuel.

Key Takeaway

Freight railroads use technology to keep employees, infrastructure and equipment safe while increasing customer service and decreasing the industry's carbon footprint.

America's freight railroads are on the cusp of the next great era of safety and efficiency improvement. From smart sensors to artificial intelligence, railroads are harnessing the power and promise of technology to drive even greater improvement in the years ahead. Railroads are deploying technology across the network to make meaningful progress on safety challenges; meet the evolving needs of our customers; reduce the industry's carbon footprint; empower rail employees and address important community concerns. Moving forward, greater application of rail technology — enabled by pro-innovation regulations — will help the industry get closer to reaching its ultimate goal of zero accidents. Technologies supporting regulations will also drive greater economic prosperity across our nation.

Delivering an Accident-Free Future

Focusing on the leading causes of accidents, freight rail employees use technology to make informed decisions and address issues proactively before accidents occur. Many of these technologies are developed and tested at the Transportation Technology Center, Inc. (TTCI), the industry's world-renowned rail research organization in Pueblo, Colorado.

- **Human Error**: Railroads use the lifesaving-potential of technology to drive down accidents related to human error. Positive Train Control (PTC) — technology that will automatically stop a train to prevent specific types of human-caused accidents — is in operation across 100% of the required Class I route miles nationwide. It will be fully interoperable by the end of 2020.

- **Track & Infrastructure**: With a vast, 140,000-mile outdoor network of tracks, bridges, tunnels and more, railroads apply technology to monitor network health in real-time. Specialized inspection technology integrated into locomotives and rail cars scans track as trains move at speed to identify defects like fissures deep within the rails. These tools enable railroads to inspect their infrastructure with greater frequency, accuracy and reliability than ever before.

- **Trains & Equipment**: With a fleet of millions of shared rail cars operating across the country each day, railroads use technology to closely monitor and plan for equipment maintenance. New machine visioning technology uses specialized cameras and data analytics to inspect trains as they pass through at speed, reducing inspection times to mere seconds. Using advanced data analytics, Big Data from this and other technologies, serves as the foundation for future initiatives.

Meeting Customer Needs

America's freight railroads use the latest technology to move more freight more efficiently than ever before. Their investments are designed to increase capacity, improve reliability and deliver unparalleled customer service for rail shippers. With freight demand expected to increase 30% by 2040, greater application of rail technology will ensure U.S. businesses continue to have the cost-effective transportation solution that makes them competitive in today's global economy.

- **Growing Capacity:** Since 1980, rail technology has helped meet a 300% increase in freight volume, despite a decrease in overall network size. The latest rail logistics planning software uses Big Data and artificial intelligence to predict patterns in train traffic and develop routing models to increase railroad velocity, capacity and efficiency.

- **Improving Reliability:** As the fastest growing segment of their business, railroads work closely with intermodal and e-commerce customers to improve reliability. Data analytics models can now predict the ideal time to perform maintenance months in advance, ensuring railroads can make repairs well before an equipment breakdown impacts network fluidity.

- **Customer Service:** Railroads use technology to give rail shippers greater insight into rail operations. This helps shipper better manage their own operations and inventory. Many railroads have developed specialized tools — from Application Programming Interfaces integrated directly into customer platforms to shipment tracking tools — that provide greater transparency for everything from the location of their products on the network to rail car availability and ordering.

Protecting the Environment

Railroads are the most environmentally-friendly way to move freight over land. Moving more freight by rail can reduce the U.S. transportation sector's impact on global climate change. Across the network, in every aspect of operations, railroads are taking steps to reduce emissions, increase fuel efficiency and preserve the natural environment.

- **Conserving Fuel:** Today's Tier IV locomotives contain hundreds of sensors and state-of-the art fuel management technology that monitor performance and calculate the most fuel-efficient speed for a train along a given route.

- **Reducing Emissions:** In rail yards, zero-emission electric cranes are used to transfer goods between ships, trucks and trains, and yard locomotives are equipped with stop-start systems to shut down a locomotive when it is not in use.

- **Relieving Highway Congestion:** A single train can carry the load of hundreds of trucks, effectively removing then from our nation's highways. Thanks to improved freight car design and other efforts, in 2019 the average freight train carried 3,667 tons, up from 2,923 tons in 2000.

Freight Railroad PTC Status

As of August 2020

Locomotives equipped	100%
Wayside units installed	100%
Radio towers installed	100%
Employees trained	100%
PTC-required route miles operational	100%

By the end of 2020

Fully implemented	100%

*A train passes through a safety inspection portal at speed.*

Rail employees use a drone to inspect a bridge.

Safeguarding Employees & Communities

Freight rail's commitment to the health and well-being of its employees and communities is best demonstrated by the unique safety culture that defines every aspect of employee relations and community engagement. From training to information sharing and pandemic response, technology plays an increasingly important role in this mission.

- **Keeping Employees Safe:** The rail industry is one of America's safest places to work with lower employee injury rates than most other sectors. Advanced training centers with simulators and virtual reality enable employees to practice real-life skills in a safe, rigorous and controlled environment, while innovations like remote control locomotives and high-definition cameras empower employees to do their jobs effectively from a distance where possible, keeping them out of harm's way. Recently, railroads developed mobile applications to enable locomotive engineers to adhere to COVID-19 social distancing protocols.

- **Information Sharing:** Technology has made it easier than ever to share information and resources with community leaders in the rare event of a rail incident. The AskRail mobile app — a collaborative effort among the emergency response community and America's freight railroads — provides tens of thousands of the nation's first responders with immediate access to accurate, timely data about what type of hazardous materials a rail car is carrying so they can make an informed decision about how to respond in the event of a rail emergency.

- **First Responder Training**: For decades, railroads have worked closely with the nation's first responder community to educate and train it on rail accident response. With business travel on hold due to the ongoing pandemic, the Security and Emergency Response Training Center — operated by TTCI — launched an online training program to ensure the nation's first responders have uninterrupted access to critical hazmat response training during this challenging time.

- **Enhancing Motorist and Pedestrian Safety:** To help keep the public safe near tracks, railroads have worked with federal regulators and private technology companies to develop technological solutions to improve safety around railroad tracks and rights of way. Railroads have partnered with Waze to develop a safety feature that alerts app users to upcoming grade crossings. As autonomous vehicle technology continues to be developed, railroads have called on the U.S. Department of Transportation to ensure that these vehicles recognize and react properly to warning devices at grade crossings.
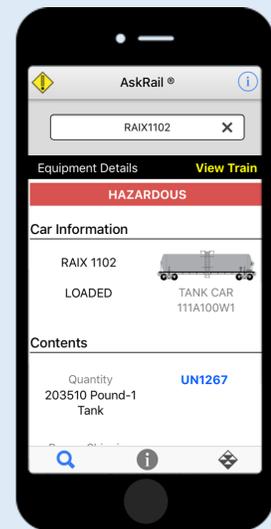
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First responders train at the world-class SERTC facility in Pueblo, CO.

TECHNOLOGY ENHANCES RAIL SAFETY & EFFICIENCY

ADVANCED FUEL MANAGEMENT SYSTEMS
assess track grade, train weight, wind speed and more, allowing our locomotives to move one ton of freight 470+ miles on a single gallon of fuel – 4x more efficient than trucks.

POSITIVE TRAIN CONTROL
continuously analyzes the hundreds of variables required to safely stop a train at any given time, counteracting human error.

MODERN TIER 4 LOCOMOTIVES
are outfitted with hundreds of sensors that generate thousands of performance readings per minute to maximize efficiency.

SMART SENSORS
positioned along the track identify worn components on passing trains in real-time and amass a wealth of data for advanced analysis.

AUTOMATED INSPECTION EQUIPMENT
monitors track integrity including curvature, alignment, grade, ballast and more.

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AMERICAN RAILROADS