



# Global Rail Solutions



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## Our mission

As a global leader in today's freight rail and passenger transit industry, Wabtec traces its origins back to an invention that transformed the safety, efficiency and productivity of railroads in the world.

When George Westinghouse created the Westinghouse Air Brake Company in 1869 to build his revolutionary air brakes, innovation formed the heart of its corporate mission. Our technology, like our company, has broadened and developed beyond recognition since the early days. And that foundational commitment to meeting the needs of our customers through innovative products and services remains with us to this day.

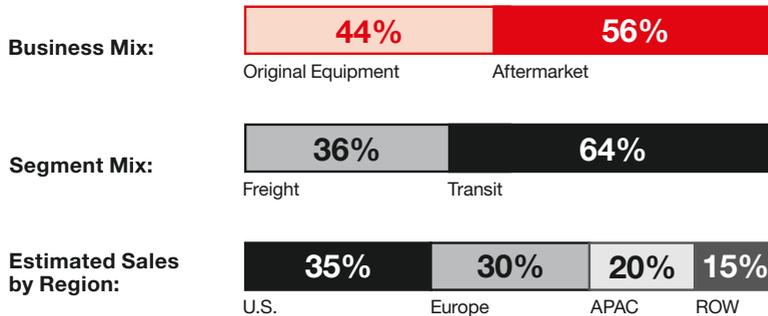
Wabtec has expanded through a combination of organic growth and acquisition, with a global perspective on the railroad industry.

The company was already operating in Europe in the late 19<sup>th</sup> century, a presence that grew before moving to a much greater scale in 2016, when Wabtec joined forces with Faiveley Transport.

As one unified company, Wabtec delivers its products and services through five business groups: Freight; Brakes & Safety; Energy, Comfort & Access; Electronics; and Transit Services. While the portfolios and geographies may be diverse, these groups share the same business focus laid down by George Westinghouse nearly 150 years ago – to meet our customers' needs for safety, efficiency and productivity. /

## A global leader

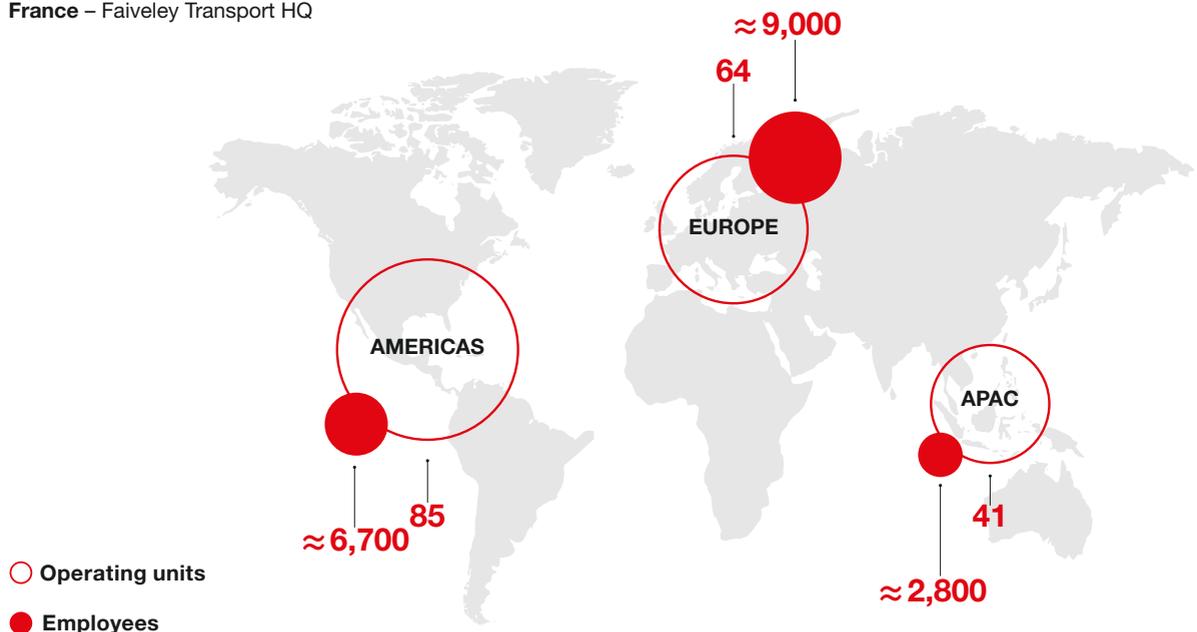
# Sales: approximately \$4 bn



### CORPORATE OFFICE LOCATIONS:

U.S. – Wabtec Corporation HQ

France – Faiveley Transport HQ



## WABTEC HAS

More than

# 18,000

employees around the world

Operations in

# 30+

countries

Products sold in

# 100+

countries

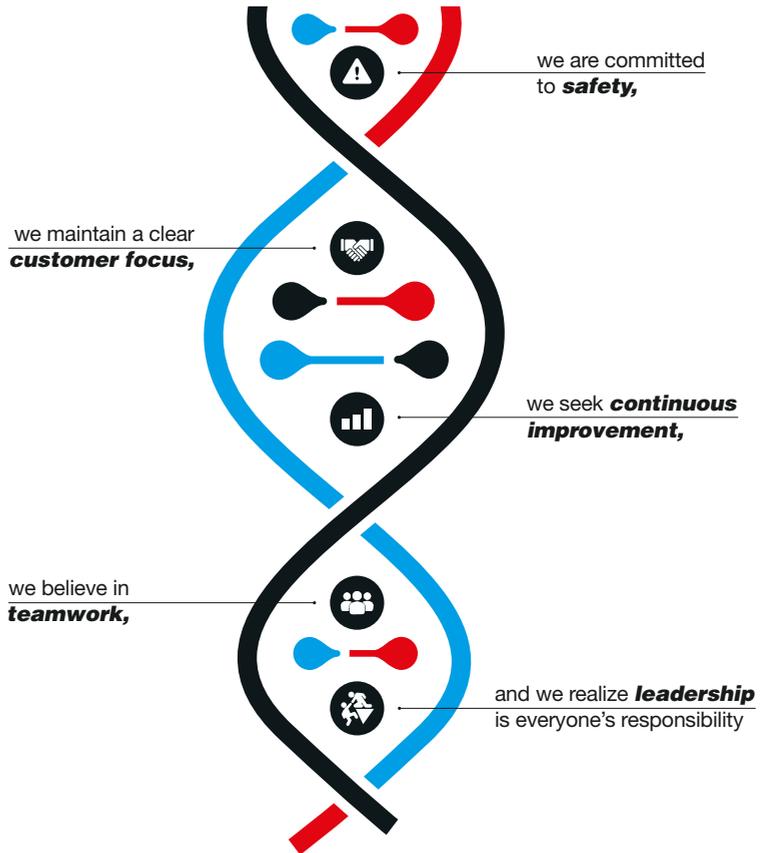
# 4,000

active patents

## THE WABTEC DNA



Because we are **reliable**,  
**passionate** and  
**collaborative** people,



**As the foremost priority for Wabtec in everything we do**, safety applies not only to our employees but also to our work with all customers, partners, and the passengers of operators using our equipment. For our employees, Wabtec has clear policies on safe behaviors and the correct operation of equipment, along with specific programs for making safety a personal priority. For every job, all tasks are clearly identified so that potential hazards can be addressed, and appropriate counter-measures implemented. Our “2-Minute Warning” program is another example of safety at work where every employee is encouraged to take two minutes to think about the job they are about to carry out. Equally important, our ‘People First’ approach is based on teamwork. At Wabtec plants, safety is a daily conversation that engages people across the organization, from the production line to management. For customers, the focus is on delivering safety through products and services that meet the highest standards of quality and reliability. I-ETMS®, Wabtec’s Positive Train Control system program (see page 07), is a major contributor to railroad safety around the world by stopping a train if it exceeds authorized speeds or attempts to enter an unauthorized track section or work zone. Accident prevention and improved efficiency is also the focus of Wabtec’s Electronically Controlled Pneumatic (ECP) brake equipment, which helps mitigate potential hazards through shorter stopping distances, and enabling trains equipped with these technologies to operate at higher speeds.

# Safety





# 22,000

locomotives will be equipped with I-ETMS® by the end of 2018.

PTC technology will cover

# 54,000

route miles in the U.S.

## ⊙ Advancing rail safety with Positive Train Control

Safety is paramount for every railroad. Positive Train Control (PTC), an accident prevention system that can slow down or stop a moving train, plays an essential role in enhancing safety by stopping a moving train in advance of a hazardous condition. Wabtec's offering, the Interoperable Electronic Train Management System (I-ETMS®), is about to become the most widely installed PTC system in the world. In 2008, following a series of accidents, the U.S. Congress mandated the use of PTC for much of the rail network in the United States. Railroads operating outside the electrified Northeast Corridor chose the Wabtec system as the standard for on-board locomotives and supporting "back office" network functions. As a result, I-ETMS® is scheduled to be installed on 22,000 locomotives by a federal

deadline of December 31, 2018, with full PTC implementation anticipated by 2020. I-ETMS® improves railroad safety through the ability to prevent four potential scenarios: a train-to-train collision; a derailment caused by excessive speed; an incursion into a work zone; and passing through a main line switch that is in the wrong position. /

## ⊙ I-ETMS®: a solution in four parts

To avoid these incidents, PTC has four main segments, beginning with the equipment on the locomotive – a computer and display screen, a GPS unit and RF communications. The wayside segments provide data about signals, switches and other detection needs, such as broken track. A mixture of RF base stations, Wi-Fi connections and cellular networks then provide the structure for the communications segment. Finally, the information is managed by the office segment, integrating authority rules and restrictions. Wabtec provides the on-board and office segments of these PTC elements. /

## ⊙ Putting it to work

I-ETMS® is already operational before a train leaves a terminal or siding. All relevant information, such as track data, the train's consist (connected cars) and speed restrictions, is downloaded from the office system to the locomotive's onboard computer. Once the train is on the move, its exact location is determined by matching GPS positioning with the on-board track database. Meanwhile, the on-board computer is continuously calculating the distances for issuing any warnings or applying the braking system if needed. At the same time, I-ETMS® listens to messages from wayside equipment to check if there are any broken rails, incorrectly aligned switches, or signals restricting movement. /

# I-ETMS®

is the on-board standard for locomotives across much of the U.S. rail network.



**For Wabtec, safety not only applies to the workplace, but also to our homes and social lives.**

## 🔴 Safety, our absolute priority

When it comes to the values by which our company operates, safety is at the top of the list and is part of everything we do. Our objective is to create safe environments in which our people can work, to help prevent accidents and enhance our production efficiency. To attain this goal, Wabtec is committed to maintaining a health and safety program that meets or exceeds the best practices of organizations within our industry. The company considers itself to be a leader in hazard assessment methodologies and behavior-based performance programs, all of which have delivered real achievements. As a result of these initiatives, Wabtec's injury rate at its plants has decreased every year for more than a decade. Along with its standard operating procedures and ongoing programs to identify potential hazards and promote safe behaviors, Wabtec also makes safety the dedicated focus of Safety Days throughout its global network of plants. /

## 🔴 Safety Days, a shared moment

Normally held across an entire week, Wabtec's Safety Days aim to engage employees with health and safety in different ways – from on-site hazard awareness and emergency drills to healthy eating and road safety. The goal is to combine the serious task of providing information and training with an enjoyable experience for our employees. In 2018, activities carried out to make work areas more secure included 60-minute safety makeovers, hazard-spotting competitions among plant teams, safety quizzes, fire extinguisher training and building evacuation drills. On the health side, our sites organized coaching in healthy lifestyles, nutrition, first aid, and the use of defibrillators. Site staff also arranged blood donations, fun runs, walks, and road safety courses for drivers and cyclists. At many sites, local first responders complemented the involvement of our in-house health and safety specialists, along with volunteers. Together, all these initiatives helped drive a message that for Wabtec, safety not only applies to the workplace, but also to our homes and social lives. Bringing people together for Safety Days also reinforces another firmly-held belief at Wabtec – that safety is everyone's business. /

**Improving the efficiency of our clients' operations is a key objective for Wabtec.** To deliver those incremental improvements – through initiatives to produce more standard products and to enhance energy efficiency – we have developed the Wabtec Excellence Program (WEP). WEP helps us to maintain what we consider to be a leading position as a low-cost producer in the industry while supporting world-class product quality, technology and customer responsiveness. Beneath the WEP umbrella, we seek efficiencies for customers in three ways: through our well-established Lean manufacturing model; by monitoring our core functional processes and cost-saving performance; and by embracing the digital transformation as we move toward Industry 4.0. Lean manufacturing, which aims to reduce waste and maximize efficiency, provides the engine for the continuous improvements we strive to achieve every day. Lean tools and expert trainers help us streamline our processes, ensure on-time delivery, improve product reliability, and reduce costs through global sourcing policies. Like the rise of connectivity and data analytics within our product portfolio, these elements help us provide customers with truly cost-effective solutions.

# Efficiency



# Efficiency

Faiveley Neoflexx®

# 20%

lighter than standard discs  
8-year lifespan.



**Faiveley Neoflexx®  
can operate  
at any energy  
level and on any  
rolling stock.**

## ◉ **Faiveley Neoflexx®: where innovation meets efficiency**

As railroad operators face growing demands for ever more efficient services, the cost and reliability of their core equipment is more important than ever. Wabtec is helping operators meet that demand with Faiveley Neoflexx®, a radically new generation of axle-mounted brake discs.

Based on unique, electron-beam welding technology, Faiveley Neoflexx® is an innovative steel alternative to traditional cast-iron discs, offering a wide range of benefits. Being 20% lighter than a standard forged disc and more energy efficient, Faiveley Neoflexx® generates savings with its low wear rate and high resistance to major mechanical stress. Both significantly extend the disc's lifespan while lowering total cost of ownership. Faiveley Neoflexx® has a flexible, modular design that can be adapted to the specific operating requirements of a manufacturer or a train operator, from freight to high-speed transit cars. This ability to provide discs to custom-made dimensions means they will provide

a better fit with existing brake pads, allowing for longer-lasting, more cost-effective brake pairs. Where heavily-used forged discs might split or break after two to three years, heavy-duty Faiveley Neoflexx® discs are expected to last around eight years – long enough in many cases to cover two bogie overhauls. Avoiding the breakdowns that can immobilize an asset for days if not weeks, clearly offers a major efficiency gain for customers.

Since the discs are produced in small batches from a widely-available raw material, Faiveley Neoflexx® has a very short lead time – less than one month. For customers, that translates into reduced stock, and therefore lower inventory costs. As the most advanced steel brake disc on the market, it can operate at any energy level and on any rolling stock. In use, it will also reduce ventilation drag. Certified to UIC and EN standards, Faiveley Neoflexx® provides a groundbreaking advance in efficiency. /



## 🎯 Respecting the environment

Wabtec's commitment to efficiency extends not only to our customers, but also to the environment. In line with our Lean principles of reducing waste and making the best use of resources, Wabtec has launched a worldwide program to report our CO<sub>2</sub> emissions and to improve our sustainability through seven practical initiatives. These initiatives cover projects to replace conventional lights with LEDs, install heat exchangers instead of more energy-intensive heating/cooling systems, and add

solar screens onto windows to reduce heat and glare. With solar power also being harnessed at certain sites, Wabtec's goal is to reduce its total energy consumption by 5% in 2018 versus 2017. Water is an equally precious resource and is the focus of two other initiatives: to install leak detection systems in pipe networks and to harvest and re-use rain and industrial waste water. Finally, sorting and recycling materials such as aluminum, glass and paper, along with composting organic material is helping reduce the amount of waste we send to landfill. /

**Wabtec will decrease energy use**

**5%**

**in 2018.**

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## Making the most of water in India

For countries where rainy seasons alternate with periods of drought, it is becoming ever more important to use rainfall more efficiently and to replenish the natural reserves of groundwater. Wabtec's facilities at Hosur in India have done just that by including a 300,000-liter percolation pit that will reuse the local groundwater, while 11,500 m<sup>2</sup> of roof area is in the process of being turned into a rain harvesting facility for subsequent filtration and reuse. Production waste water is similarly being treated and recycled at the site.

**The exponential growth in intelligent sensors**, connectivity and the Internet of Things will enable gains in productivity for a wide range of industries. The railroad sector offers especially compelling opportunities. By deploying smart devices and smarter analytics, locomotive manufacturers and railroad operators can make their assets even more productive. Wabtec is at the forefront of this digital transformation. Our products are increasingly equipped with sensors that continuously record a broad spectrum of indicators, and then transmit that data via different communications channels. To process that information, we have developed WabtecONE®, a cloud-based monitoring and analytics platform that turns big data into business and operational intelligence. At the same time, Wabtec is also adopting new technologies, such as Additive Manufacturing (AM), to further increase the productivity of our customers. With AM, Wabtec is able to create spare parts to order, thereby reducing customers' inventory requirements while supplying them within very short lead times. Keeping rolling stock on the move is the key to productivity in the railroad industry, and Wabtec is continuously looking for innovative ways to deliver increased productivity for our customers.

# Productivity



# Productivity

## 🎯 WabtecONE®: a digital solution for today's railroads

As train manufacturers and transport operators look to improve productivity through smart devices and data analytics, Wabtec is delivering that technology today in the form of WabtecONE®. Devices embedded within locomotives, freight, metro cars, tracks and railyards can all be connected to this platform, enabling rail operators to raise productivity by improved asset monitoring capability.

With WabtecONE®, operators can access real-time information about the state of their rolling stock and the wear-and-tear on specific subsystems. A better understanding of the status of brakes, doors or HVAC systems means that maintenance teams can intervene before a train's availability is reduced. WabtecONE® can also help to reduce the number of sudden breakdowns and decrease the mean time between failures by predicting when parts are likely to fail. Over time, using data analytics to improve the availability of rolling stock will also help to reduce mean time to repair. These benefits combine to make rail assets more productive and reduces their total cost of ownership. /



## 🎯 Harnessing the power of dashboards

Along with improving individual components of a railroad infrastructure, WabtecONE® is also the management tool for large-scale systems such as our Positive Train Control offering, I-ETMS®. By providing customized dashboards with KPIs, our platform significantly reduces the effort required by maintenance personnel to manually analyze and summarize data, perform specific investigations, maintain customized tools or seek third-party tools for data analysis. Though designed for an office-based control center, WabtecONE® access can also be provided by a mobile connection for engineers on the move. /

## 🎯 A leader in innovation

The scope of transportation networks, from railroads to metros and tramways, offers widespread opportunities for introducing new technology. Wabtec's reputation for innovation means that the company is continuously developing new applications – many of which can also be configured to operate with WabtecONE®. From rail sanding equipment to door operation and wayside monitoring (see page 14), our innovations are already playing their part in raising productivity for our customers. /



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**Using data analytics to improve the availability of rolling stock will help reduce mean time to repair.**



Wabtec's Smart Sanding Device transmits data and alerts about sand levels in real-time to a remote server, and indicates whether the sanding unit is operating properly or not, thus optimizing the intervention of maintenance personnel and fleet management.

**Oil-free compressor.** Designed to deliver compressed air to brakes and other pneumatic systems in locomotives, Wabtec's oil-free compressor uses permanently sealed bearings and custom designed sealing elements to eliminate the need for lubricating oil. By eliminating oil change intervals, filter replacements, pump components, and component/performance reductions due to oil degradation, compressor reliability is increased, while routine maintenance is reduced.

#### **DLC2 NG Door Control Unit.**

Wabtec is delivering a breakthrough in door units for metro trains or platform screens with the DLC2 NG, the first to achieve SIL4 – the highest level of safety for a door control system. While carrying out the task of safely operating the door systems, the DLC2 NG is a connected device that also records operational data for diagnostics and Condition-Based Maintenance. Enhanced with cybersecurity software, the DLC2 NG is being deployed on the Paris Metro.

**Xebra 3 CCTV.** A fully connected, real-time CCTV system for buses and tramways, Xebra 3's wireless connectivity reduces the response time for alerts and law enforcement requests, while also providing remote monitoring of the status of both the camera and recording equipment. Other on-board maintenance tasks can be implemented wirelessly, helping to further optimize maintenance activities. /

### **Productivity tools: a wealth of opportunity from Wabtec**

**Track IQ.** A comprehensive, versatile and smart infrastructure solution, Track IQ assesses the status of key rolling stock components by collecting data as a train passes by, even at high speed, at any location on the network. Track IQ's wayside monitors can carry out highly accurate checks of bearing status, wheel profiles and damage, brake shoe wear and bogie conditions, along with a full vehicle inspection system. All the monitored data can also be integrated with rolling stock maintenance information, with a further option of integrating other vendor's equipment, such as hot bearing detectors or pantograph measurement systems.

**Smart Sanding Device.** Distributing sand onto railroad tracks to improve grip is an important safety measure in wet conditions. However, checking sand levels and inspecting the unit beneath the train can be an awkward, time-consuming task.

**Track IQ's wayside systems generate predictive alarms and alerts, allowing customers to optimise maintenance and improve availability while reducing the whole life cost of operation.**





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