Wabtec CORPORATION

WABTEC

Services

124
GLOBAL SITES

3,100
SERVICE EMPLOYEE

+23K
INSTALLED BASE OF LOCOMOTIVES

Pittsburgh
HEADQUARTERS

Chicago
FREIGHT SERVICES HEADQUARTERS

Segments
FREIGHT AND TRANSIT

MOVING THE WORLD

At Wabtec, we move the world. We are a global digital industrial leader and supplier to the rail, mining, marine, stationary power, and drilling industries.

Our solutions help customers deliver goods and services with greater speed and greater savings using our advanced manufacturing techniques, industry expertise and connected machines.

Established more than a century ago, Wabtec began as a pioneer in passenger and freight locomotives. That innovative spirit still drives Wabtec today. It's the engine of change that puts us at the forefront of transportation technology, software, and analytics. And it's why we continue to find and realize the potential that keeps our connected world moving forward.

+11K

LOCOMOTIVES UNDER MSA

~18K

LOCOMOTIVES REMOTE MONITORING AND DIAGNOSTICS

4

GLOBAL PERFORMANCE OPTIMIZATION CENTERS

COMPREHENSIVE AND FLEXIBLE OUTCOME CENTRIC SERVICE

Wabtec provides Integrated Services including technology, people, and processes, designed to maximize reliability and availability of customers' locomotives at optimal operating costs.

We can provide tailored solutions for each customer's operating needs, fleet strategy, and changing business trends. The team helps customers achieve their desired business outcomes which are delivered through a multi-year service agreement (MSA).

Our ongoing flexibility rebalances service solutions to meet changing business environments and needs for our customers' continued success.

COMPREHENSIVE AND FLEXIBLE OUTCOME CENTRIC SOLUTIONS

Integrated Service Offerings

Wabtec has the ability to customize capabilities to serve customer needs ranging from parts offerings to long term service agreements (MSA)

"Our service solutions – technology, people, and processes are designed to maximize reliability and availability of our customers' locomotives at optimal operating costs. By providing tailored solutions for each customer's operating needs, fleet strategy, and changing business trends, we continuously work on helping customers achieve their desired business outcomes."

Pascal Schweitzer *President, Global Freight Services*

INTEGRATED SERVICE OFFERINGS

PRE-OWNED LOCOMOTIVES AND SERVICES OEM	OEM certified pre-owned locomotives, parts, and support services for short line and regional railroads and industrial customers
LOCOMOTIVE MAINTENANCE SOLUTIONS SERVICE	Service shop solutions OEM, quality aftermarket parts, parts and inventory management, technical training, and qualification
REMANUFACTURING SOLUTIONS	Remanufacturing and unit exchange (UX) for engine systems, traction systems, and control systems
ASSET PERFORMANCE MANAGEMENT	Data, analytics, and digital solutions to improve asset performance
LOCOMOTIVE MODERNIZATIONS	Transform 20+ year old locomotives to improve performance in remaining asset life and reduce operating costs
PERFORMANCE UPGRADES	Software and hardware upgrade options to reduce fuel consumption and emissions, enhance asset availability and reliability, and optimize asset lifecycle costs

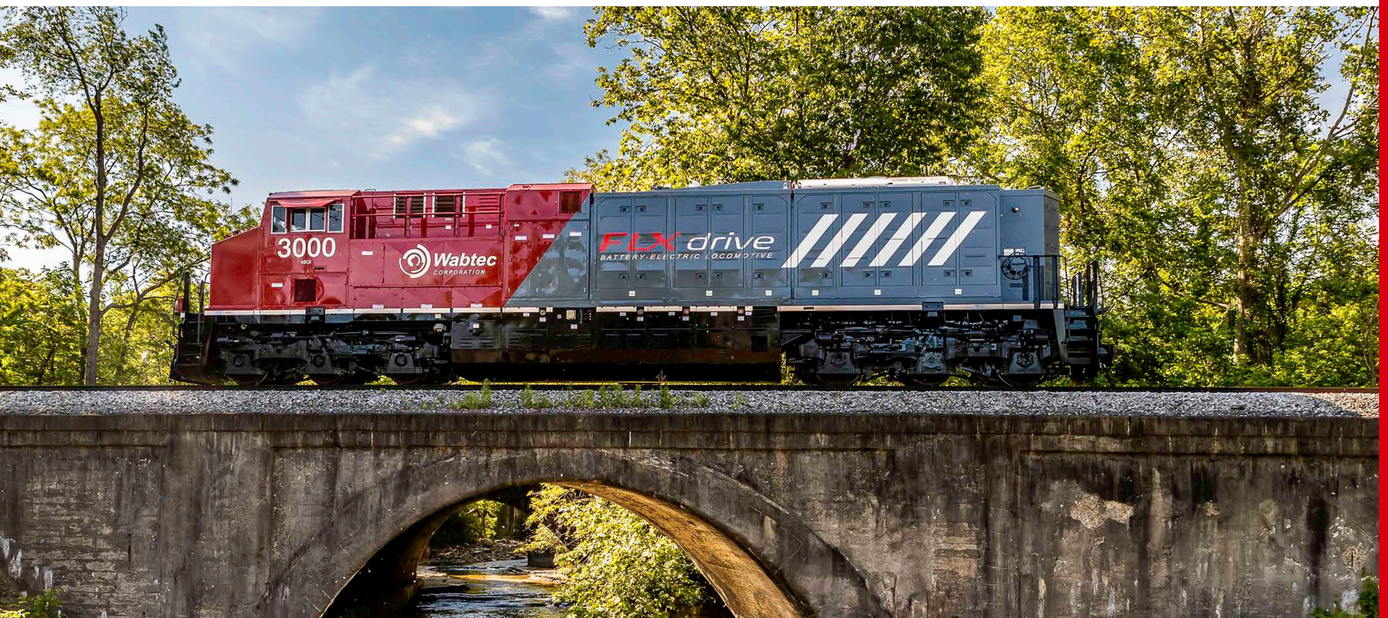
WABTEC SERVICES

Building a More Sustainable Future

Sustainability at Wabtec means operating in an ethically and socially responsible manner, maintaining a culture of safety, protecting the environment, supporting our communities, and growing and developing our employees.

“We are committed to accelerating our sustainability priorities, evolving our culture, and innovating groundbreaking technologies that will help build a cleaner, safer, more inclusive world.”

Rafael Santana *President and CEO*



SUSTAINABILITY PRINCIPLES

Innovating with Purpose

We are committed to developing responsible and sustainable products that minimize the impact on the planet.

Driving Responsible Operations

We are committed to providing safe work environments and products that enable productive and efficient use of resources.

Empowering People and Communities

We are committed to driving an inclusive culture grounded in integrity, as well as to the development of and investment in the communities where our teams live and work.

WABTEC

Expanding Our Global Service

WABTEC AND BNSF RAILWAYS BIOFUELS PILOT TO ADVANCE SUSTAINABILITY

“The rail industry is intently focused on reducing its environmental footprint by exploring emerging technologies. Biofuels provide a unique near-term opportunity to have a significant impact on reducing carbon intensity.”

Bob Bremmer
Group Vice President, Product Manangement

WABTEC TO DELIVER AUSTRALIA’S FIRST FLEET OF MODERNISED LOCOMOTIVES TO FORTESCUE

“While we have completed more than 1,000 modernisations for customers globally, it’s a first for Australia and demonstrates Fortescue’s commitment to drive more sustainable rail operations. By repurposing and rebuilding our locomotives, we give these heavy-haul trains another 20 years of life, while reducing the fuel consumption and maintenance, and repair and overhaul expenses by up to 20 percent. For Fortescue, the modernised trains will deliver up to a 55 percent increase in tractive effort and more than 40 percent increase in reliability.”

Wendy McMillan
Senior Regional Vice President, South East Asia, Australia and New Zealand

UNION PACIFIC SIGNS LARGEST LOCOMOTIVE MODERNIZATION DEAL IN RAIL INDUSTRY HISTORY WITH WABTEC

“Modernizations are a game changer for our customers offering the ability to realize significantly more value out of existing locomotive assets. By customizing these solutions for our customers and installing state-of-the-art technology, we are helping our customers realize outcomes including increased tractive effort, fuel efficiency, reliability, and adhesion, which reduce maintenance, repair and overhaul expenses. These fleet benefits will support Union Pacific’s sustainable service improvements and long-term growth strategy.”

Rafael Santana
President and CEO of Wabtec

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WABTEC SERVICES

Maintenance

ESERVICES

Digitally Connected Service Shop

eServices is a digital portal, specially designed to drive efficiency in locomotive service shops.

eServices captures asset repair and maintenance history, integrates with remote monitoring and diagnostics systems and shop processes, and enables creation and assignment of asset repair work-scopes. The platform offers real-time execution guidance and communications between technicians and experts based on actual locomotive conditions.

01 **OUTCOMES**

Improved Availability
Improved Reliability
Reduce Dwell / Cycle Time, FDL / GEVO

02 **FEATURES**

Asset Configuration Management
Asset Life Cycle History
Asset Performance Measurement
Integration with Remote Monitoring and Diagnostics
Shop Flow and Labor Management
Analytics Driven Real Time Work Scopes
Material Management
Shop Floor Execution

03 **APPLICATIONS**

Dash 7, Dash 8, Dash 9, AC4400, EVO Series
FDL and EVO Platforms
AC and DC Power
EMD Locomotives

IMMERSIVE TECHNOLOGIES

Driving Expertise with Technology

Wearable, augmented, mixed, and full virtual reality tool that allows the wearer to experience working on the locomotive without necessarily being in one.

Technical Advisor (TA) Remote Assist
Through TA Remote Assist, global technical support is available 24/7 for collaborative problem solving.

Technical Advisor (TA) Guides
The TA Guides are work procedure guidance supported through libraries of knowledge, procedures, and work instructions all delivered in context and hands-free.

Training
Mixed reality training enables opportunities without the need of physical assets. This removes the boundaries of location and time while enhancing technical understanding.

01 OUTCOMES
- Rapid Response Time to Customer Issues
- Reduction in Carbon Footprint
- Improved Customer Service
- Training without Physical Asset, Cutting Asset Downtime
- Enhanced Technician Proficiency
- Consistent and Standard Work Scopes

02 FEATURES
- Smart Shop Integration
- Work Scope Management
- Virtual Training
- Virtual Troubleshooting
- Mixed & Augmented Virtual Reality

03 APPLICATIONS
- Rolling Stock Assets - Railroads, Mining
- Service Focused

MAINTENANCE CONSULTING SERVICES

Helping Customers Optimize and Execute Service Plans

With over 30+ years of experience maintaining locomotives, Wabtec has a deep domain of expertise in locomotive maintenance. Our experts advise on everything from shop revitalization and lean services to IT implementation and project management.

01 **OUTCOMES**

Improved Asset Availability and Reliability

Capabilities Assessment and Education

Reduced Training Costs and Time

02 **FEATURES**

Areas of Expertise

Labor and Material Planning

IT Systems

Shop Flow

Lean/Six Sigma

Shop Setup

Monitoring and Diagnostics

OEM QUALITY AFTERMARKETS PARTS

Optimized Asset Lifecycle Costs

We are the world's leading provider of OEM quality aftermarket parts and maintenance kits for its full line of locomotives, engines, traction motors, wheels, alternators, controls, and various other sub-systems.

Our world-class manufacturing, quality, and field performance monitoring processes ensure high performance and reliable parts. In addition, effective training and certification programs minimize asset life cycle costs. Our dedicated customer service along with a global network of distribution centers and digital online marketplace enable parts to be delivered on time.

01 **OUTCOMES**

Improved Fuel Efficiency
Enhanced Performance
Increased Reliability and Availability
Reduced Asset Lifecycle Costs

02 **FEATURES**

Engine Components
Propulsion Components
Mechanical Components
Control Components
Maintenance Kits

PARTS AND INVENTORY MANAGEMENT

Best in Class Materials Management

Wabtec has the right material footprint and tools to ensure material is in the right place at the right time. We can provide a range of customized solutions that range from basic parts offering to fully managed material management. We can help you with storage solutions, service centric planning, demand trending analytics, dedicated shipping lanes, all backed by a 24/7/365 support team.

01

FEATURES

Multi Service Levels:

Consultation

Materials On-site

Complete On-site Enterprise

Planning and Forecasting

Inventory and Freight Optimization

02

APPLICATIONS

Class I and II Railroads

Mining

Service Focused Businesses

03

OUTCOMES

Optimize and Reduce Total Cost of Supply Chain

Improved Customer Service

SERVICE SHOP

Efficient Service Shop Management

Our Service Shop offerings range from basic technical support and materials management to comprehensive management and operations of customer service shops.

Leveraging more than 125 years of experience in the manufacturing, servicing, repair, overhaul, remanufacturing and modernization of locomotives and engines, Service Shop offerings provide customers with the benefits of OEM trained technicians and supervisors, optimized parts management, latest technologies, and streamlined operating processes.

01

OUTCOMES

Improve Reliability Through Shop Driven Process Control

Increase Availability by Reducing Dwell and In-shop Cycle Times

Reduce Asset Lifecycle Costs by Ensuring Optimal Maintenance, Repair, and Overhaul Schedules and Minimizing Parts Purchase Expenses

02

FEATURES

Technical Support to Full Labor

Parts Management

Inventory Management

Parts Purchase Agreements

Technologies

Smart Shop

eServices

Technical Rail Expert

Cutting Edge Tooling

Processes

Lean / Six Sigma

Monitoring and Reporting

Cost Management

03

APPLICATIONS

Dash 7, Dash 8, Dash 9, AC4400, EVO Series

FDL and EVO Platforms

AC and DC Power

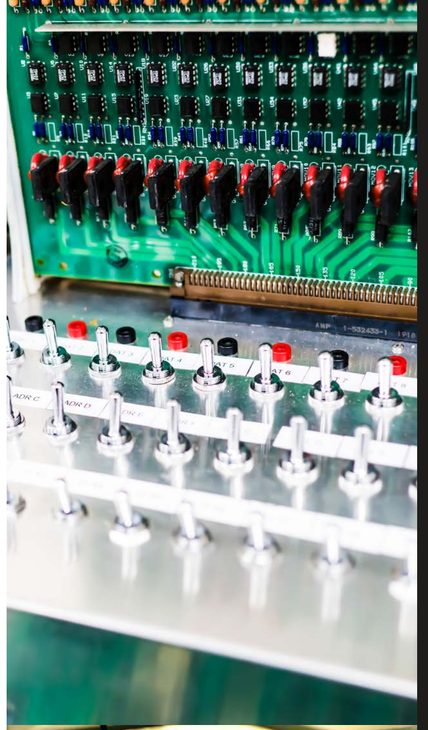
SMART SHOP

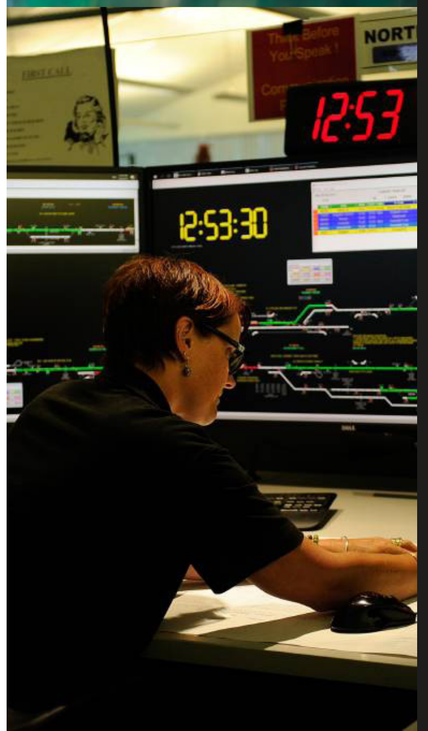
Integrated Service Shop

Smart Shop is an integrated solution comprised of eServices, remote monitoring and diagnostics solutions, analytics based work-scopes, and best practice Service Shop management processes.

Smart Shop provides a digital dashboard that helps to easily identify high and medium risk locomotives. Analytics based work-scopes are created prior to the locomotive's arrival at the service shop and ensure high reliability while streamlining in-shop cycle times.

Workflows enable users to plan, schedule (spotting), monitor, guide, and execute work-scopes and manage the service shop to deliver complete and quicker repairs.





01 OUTCOMES

- 1-4% Asset Availability Improvement
- 40-80 Hours Reduced Shop Dwell Times
- 20% Reduction in Repeaters (repeat service incidents)
- Reduction in Line of Road Failures
- Increase in Shop Throughput
- Reduction in In-shop Fuel Consumption (~100 gal/event) and Carbon Footprint
- Reduced Maintainer Exposure

02 FEATURES

- Geo Location Services
- Splintered Smart Inbound
- Service Track Reporting
- Turn Over Reporting
- Integration with eServices Asset Management Solution

03 APPLICATIONS

- Dash 7, Dash 8, Dash 9, AC4400, EVO Series
- FDL and EVO Platforms
- AC and DC Power

TECHNICAL TRAINING AND CERTIFICATION

Enhanced Technician Proficiency

Our world-class training and qualification program provides our employees and our customers with the ability to train and qualify service shop managers, supervisors, and technicians in the diagnosis, repair, and maintenance of our locomotives and engines. Leveraging virtual on-demand courses, as well as in-person hands-on classes and workshops, customers can update their knowledge of technical and operational best practices on an ongoing basis.

LEVEL	TECHNICAL	MANAGEMENT AND KNOWLEDGE TRANSFER	PROCESS		ROLE REQUIREMENTS
03	**Expert Master**	Group	Experienced	EXPERT MASTER LEVEL 3 **10%**	*Service RTS, service consultants, GPOC*
02	**Expert Advanced**	Team	Developed	EXPERT ADVANCED LEVEL 2 **30%**	*Select TA/MTA, Quality leaders, Site technical leaders, Training Instructors*
01	**Expert Qualified**	Self	Intro	EXPERT QUALIFIED LEVEL 1 **100%**	*TA/MTA, Quality leaders, Site technical leaders, Material specialists, Training instructors, Work order specialists, Fleet program managers*

01

OUTCOMES

Improved Technician Efficiency

Capabilities Assessment and Education

Reduced Training Costs and Time

02

FEATURES

Wabtec University – On Demand

Basic and Advanced Courses

Standard Locomotive and Marine Models

Multiple Languages

Annual Licensing for Continuous Training

Customer Innovation Center

Full Size Engines

Training Aids / Mock-ups

Operational Locomotive

Customer On-Site Training

On Customer Equipment

03

APPLICATIONS

Dash 7, Dash 8, Dash 9, AC4400, Powerhaul, EVO Series

FDL, P616, and EVO Platforms

AC and DC Power

V228 and V250 Marine and Stationary Engines

WABTEC SERVICES

Remanufacturing

REMANUFACTURING SOLUTIONS

Optimizing Lifecycle Costs

Our remanufacturing solutions enable customers to replace old engines, cylinder assembly, turbochargers, traction motors, alternators, blowers, exhausters, cards, and other key components of a locomotive with corresponding certified OEM quality units.

Wabtec has a broad remanufactured parts offering, this includes repair and return for customers who want their asset back, or Unit Exchange for customers that want their asset pool managed, where an equivalent unit is promptly provided in return for the original unit. In either case, units go through a comprehensive tear-down, requalification, and assembly process that ensures remanufactured units perform at par with corresponding new units.

Available at a fraction of the cost of purchasing new units, remanufactured units extend the life of the locomotive and restore original performance.

01 **WORKSCOPES**

Engine Systems

Traction Systems

Control Systems

02 **OUTCOMES**

Same Service Life as New

Same Warranty as New

Shorter Lead Time

~30% - 50% Cost Savings

WABTEC GLOBAL SERVICES

Aftermarket Component-based Solutions from the World Leader in Railway Equipment Technology

We take pride in our ability to offer top-quality maintenance solutions that quickly restore and enhance asset performance. With over 150-years-experience, we offer the finest in reconditioning and upgrade services as well as supplier managed inventory and parts distribution. Our extensive network of distribution centers and M-1003 certified repair facilities offer unmatched product diversity aimed at providing timely and cost effective support to our partners and customers in the transportation segments we serve.

WGS NETWORK

Columbia, SC
Chicago, IL
Houston, TX
Kansas City, MO
Montreal, CA
San Luis Potosi, MX
Contagem, BR

REPAIR LOCATION	NORTH AMERICA Kansas City, Missouri	Chicago, Illinois	Columbia, South Carolina	Houston, Texas	Montreal, Canada	San Luis Potosi, Mexico	SOUTH AMERICA Contagem, Brazil
Freight Car Components							
Air Brake Control Valves	●		●		●	●	●
Empty Load Valves	●		●		●		
Brake Cylinders	●		●		●	●	●
Slack Adjuster			●		●		●
End of Car Cushion Unit	●						
Car Test Devices	●		●		●	●	
Wheel Shocks						●	
Spare Part Distribution		●		●	●		
Locomotive Components							
Pneumatic Air Brakes	●		●		●	●	●
Electro Pneumatic Air Brakes	●		●		●	●	
Air Compressors	●		●			●	●
Heat Exchangers	●					●	●
Electronics/Communications	●		●		●	●	
Air Dryers	●				●		
Auxiliary Air	●		●		●		
Brake Cylinders	●		●		●		
Spare Parts Distribution		●		●	●		
Transit Components							
Air Compressors			●			●	
Tread Brake Units			●		●	●	
Actuators			●		●	●	
Auxiliary Air			●		●	●	
Other Components							
Industrial Heat Exchanges	●						

WABTEC SERVICES

Modernization

MODERNIZATION SOLUTIONS

Maximize Asset Value and Fleet Performance

Our Modernization solutions transform 20+ year old locomotives to extend asset life and reduce operating costs.

Solutions can range from a control system upgrade to complete transformation of an aged DC locomotive into an AC locomotive outfitted with state-of-the-art digital technology. Each solution is tailored to a customer's unique operation and technology needs to maximize return on investment.

Wabtec has completed over 1,800 modernizations on a broad range of models, including U-Series, C-Series, Dash 8, Dash 9, and AC4400, in more than 24 countries. We are serving the majority of the North American Class I railroads.

01 OUTCOMES

Modernization Solutions Deliver Up To:

58% Tractive Effort Increase

24% Fuel Efficiency Improvement

40% Reliability Enhancement

25% Adhesion Increase

02 KEY CAPABILITIES

Engine Systems

Complete Engine Rebuild with FDLA Upgrade

5% Fuel Efficiency Improvement

Engine Control System Upgrade

20% Diagnostic Capability Increase

Traction Systems

Traction System Conversion

Advanced Tractive Effort Package

Drivetrain Health Monitor System

Truck Enhancement

Digital Solutions

Control Systems Upgrade

IGBT Based Electronics

GoLINC Mobile Data Platform

Locotrol® Distributed Power and Trip Optimizer Train Handling Systems

Platform and Body

New Operator Cab

New Aux Cab

Refresh Engine and Cooling Cab

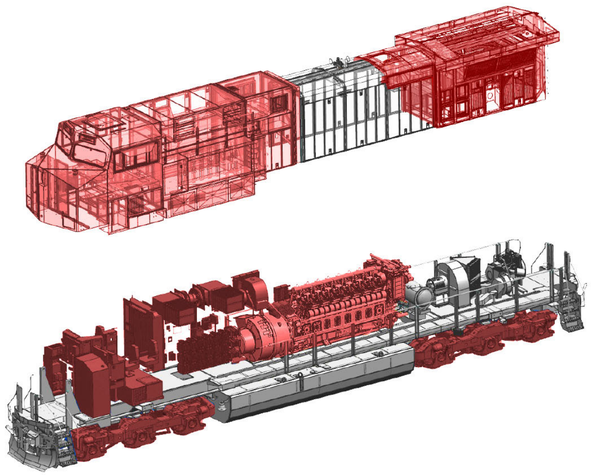
Rebuild Platform

Meet Latest Crash Worthy Requirement

MODERNIZATION SOLUTIONS

DC2AC Conversion

As railroads seek to improve operational efficiency and reduce the impact on the environment, Wabtec's DC2AC product transforms existing DC locomotives in to more productive and efficient AC locomotives. Along with the 58% increase in tractive effort, the conversion also incorporates our latest control system CCA allowing for seamless integration of Digital Solutions and engine system fuel savings products to maximize operational savings.



Capital efficient approach for maximum operation efficiency improvement and ESG reduction

01 KEY CAPABILITIES

New Nose and Operator Cab

New Aux Cab with all New Control System and Electronics

New Dynamic Braking Package

OH In-kind or Upgrade Engine with Latest Fuel Solution

OH In-kind or Upgrade Cooling System

OH In-kind of all Propulsion Equipment

New High Tractive Effort Truck and New AC Traction Motors

New Advanced High Tractive Effort Package

Factory Installation and Integration of Digital Solutions including PTC, TO, Antenna Farm, GoLINC, etc.

~58% Increase in Tractive Effort

~5-24% Fuel Efficiency Improvement

~40% Reliability Improvement

02 ESG BENEFITS

550T CO_2 Reduction per Loco per Year

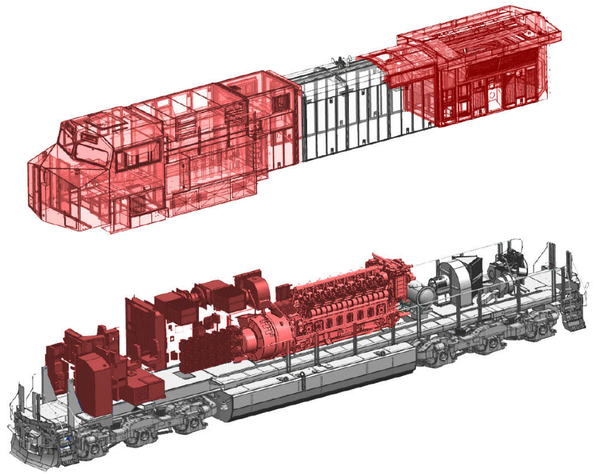
~180T CO_2 Avoidance per Loco

MODERNIZATION SOLUTIONS

AC Refresh

Industry proven AC Refresh modernization has brought new life into 20+ years old locomotives. The modernization enables the locomotives to receive the latest control system, fuel savings, propulsion, adhesion technology, and connectivity solutions while optimizing the use of existing hardware, making the greatest impact to the environment.

With over several hundred locomotives in operation across multiple customers with variety of applications, the AC Refresh product continues to exceed expectations.



Capital efficient approach to maximize asset reliability

01 KEY CAPABILITIES

New Nose and Operator Cab

New Aux Cab with all New Control System and Electronics

New Dynamic Braking Package

OH In-kind or Upgrade Engine with Latest Fuel Solution

OH In-kind or Upgrade Cooling System

OH In-kind AC Traction Motors and all Other Propulsion Equipments

Advanced High Tractive Effort Upgrade

Factory Installation and Integration of Digital Solutions Including PTC, TO, Antenna Farm, GoLINC, etc.

~14% Increase In Tractive Effort

~5-23% Fuel Efficiency Improvement

~25% Reliability Improvement

02 ESG BENEFITS

540T CO_2 Reduction per Loco per Year

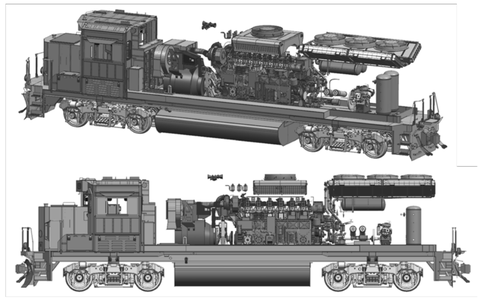
~220T CO_2 Avoidance per Loco

MODERNIZATION SOLUTIONS

ET23 Repower

Proven Tier 4 solution designed for switch and short line application with a focus on reliability, performance, and life cycle cost.

The ET23 Repower convert the old Dash 2 control systems, 645 diesel engine, and locomotive cooling system with a new BrightStar control system, Tier 4 Engine Control Unit, Tier 4 6L250 Evolution Technology diesel engine, and Tier 4 cooling system while at leaset maintaining the same starting and continues tractive effort rating of the locomotives being repowered.



The ET23 repower includes equipment designed and installed into a SD40-2, GP38-2 or GP40 locomotives. The repower is intended to be executed on customer supplied locomotives. The customer supplied locomotive will be modified with a combination of new equipment, unit exchange parts, and existing parts from the customer supplied locomotive or from common industry suppliers and sources.

While maximizing the reuse of many components has been a priority, locomotives can also be modified with new S-580 compliant operator cabs, new S-5506 compliant fuel tanks, or any number of upgrades and enhancements that are available.

01

KEY CAPABILITIES

EPA Tier 4 Line Haul Certified

CARB Verified

2,350 Gross Horse Power

Over 1,000 Tier 4 Engines in Operation

Over 300,000,000 miles in revenue service

NO UREA

Repower GP’s or SD’s

Up to 20% Fuel Savings

~50% Lube Oil Savings

~20-year Overhaul Cycle

02

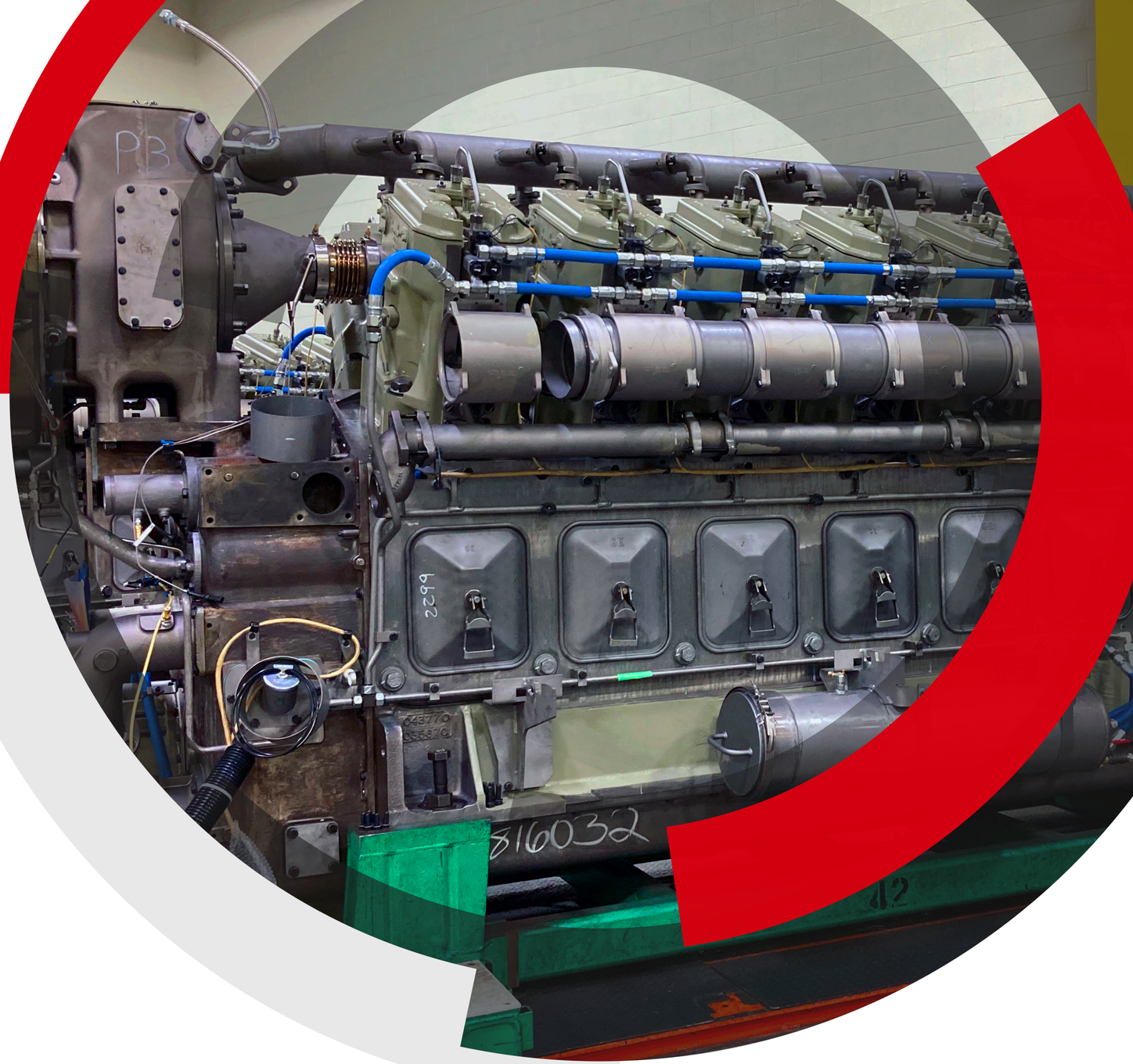
ESG BENEFITS

90% Emission Reduction (NOx and PM)

~ 95T CO_2 Reduction per Loco per Year

WABTEC SERVICES

Performance Upgrades



ADVANCED ADHESION SOLUTIONS

Increase Carloads and Haul More Freight

Improve all weather tractive effort and adhesion by leveraging a package of hardware and software solutions

Advanced Rail Cleaner (ARC)

Hardware and software based solution that improves adhesion and related tractive effort by leveraging proprietary rail cleaning system.

Direct Excitation Adhesion Control (DEAC)

Improved creep regulation at lower speeds and reduces wheel slip occurrence by enforcing excitation frequency rate limits.

Extended Tractive Effort

A software solution that increases the per axle tractive effort rating for the locomotive up to 40K lbs.

01

OUTCOMES

Increase in Adhesion

Increase in Tractive Effort and Hauled Tonnage in all

Weather Conditions Leading to Higher Customer Revenue

Reduction in Stalls

02

APPLICATIONS

AC Power

AUTOMATED SELF LOAD OUTBOUND TEST

Reduced Cycle Time, Labor, and Fuel During Self Load Testing

The Automatic Self Load Outbound Test (ASLOT) standardizes a repeatable, accurate, and concise process or load testing locomotives. Snapshots of locomotive performance data are obtained automatically without manual operator transcription. By establishing an objective test for a set duration, this creates fuel savings and enhances operator efficiency by reducing overall cycle time for the test.

ASLOT *An Automatic Locomotive test that gives a clear pass/fail in the locomotive log with supporting data.*

01 OUTCOMES

Reduces the maintenance cycle time – optimizing labor to minimize fuel consumption, saving hundreds of gallons of fuel a year for normal maintenance and reliability cycles

Fastest warming time for cold engine

02 FEATURES

Process Automation and Data Capture

Simple Pass/fail Logic for Locomotive Health

Concise Test Log Showing Active Incidents

03 APPLICATIONS

AC CCA Based Locomotives

Tier 2 and 3 Engines

Tier 4, DC, and FDL/GEVO platforms (upon request)

Power PC and SCIO Based Control System Only

AUTOMATIC COOLING HEALTH

Reduced Life Cycle Cost

The Automatic Cooling Health (ACH) Test automates a repeatable and standard load testing process to help identify defects in the cooling system.

Data is captured from the locomotive in the form of data packs and displays the locomotive performance without the need for manual operator transcription. Simple pass/fail criteria based on the captured data, help pinpoint root causes within the complex cooling system, enabling faster troubleshooting.

01

OUTCOMES

Minimizes hot engine road failures

Quicker testing and troubleshooting, minimizing cycle time and related labor and fuel consumption

02

FEATURES

Automated and Standardized incident with data capture from locomotive control

10 new Incident SUB IDS help identify root cause of cooling system issue

Updated Fault Analysis Manual (FAM) to help solve root cause

03

APPLICATIONS

AC CCA based locomotives

Tier 2 and 3 Engines

Tier 4, DC and FDL/GEVO platforms (upon request)

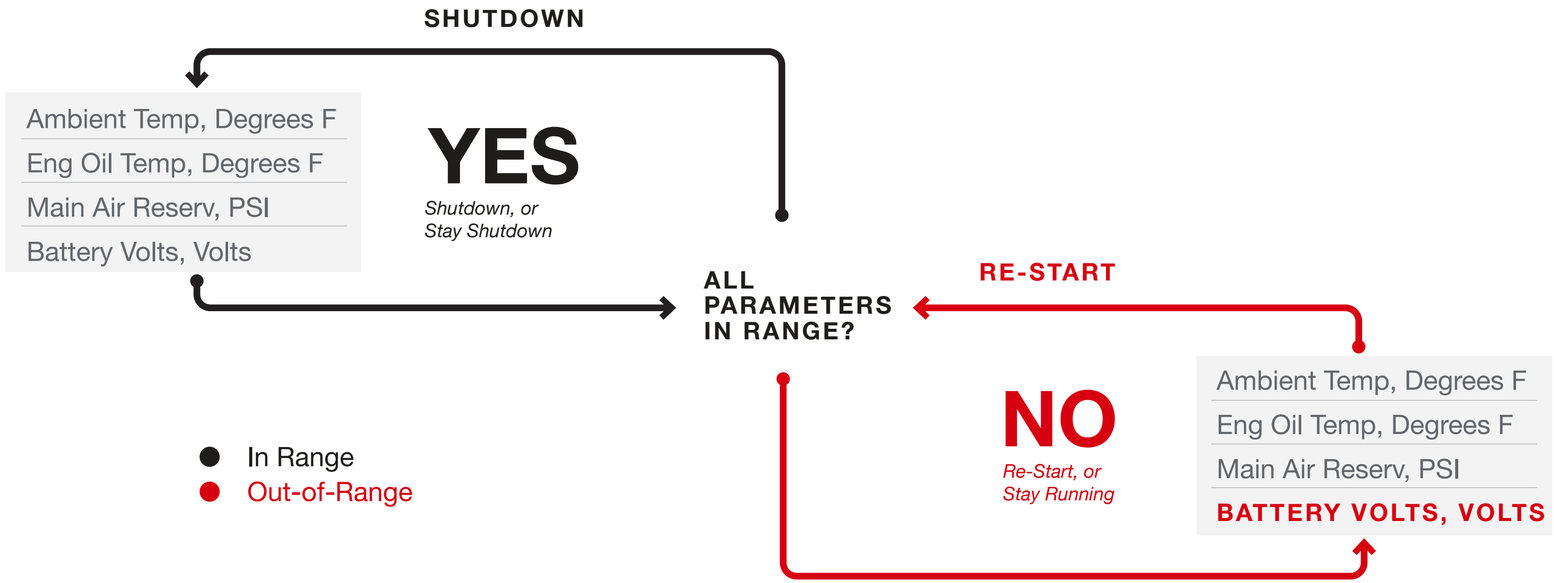
Power PC and SCIO based Control System Only

AUTOMATIC ENGINE START STOP SYSTEMS

Optimized Idling and Enhanced Safety

Our Automatic Engine Start Stop Systems (AESS) include hardware and software solutions that help to reduce idling locomotive fuel consumption and lower emissions for locomotives.

Based on locomotive speed, ambient temperature, battery voltage, and brake system air pressure, the system automatically triggers the engine to stop or



01 OUTCOMES

Up to 10% Reduction in Fuel Consumption for Yard Service

Up to 3% Reduction in Fuel Consumption for Road Service

02 FEATURES

Start-up/Shut-down Override Button

Shut-down Counter

Engine Status Indicator Lights

Starter Motor Protection System

Automatic Governor Reset Feature

Manual and Online Data Download

03 APPLICATIONS

Dash 8, Dash 9, AC4400, EVO Series

FDL and EVO Platforms

EMD Locomotives

AC and DC Power

SUSTAINABILITY

Reduced Fuel Consumption and Reduction in GHG Emissions

In 2021, our fleet of 23,000+ locomotives globally traveled over 1.8 billion miles and helped our end-customers eliminate over 135 million metric tons of GHG emissions by choosing rail over truck transportation. That's the equivalent of removing over 27 million cars from the roads or planting 37 million acres of trees.

Our fuel soultions include hardware and software solutions, driven by upgraded and SW to optimize fuel consumption for given applications and emissions level.

FDL Advantage

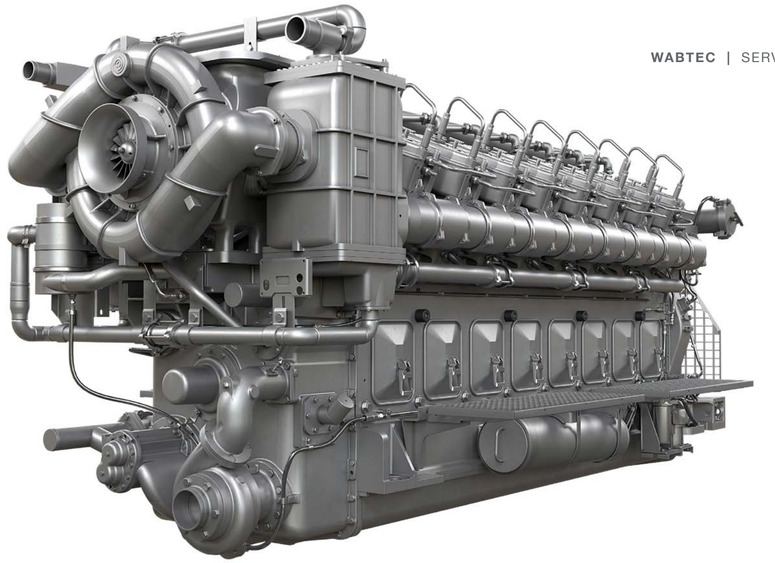
Our fuel-saving engine upgrade package for the FDL locomotive platform and a complete control system replacement. In addition to addressing industry imperatives for improved fuel efficiency and reliability, these solutions introduce next-generation data and software capabilities to position railroads for the future of transportation.

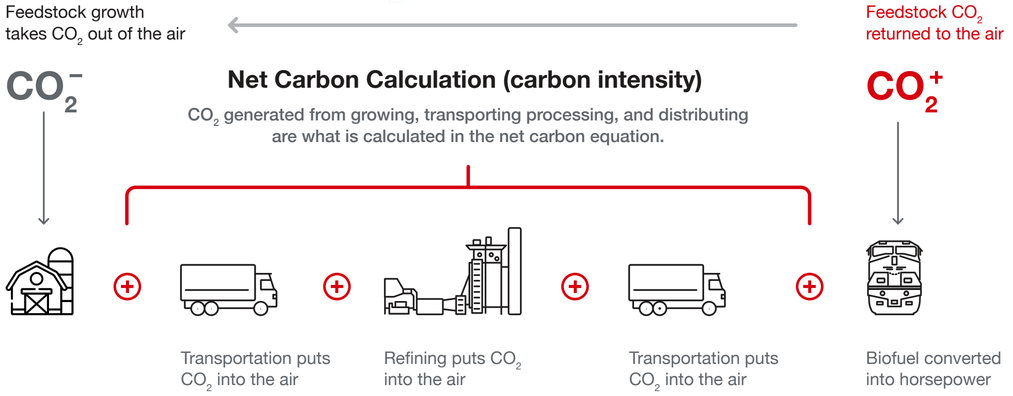
Biofuel Validation

Partnering with 4+ of our customers to determine max Biomass (Biofuel and Renewable diesel) blend ratios (above current B5R30 approval) that protects performance, durability, and emissions compliance while maximizing net carbon intensity reduction.

eTurbo (Development)

New technology under development for Evolution Series Engines to enhance fuel efficiency through system integration and packaging.





01 OUTCOMES

Increase in Fuel Efficiency

Lower GHG Emissions

02 APPLICATIONS

Dash 8, Dash 9, AC4400, EVO

FDL

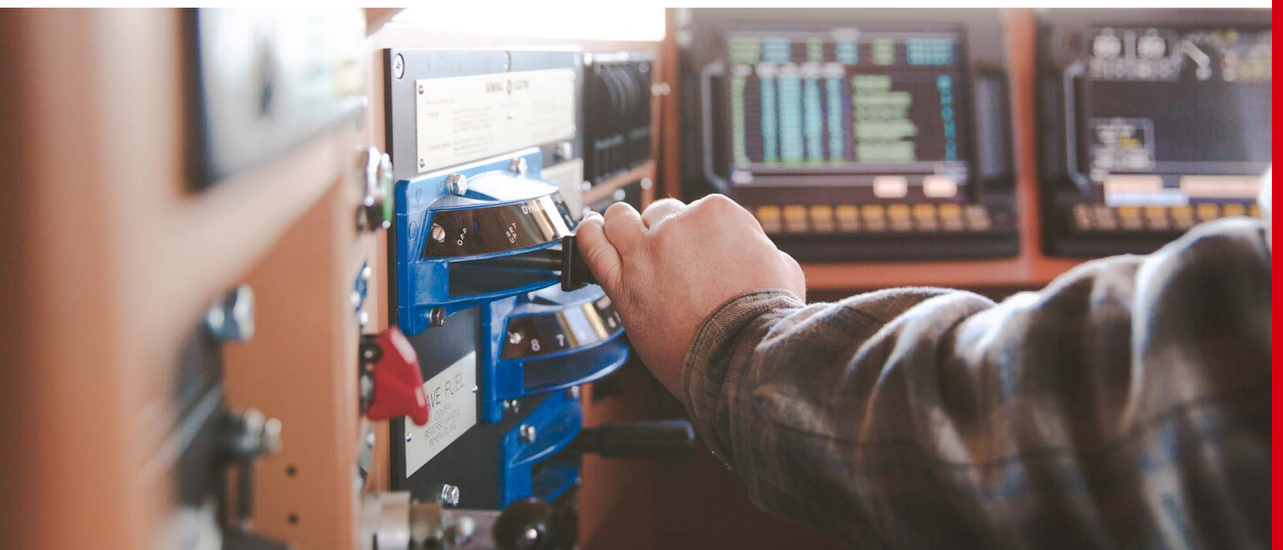
AC and DC Power

SINGLE PORT LOADING

Improved Productivity with Software Loading

A single ethernet port interface to the locomotive enables the maintainer to program and configure the entire control system via Wabtec's Toolbox using a M12 to RJ45 cable, eliminating the need for PCMCIA and USB cards.

An automated process prompts the operator to take action, cutting programming time in half from 1.5 hours to 45 minutes, and reducing unnecessary no-trouble-found (NTF) part changeouts of CIO panels and SDIS.



01

OUTCOMES

Single Ethernet Interface Eliminates Need for PCMCIA and USB Cards

Automated Process Reduces Power Cycles and Associated Fuel and Labor Consumption

Minimizes Unnecessary Part Changeouts by Reducing Errors from Manual Programming

02

FEATURES

Single Ethernet Port Interface to Locomotive Control System

Automated Process to Program and Configure Locomotive Control System

03

APPLICATIONS

EVO Series (Development)

AC and DC Power

Power PC and SCIO based Control System Only

MODULAR CONTROL ARCHITECTURE

Improved Reliability, Security, and Future Expansion

Modular Control Architecture (MCA) is an upgraded, flexible, expandable control system platform to allow growth for the generation of freight services. System allows for current and future cybersecurity needs, growth to handle autonomous and increased condition-based maintenance, and other future needs.

01

OUTCOMES

Significant increase in computing power and performance

Higher reliability of control system

Increased data to solve maintenane and operational needs faster

02

FEATURES

Expandable inputs/outputs of 5X for compatibility with alternative fuels and automation

Secure ethernet coomunications for robust data pipeline with new and future product expansion

03

APPLICATIONS

Modernized Locos (2023+)

FLXdrive Locos

AC and DC Power

TRACTION ANTILOCK BRAKING SYSTEM

Reduced Severity and Frequency of Wheel Slides

Traction Antilock Braking System (TABS) Software enhancement for the AC Traction Motor Controller applies motor torque to overcome excessive air brake forces while in Dyanic Braking or Idle.

TABS reduces wheel slides, which reduces flat spots and the resulting impact loading to rails, wheels and drive components.

01 OUTCOMES

- Reduced Wheel Flat Spots
- Reduced Wheel Impact Damage
- Decrease in Wheel Defects

02 FEATURES

- Automatic action to prevent and correct wheel slides
- Automatic sanding at slide detection
- Automatic wheel slide arm (optional)

03 APPLICATIONS

- AC CCA
- FDL and EVO
- AC Traction

WABTEC SERVICES

Asset Performance Management

EXPERT-ON-ALERT

Real-time Centralized Monitoring and Diagnostics

Expert-on-Alert provides centralized monitoring of locomotive health status and performance in real time.

Locomotives transmit data to our Global Performance Optimization Center (GPOC), where experts supported by software algorithms, analyze control system status, and performance data. This enables us to determine root cause of failures while in-transit and proactively manage necessary maintenance and repair of locomotives. The GPOCs operate 24x7 in 4 locations, addressing ~80% of failures that can impact a locomotive, and issuing ~300 work-scope recommendations per day to field service teams.

01 OUTCOMES

- Reduced Unplanned Downtime and Train Delays
- Increase Locomotive Availability
- Reduced In-shop Dwell and Cycle Times
- Improved Service Shop Labor and Material Productivity
- Reduced Maintenance Spend

02 FEATURES

- Real-time Fault Analysis and Diagnostics
- Proactive Parts and Resource Planning
- Work-scopes Ensuring Fix Right First Time
- Integrates with Wabtec eServices

03 APPLICATIONS

- Dash 8, Dash 9, AC4400, EVO Series
- FDL and EVO Platforms
- AC and DC Power

GOLINC®

Onboard Network Data Center

GoLINC is an industry-tested network, communication and application management platform for the railroad environment. It is a mobile data center that provides robust processing, wireless communication, networking, video and data storage.

GoLINC's modular, flexible and upgradeable platform allows it to keep pace with technology. GoLINC interfaces with both locomotive and third-party systems to make data available, and features onboard wireless capability for easier data transfer.

01 OUTCOMES

Improved locomotive and train performance

Enhanced communication and improved productivity between locomotive / train and centralized operations

Integrated data storage, processing, and communication across our systems as well as third-parties

02 FEATURES

Network switch/routing

Dual LTE/4G wireless capability

Dual Wi-Fi, integrated GPS

Expandable applications processing

8TB network addressable storage

Multiple high-definition video processing

Allows user to configure, upgrade and view diagnostics of any module in the chassis

Ruggedized for harsh railroad environments

03 APPLICATIONS

Dash 7, Dash 8, Dash 9, AC4400, EVO Series

FDL and EVO Platforms

AC and DC Power

LOCOTROL®

Distributed Power System

To meet demand for longer, heavier trains — and provide efficient train handling — rail companies are choosing advanced distributed power systems that enable remote control of locomotives in separate consists from the lead locomotive.

Wabtec's LOCOTROL® Distributed Power System is a proven control and communication system that enables coordinated braking and traction power distribution between lead and remote locomotives—for increased hauling capacity, improved fuel efficiency, and reduced operating costs.

50+

Years of operating experience

21,000+

LOCOTROL DP systems installed worldwide

01 NEXT GENERATION PLATFORM

LOCOTROL Expanded Architecture (XA) is the next-generation platform providing a host of enhancements and productivity applications designed to increase the reliability and robustness needed for today's railroad operations. Architected for the future of digital-rail communications, LOCOTROL XA utilizes multiple communication options to increase bandwidth and connectivity, resulting in 50% reduction in DP communication losses and associated train delays. Current DP customers can realize significant benefits by updating to the newer XA platform.

02 BENEFITS AND OUTCOMES

Increases Train Hauling Capacity:
Enables longer, heavier trains.

Improves Train Handling:
Reduces in-train forces and reduces break-in-twos.

Increases Fuel Efficiency:
Reduces lateral forces and friction, resulting in fuel savings of 4-6%*, 3% EPA certified.

Increases Efficiency:
Increases throughout and efficiency; reduces cycle times.

** U.S. Federal Railroad Administration, Best Practices and Strategies for Improving Rail Energy Efficiency*

POWER ADVISOR

Real-time Power Assignment System

Power Advisor is a real-time locomotive decision support tool designed to deliver locomotive health insights that enable power planners and dispatchers to make smarter and faster power assignment decisions, improving utilization and mission success outcomes for high priority trains. Power Advisor's advanced algorithms give customers the advantage of knowing the health of each locomotive before selecting it for a mission.

Unit	Fleet	Train ID	Next Train	Health
C1-157	HOS78	C1-Train-15		2.1
C3-0137	IUF68AD	C3-Train-25		22.8
C1-598	HOS78	C1-Train-56	C1-Train-48	40.0
C3-6454	IUF68AD		C3-Train-06	60.9
C2-7349	HUR07EZ	C2-Train-178	C2-Train-148	70.0
C1-222	HOS78	C1-Train-03		70.0
C6-8809	YTZ0	C6-Train-12		75.1
C1-334	HOS78	C1-Train-71		90.0
C1-202	HOS78	C1-Train-03		100.0

01

OUTCOMES

Maximize mission success by selecting the healthiest locomotives for the trip

Reduce train delays by making smarter, faster on/off train decision

Increase asset utilization by providing enhanced visibility of locomotive performance

02

FEATURES

Cloud-based portal

Locomotive Location GUI

Integration available with customer systems

Proactive Health Checks

Advanced Monitoring analytics

Asset Performance Index (API) benchmarking

Cross-fleet locomotive health performance trends

03

APPLICATIONS

Dash 8, Dash 9, AC4400, EVO Series

FDL and EVO Platforms

AC and DC Power

TRIP OPTIMIZER™

Smart Cruise Control for Trains

Save fuel, improve train handling

Trip Optimizer™ is a smart cruise-control system for trains that takes into account terrain, train make-up, speed restrictions and operating conditions to calculate an optimum speed profile. It then automatically controls locomotive throttle and dynamic brakes to reduce fuel burn and provide efficient train handling.

With Trip Optimizer, trains run on time, operate more smoothly, and use fuel more efficiently – resulting in fuel savings and corresponding emissions reduction.

3.8
Million liters of fuel saved every day

300+
Million auto miles operated

01 ADVANCED FEATURES AND FUNCTIONS

- Advanced Train Handling
- LOCOTROL® Integration
- SmartHPT
- Air Brake Advisement
- Integration with Automatic Train Protection
- Network Pacing
- Auto Air Brake Control

02 BENEFITS AND OUTCOMES

Sustainable Fuel Savings:
Up to 30% fuel savings for the Trip Optimizer suite; EPA-certified for 15% fuel savings

Emissions Reduction:
Up to 30% based on fuel savings, plus potential for emissions credits

Efficient Train Handling:
Minimizes in-train forces

Consistent Velocity Performance:
Eliminates unnecessary acceleration and deceleration

Reduces Wear & Tear:
Reduces deterioration of the locomotive and track through better train performance

Enhanced Train Automation:
Provides the foundation for increased train automation, including application and release of air brakes and auto operation from start to stop

WAYSIDE CONDITION MONITORING

Automated Inspection Monitoring

Wayside Condition Monitoring is a comprehensive portfolio of solutions that provide non-contact proactive monitoring of rolling stock conditions. Spanning key components – including wheels, brakes, bearings, air hoses, cross keys – and extending to full train inspection, it combines machine vision with remote sensing technology and AI-driven analytics to optimize inspection for increased asset availability and reduced operational costs.

01 POWERED BY LEADING TECHNOLOGIES

Wayside Condition Monitoring brings together Beena Vision's advanced digital high speed imaging and 3D laser scanning technology with Track IQ's sensor-based systems to produce an industry-leading suite of wayside inspection solutions.

Together, these technologies provide the following capabilities:

Automated Condition Monitoring

Optimized Maintenance

Advanced Analytics

02 BENEFITS AND OUTCOMES

Streamline Inspections & Operations

Optimize Manpower

Increase Reliability & Availability

Maximize Asset Life

Improve Safety & Compliance

WABTEC SERVICES

Pre-Owned Locomotives and Services

PRE-OWNED LOCOMOTIVES AND SERVICES

Certified, Upgraded, and OEM-Backed

Our marketplace for pre-owned locomotives and services enables short line and regional railroads as well as other industrial manufacturers to make optimal purchasing decisions for their fleet.

The marketplace provides a range of certified pre-owned locomotives. Necessary upgrades are included to ensure OEM design standards are met. In addition, the marketplace provides ongoing access to cost-effective service options including parts and technical support.

01 **OUTCOMES**

Improved Service Delivery

Increased Tractive Power

Enhanced Return on Assets

02 **FEATURES**

Certified Pre-Owned Locomotives

Parts

Warranty Available

Technical Support

Digital Upgrades

Surge Power

03 **APPLICATIONS**

Short Line Railroads

Regional Railroads

Industrial and Manufacturing Companies

Dash 7, Dash 8, Dash 9, AC4400, EVO Series

FDL/EVO Platforms

AC and DC Surge Power

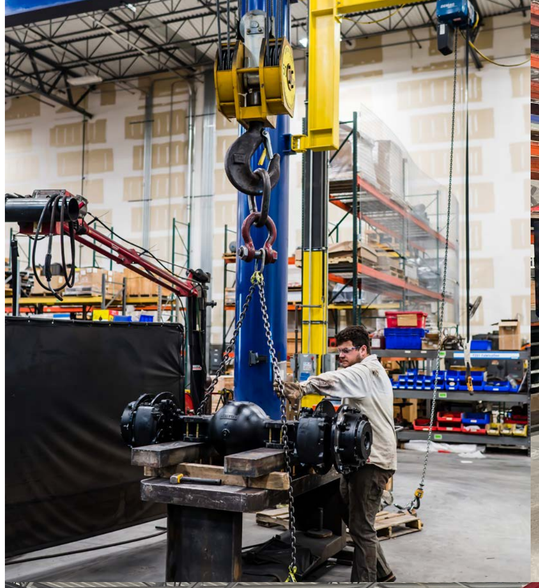
WABTEC SERVICES

Railcar Movers/Shunters

RAILCAR MOVING

Driving Velocity in the Rail Industry

Our Shuttlewagon products portfolio includes solutions to move rail cars most efficiently. We provide new equipment, services support, aftermarket parts, and various on site services.



01 APPLICAION

Industrial

Shunting

02 FEATURES

R3000 to 85000 Lbs. Towing Capability, Remote Control, Camera and DVR Systems

Diesel and 100% Electric Models

Rubber on Steel Traction with Guidance Rail System

Ride Comfort and Flexible Controls

No-Weight Transfer Technology and Locomotive Coupler AAR and Red Zone

Ease of Maintenance with Telematics

Cold Weather and Debris Management Options

DIESEL MODELS

Shuttlewagon

The Commander Series is powerful, versatile, and dependable. Equipped with the latest technology for maximum operator comfort and safety.

Up to 40 loaded railcars
Tractive effort 27-35K lbs (120-156 kN)
SWX 315/420/525

The Navigator Series incoporates the most advanced technologies available to ensure safety and reliability are never compromised while delivering high performance capacity.

Pull up to 60 loaded railcars
Tractive effort 38-60K lbs (169-267 kN)
NVX 5025/6030/7035/8040

01 OUTCOMES

- Enhanced rail stability
- Increased tire life
- Increased traction on steel
- Increased fuel efficiency

02 FEATURES

- Non-weight transfer couplers
- Anti-lock brakes
- Fully enclosed, 360 degree visibility operator cab
- Color digital display with 180 degree rotation
- CANbus technology
- 90 gallon fuel tank

03 APPLICATIONS

- On or off-rail
- Economical replacement of switching locomotives
- Navigate up to 70 degree curves

ELECTRIC MODELS

Shuttlewagon

The compact electric series are easy to operate, require low maintenance, and are efficient and powerful enough to handle the most demanding applications. The compact electric models range in power from 310 tons to 4,000 tons of towing capacity. For more robust applications requiring battery power, the Navigator NVXe can move up to 40 loaded or empty railcars.

Tractive effort 1,125-5,250 lbs
SWX-e 5/16/25/32

Tractive effort 7.4-10K lbs
SWX-e 50

Tractive effort 20-32K lbs
SWX-e 90/120/160

Tractive effort 45K+ lbs
NVX-e 140/200

01 **OUTCOMES**

- Enhanced rail stability
- Increased tire life
- Increased traction on steel
- Zero emissions
- Low operating costs
- Reduced maintenance costs

02 **FEATURES**

- Fast charge
- Continuous power electric motor
- Lithium ion batteries (NVX-e)
- Regenerative braking
- Non-weight transfer couplers
- Fully enclosed, 360 degree visibility operator cab
- Color digital display with 180 degree rotation
- CANbus technology

03 **APPLICATIONS**

- On or off-rail
- Economical replacement of switching locomotives
- Navigate up to 70 degree curves

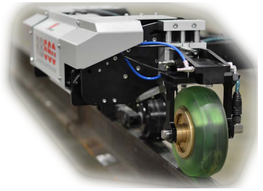
WABTEC SERVICES

Maintenance of Way

MAINTENANCE OF WAY

Driving Velocity in the Rail Industry

Comprehensive products and service portfolio that includes solutions to optimize rail track maintenance. We serve industries that rely heavily on rail transportation, including port authorities, agriculture, mining, chemicals, and energy.



01 TRACK MAINTENANCE

Applications
Tie Replacement, Ballast Regulation, Spike Driving and Pulling, Tie Plugging, Tamping, Anchor Application, Cribbing, Clip Application, Rail Lifting

Features
Technology, Durability, Gang Productivity, Service and Support

02 RAIL INSPECTIONN

Applications
Rail Flaw Detection

Features
Ultrasonic Technology, Multiple Channel Digital Signal Processing, Superior Signal to Noise Ratios, Higher Testing Speeds, Portable, Recordable Test Results, Ergonomically Designed, Integrated Couplant Delivery System

03 SPECIALTY MACHINES

Applications
Tie Service, Ballast, Crew Cars, Well Cars, Vegetation Management, Water Cars, Snow Removal, Rail Unloaders

Features
Custom Built Design, Self Contained Consist, High Visibility Cabs, Bridge and Bogie Design for Excavators, Vehicle Storage, Tool Storage

RAILWAY WORK EQUIPMENT

Increased Safety, Velocity, and ROI

Maintenance of Way is an aspect of railway maintenance which is designed to ensure that the railway remains clear, safe, and navigable.

Tie equipment is used for tie installation and replacement and is part of our track maintenance offerings.

TPX Tie Exchanger

Automated plate handling system that mechanically secures the plate to the rail during wood tie exchange. Tie only mode allows for increased versatility near swtiches, crossings and operating conditions.

Tie Shear (Tiesaurus)

Ideal for use when obstructions or close adjacent tracks make horizontal removal of a full tie difficult or impossible. The two scissor-style workheads cut the ties into pieces and can adjust for varying depts while utilizing integrated tie kickers to push tie pieces aside.

Tie Remover/Inserter (TRIPP)

TRIPP is designed to handle all wood and wood composite ties and with optional conrete grippers can convert TRIPP to hanfle concrete ties as well. Adjustable gripper forces on the tie gripper assembly handle different ties, tie degregaton and tie insertion.

01

KEY CAPABILITIES

Safely removes/inserts ties

Adaptable to tie depth and conditions

More efficient line process

TPX Enhancement

Adjustable gripper force

Onboard machine diagnostics with faultcode reporting & trouble shooting

02

FEATURES

Single-operator climate-controlled, enclosed cab

24 VDC, circuit breaker-protected, electrical system

Dual, pressure-compensated, hydraulic pumps

Steel manifold-mounted, electrical control valves

Joystick controls

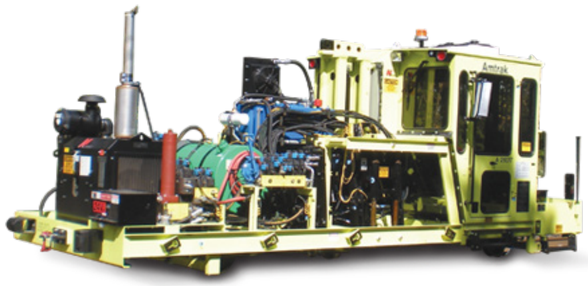
NEXXUS Control System (TPX)

Common parts to reduce stock on maintenance parts

CLIP MACHINES

Increased Safety & Efficiency

Clip Machines are utilized in the fastening of rails to baseplates.These machines are equipped with 4 workhead guns, 2 over each rail allow for rapid installation.



Clip Applicator (Nipper Clipper)

Dual-workhead mode provides efficient operation for both inside and outside workhead guns simultaneously. An in-cab camera and monitor allow a single operator to easily handle both workheads. The integrated nipper functionality provides a method for handling hanging ties without manual intervention.

Spring Clip Applicator (NSCA)

Dual-workhead mode provides efficient operation for both inside and outside workhead guns simultaneously. The integrated soap sprayer nozzles on each workhead automatically lubricate clips during application to ensure fast placement and attachment.

Vossloh Clip Applicator Remover (NVCAR)

Move clips on the guide rods to set the socket descend level for different rail heights, set the workheads to handle different base widths for accurate clip insertion placement, position inner and outer workhead guns to align for different screw hole patterns, and switch between installation, retraction, and de-stressing functions with operator controls.

01

KEY CAPABILITIES

- Dual workhead mode
- Adjustable for rail height
- Adjustable for varying base width
- Align to different screw hole patterns

02

FEATURES

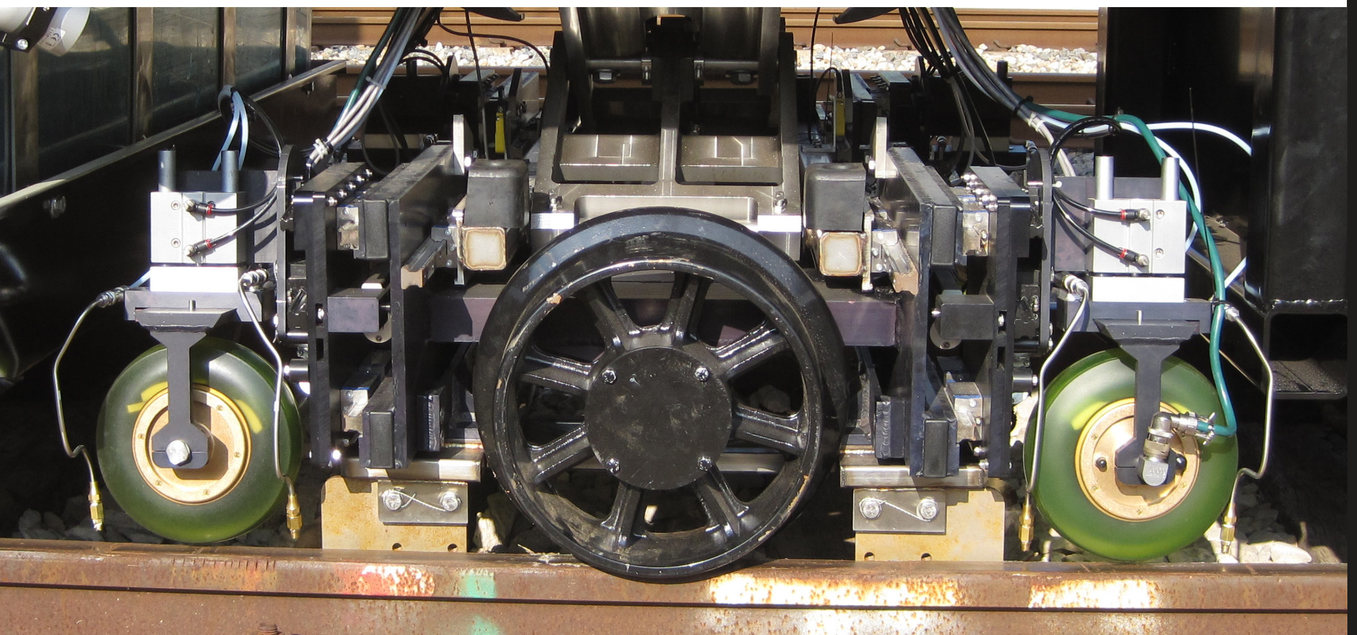
- Enclosed dual-operator, climate controlled cab
- Cobra brake shoes
- 4 wheel, dual axle chain driven propulsion system
- Cab-controlled workhead power lock-ups
- Joystick controls

INSPECTION TECHNOLOGIES

Rail-Bound Flaw Inspection System

Real-time ultrasonic testing records data, evaluates channel patterns, with adaptive learning capabilites all to accurately identify defects with GPS tagging and reported mileage to the thousandths of a mile.

Rail-bound flaw inspection systems are designed to be installed on rail-bound vehicles for testing of both rails at vehicle speeds up to 60 km/h with high accuracy.



01 **OUTCOMES**

GPS tagging of car movement and defect location

Pattern recognition defect classification

Reduced false positive results

Comparative analysis & reporting

02 **FEATURES**

Offerings 24, 32, 48-channel digital signal processing

Windows-based rail flaw inspection software

Dual display formats

Adaptive leaning AI

03 **APPLICATIONS**

Industrial

Transit

Wabtec
CORPORATION