Wabtec's Digital Solutions

Trip Optimizer™

Smart Cruise Control for Trains

Save fuel, improve train handling, enable train automation

Train length and weight. Track grade and condition. Speed restrictions. Driver-to-driver variation. These are some of the factors that can result in less than optimal fuel use, high emissions and trip time variations.

Trip Optimizer™ ("TO") is a smart cruise control system for trains that takes into account terrain, train make-up, speed restrictions and operating condition 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.

Trip Optimizer Advanced Features & Functions

Trip Optimizer/LOCOTROL Integration
Trip Optimizer provides automatic control of LOCOTROL independent mode providing smooth, consistent train handling for longer and heavier trains over challenging terrain.

Trip Optimizer SmartHPT
Trip Optimizer SmartHPT provides incremental fuel savings by optimizing train performance for a given HPT (Horse Power per Ton) target. Auto Idle feature automatically idles trail locomotives when horse power is not needed to maintain velocity. Smart Planner uses railroad operating rules to avoid excessive use of HP on overpowered trains. Network Control increases savings from Auto Idle & Smart Planner by allowing control of individual trailing locomotives.

Air Brake Advisement
Trip Optimizer plans where air brake is required and based on real-time monitoring prompts operator for air brake application and release.

Trip Optimizer Quick facts:

- ~11,000 units over 17 railroads, including all North American Class 1 railroads plus key international customers
- Closed-Loop Auto Control of throttle and dynamic brakes with constant operator supervision
- Individual trip plan for each train over a given territory
- New features like SmartHPT to save even more fuel
- >300 million auto miles operated; ~1.5 million auto miles and~900,000 gallons of fuel saved per week

Benefits, Outcomes

- Sustainable fuel savings; EPA-certified for 10% fuel savings
- Emissions reduction (emission credits)
- Efficient train handling
- Consistent velocity performance
- Reduced wear and tear
- Provides key enabling technology for enhanced train automation

Trip Optimizer Advanced Features & Functions *(continued)*

Advanced Train Handling

Trip Optimizer features algorithms that provide significant enhancements to train handling by predicting in-train forces real-time and making adjustments to control them.

Network Pacing

Trip Optimizer can be integrated with the Movement Planner network optimization system. Movement Planner provides time of arrival targets to Trip Optimizer. This allows Trip Optimizer to adjust the trip plan to meet the schedule, resulting in additional fuel savings.

Flexible Platform Options

Trip Optimizer can be integrated into GE and non-GE locomotives. A number of host platforms are supported such as – integration with the locomotive control system, the PTC Energy Management Card in the Wabtec Train Management Computer (TMC), the GoLINC High Performance Extended Applications Platform (HPEAP) and industry standard locomotive control interfaces such as M9155 Locomotive Command Control Messaging.

Integration with Positive Train Control

Trip Optimizer has been integrated with North American Positive Train Control (PTC) system and other Advanced Train Protection (ATP) systems. TO adjusts its plan real-time based on signal and restriction updates to provide additional automation and fuel savings.

Enhanced Train Automation

Future functionality for Trip Optimizer provides enhanced train control including application and release of airbrakes, auto operation from start to stop. These functions provide the foundation for increased train automation.

TO Deployment Overview

Track database creation

Customers can provide electronic track database or opt for GPS survey and track database development services. Track database is validated using clearing runs.

Back office connection

To automate transfer of train manifest, schedule, and slow order information, a B2B connection may be needed.

Hardware kit

Hardware may include GoLINC™ platform. Additional hardware may be needed depending on the locomotive configuration.

Supervised runs

Final step in the deployment is the supervised runs to verify the system before handing over for revenue service.

On-going services

These include services like software upgrades, support for track database changes and technical support etc.

How Trip Optimizer works

It starts with railroad's data, which is transferred wirelessly to the locomotive through a data link.

Origin-destination, train data (weight, length, cars), temporary speed restrictions

TO Onboard Planner

Planner creates a fuel efficient trip plan using train data, speed restriction data, track database and GPS data. It provides the plan to the regulator to execute

TO Onboard Regulator

Provides closed loop throttle & dynamic brake control to regulate train speed to the plan. If conditions change, an updated plan is executed

Train operator/ engineer

Train operator initiates the trip, engages auto mode and supervises TO operation. TO also provides situational awareness to the operator

Rolling Trip Map

Sample value calculator

Locomotive Fleet	500 Units
Fuel burn per loco per year	300,000 Gallons
TO Fuel savings**	10%
Fuel savings per year	30,000 Gallons
Price of fuel	$3
$ Savings per year	$45 M

**Fuel savings vary by train type, terrain and operation

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