cato

METRO

Metros with perfect eco-optimal driving

DAS or ATO mode

There is a constantly increasing pressure on metros globally to provide greater capacity and to improve service performance. There is also a pressure for sustainability and to reduce investment and energy costs. CATO creates a new era in railway operations, to solve these and other challenges. This includes metros with or without ATO.

Transrail Sweden AB is proud to offer CATO, a proven comprehensive system for eco-efficient train operation, to the global metro market.

Minimizing
- ▶ Energy and power consumption
- ▶ Operational costs
- ▶ Environmental emissions
- ▶ Wear of rolling stock and infrastructure
- ▶ Headways

Maximizing
- ▶ Punctuality
- ▶ Capacity of the infrastructure
- ▶ Passenger comfort and satisfaction

Solves
- ▶ Specific operational problems

Short description

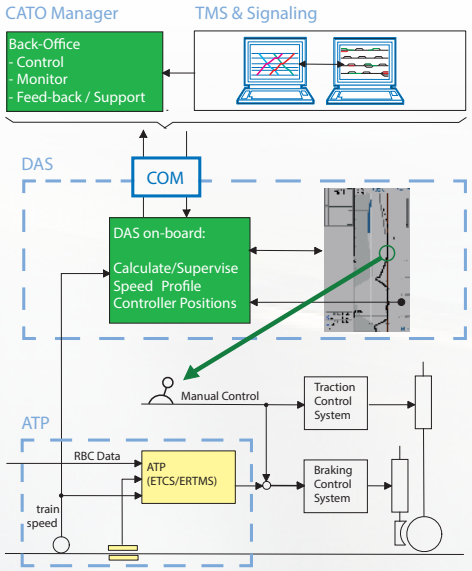
The CATO system consists of two core parts, one trackside module (CATO-TCC) and one module on board each vehicle (CATO-TRAIN). The configuration may also be fully trackside.

CATO is linked to the Traffic Management System (TMS) and continuously receives updated information on timetables and possible solutions to traffic disturbances.

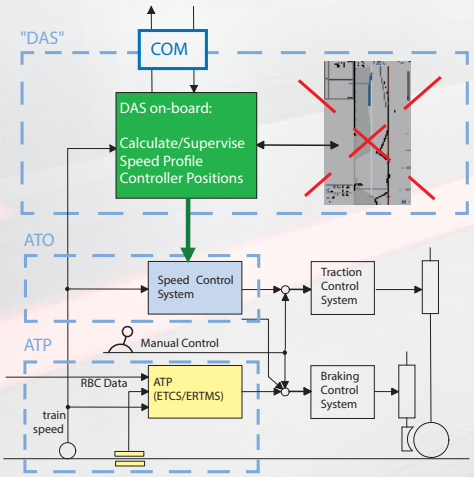
CATO-TRAIN calculates the optimum driving profile following the current real time traffic plan, avoiding conflicts with other trains and supporting minimum headways when needed. The optimized driving profile takes also other aspects into account, such as minimizing energy consumption, reducing wear on train and track etc.

CATO-TRAIN may be used as a Driving Advisory System (DAS) or as an engine for optimal Automatic Train Control (ATO). In DAS mode the advised optimal driving profile is displayed in the driver's CATO interface. The display is intuitive, ergonomic and simple to use. The training of drivers has proven to be smooth.

CATO provides control of the trains by their timings and possible constraints for their runs, e.g. speed restrictions, power consumption, receptivity for regenerative braking etc. The control is always smooth and gives high passenger comfort.



CATO in DAS mode



CATO in ATO mode

Significant savings with short pay-back

Since the train modeling and optimization method of CATO is general and without constraints, the savings with CATO should in any situation be the best that a DAS or ATO system can achieve.

The unique CATO concept of real time interaction with the TMS, and possible supportive modeling in CATO-TCC, brings further substantial benefits. The trains can run according to the real-time traffic plan Any change of the plan triggers CATO to give re-optimized driver advice or ATO control. This means that trains can always run optimal in accordance with the actual traffic situation.

15-25%
ENERGY/FUEL REDUCTION

5-15%
INCREASED LINE CAPACITY

50-80%
REDUCED WEAR

Helsinki Metro

"Our DAS project started with a pilot phase and we were impressed by the results."

"We had a smooth implementation."

"Overall acceptance is good as the drivers can see the benefits for their own work."

"The investment is highly profitable."

Arttu Kuukankorpi
Director of Traffic Operations Unit
Helsinki City Transport

"Cato is introduced at the right time when HKL develops to work more efficient."

Kari Klemetti
Project Manager
Helsinki City Transport

"Cato is a good partner for relaxed driving."

Sari Borgman
Driver Helsinki Metro

"Cato reduces stress and the sense of rushing."

Kirsi Hölttä
Driver Helsinki Metro

"Traffic situation awareness is improved."

Abdugadir Musse
Driver Helsinki Metro

Helsinki Metro driver interface

Possibility to handle complex situations

The CATO-solution allows any complexity as regards the models of the train including passenger load, line profile, power supply, timings including station dwell times etc. The models can be as detailed as necessary in any specific customer situation and can be handled by the optimizing algorithms.

- CATO may handle any type of metro operation
- Power supply restrictions can be imposed.
- The effects of for example passenger load and rail friction are other parts of the models.
- Any customer specific driving strategies may be implented.

Customized optimization

Users of CATO may choose the optimization criteria. The optimization may be set to optimize punctuality, energy savings, regeneration, power loads, mechanical braking or any combination of these or other parameters. The optimization parameters may also be dynamically changed during the day, seasonally or dictated by the production system generating transport demands.

Future proof

The mathematics and general structure of CATO brings a future proof solution, easily expandable to possible new requirements and implementations.

Our system support CATO CARE concept includes successive improvements to our customers' code base and to meet their demands as they may develop by time.

Photographer: Niki Twang

Train control integration

CATO-TRAIN can share information with other onboard systems giving enhanced performance and/or make use of existing devices and systems, e.g.:

- Automatic Train Operation, ATO: CATO can be used either as an advisory system for manual driving or, depending on the train control system, be used in an automatic mode.
- ATP integration: CATO has been designed for possible integration with existing and future ATO and ATP systems, for example CBTC and AoE systems.

CATO Awards

Nominated by a jury of the International Railway Research Board (IRRB) CATO won the prestigious Global Research & Innovation Award 2012, category Sustainable Development, of the International Union of Railways (UIC)

In June 2014 the Scandinavian think tank SUSTAINIA released their 2014 guide on 100 leading sustainability innovations deployed on global markets. CATO was included in this guide, selected for its state-of-the-art innovation.

Short about Transrail Sweden AB

Transrail Sweden (TRS) is an experienced provider of Consultancy Services and IT Solutions for the Trains and Railway Systems of the Future. TRS has experience of all aspects and the full life cycle of rail, metro and light-rail systems. Since 2016, the main focus of the company is worldwide deployment of the CATO product.

In the context of the CATO system, it is worth mentioning that TRS provides world class technical knowledge in train dynamics, railway systems engineering and train energy issues. This ensures competent development support and solving of possible problems. TRS is involved in ongoing international research and development and standardization projects in this area, ensuring state of the art solutions.

CATO is based on a Train Performance Calculation system (TRAINS) with versatile library functions. TRAINS is a modular software tool developed by TRS containing various detailed and sophisticated models and algorithms for calculation of train movements, train controls, traffic control, capacity, energy supply etc.

The CATO software architecture and library of models cover the full range of train services; heavy-haul freight, freight, high-speed passenger, intercity, suburban, metro etc.

For further information, please contact:

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www.transrail.se
www.transrail.se/CatoFilm.php

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