

TRACTION MODERNIZATION

Alstom focuses on operators' concerns and expectations to provide the most suitable solution to extend their fleet's lifetime and to reduce energy cost. Alstom's proximity and geographical footprint allow high reactivity and fast mobilization of our experts. They work closely with our customers supporting them reaching their business objectives.

General Description

Traction Modernization allows train operators and rolling stock owners to:

- extend the life of their fleet by 10 to 20 years,
- reduce maintenance costs and energy consumption,
- improve reliability, performance and train availability.

Alstom provides solutions to respond to operators' objectives through the combination of service-proven components and system integrator expertise.

CUSTOMER BENEFITS

Optimum energy savings

Energy efficient traction with less power usage is a priority for Operators and therefore a main challenge for Alstom. Alstom is ready to commit to energy savings as demonstrated with STC in Mexico in 2007.

Proven reliability increase

Alstom is a traction expert but also combines strong rolling stock, integration and system expertise. Alstom offers service-proven products as well as the capability to integrate traction equipment on any rolling stock (Alstom built or not). This expertise meets customers' reliability objectives and reduces drastically maintenance costs. This was demonstrated with RATP in Paris where the yearly cost of repair was divided by a factor of three. In Mexico, Alstom over-achieved its reliability objective by 30%.

Reduced investment costs

Alstom's modular design allows the replacement of obsolete parts only, while components that are in good working condition can simply be re-used. This avoids changing the whole traction cubicle and leads to reduced investment cost. This can even be undertaken during maintenance operations with a limited train immobilization.

Tailored solution

Alstom is the only supplier able to offer all types of traction modernization and able to provide the most suitable solution according to operators' fleet and business objectives. Alstom offers full turnkey solutions or alternatively the project management with supply of components in kit form for integration onto the train by the maintainer. Customized design can even be provided such as Plug & Play solutions.

HIGHLIGHTS

- **Over 35% energy savings** in Mexico
- **Yearly cost of repair divided by a factor of three** in Paris
- **20 years** of traction modernization experience
- Worldwide installed-base: **10.000 traction systems** modernized



TRACTION MODERNIZATION SOLUTION

Legacy solution	Modernized solution
AC Thyristor, GTO inverter	AC IGBT inverter
DC Camshaft, Contactor, Thyristor, GTO chopper	AC IGBT inverter
DC Camshaft, Contactor, Thyristor, GTO chopper	DC IGBT chopper



Contactor and camshaft are outdated technologies which do not allow regenerative braking. They have been replaced, first by thyristors and GTO (Gate Turn-Off) and then by IGBT (Insulated Gate Bipolar Transistors) which represents now the state-of-the-art for traction: IGBT chopper for DC motors and IGBT inverter for AC motors.

> AC traction drive obsolescence management

Alstom offers different solutions to modernize AC traction drives in order to mitigate the equipment obsolescence and improve reliability.

A solution consists of replacing the GTO semi-conductors inside the electrical converters by IGBT semi-conductors. Other solutions involve replacing the Freon cooled Thyristor inverter by an Air cooled IGBT inverter or replacing the panel based on GTO by a new panel based on IGBT.

In all cases, Alstom is able to modify the necessary power module even without modifying the whole traction case in a plug & play design. This can even be done during maintenance operation, minimizing train immobilization and providing the possibility to modernize the fleet progressively.

References: RATP metro in Paris; GVB tramway in Amsterdam



> DC to AC traction drive

In order to upgrade existing DC traction drives (or choppers), Alstom is in position to its standard IGBT inverter system on any existing rolling stock. Operators can then take advantages of a new built component without investing in a whole new train. This upgrade may be performed by Alstom or by a designated maintainer through the use of traction kits.

References: CMSP metro in Sao Paulo; NS EMU in The Netherlands

> DC to DC traction drive

By replacing outdated technologies by IGBT chopper, Alstom brings all the advantages of a modern traction drive to existing fleets, while reducing cost impact.

On Metro of Mexico where the existing chopper has been replaced with a regenerative chopper, over 35% of the braking energy is re-used. This represents 40.000MWh of savings per year for the 25 metros of the Mexico L8 equal to 6M€/year.

References: STC metro in Mexico; PATCO metro in Philadelphia

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