The CAF Rapid Charge Accumulator: Technology for Removing Catenary Between Stations

Construcciones y Auxiliar de Ferrocarriles (CAF) has developed a system for storing energy on board trains, which allows the removal of overhead cables between stations in urban surroundings. The Rapid Charge Accumulator (ACR), based on ultra - capacitors, will allow vehicles to circulate without cables between stations, with no need for extra installations or special investments.

GARETH THOMAS

The company Construcciones y Auxiliar de Ferrocarriles (CAF) shall present this new technology at the UITP World Congress. The Rapid Charge Accumulator (ACR), a system based on ultra-capacitors, will help better integrate urban transport in cities, minimizing visual impact in historic centres and improving energy efficiency, among other aspects.

The development of this new system has included the collaboration of Trainelec, daughter-company of CAF dedicated to the design and manufacture of electrical traction equipment, and several technology centres such as the ITA.

The accumulator can be applied to rolling stock of any type and manufacturer.

Functioning

The ultra-capacitors are charged while the train is stopped in a station, for an average of 30 seconds. This system not only recovers the energy stored on the journey but can also store the braking energy, frequently generated in cities. The system has a working autonomy without catenary of around 1,200 metres, depending on the capacity installed and the characteristics of each tram line.

The accumulator is suitable for rolling stock of any type and manufacturer, as well as any new or existing installations and infrastructure. The company also states that it is "clean, safe and reliable, easy to install and maintain, and is highly economically competitive."

A System for the New Generation of Urbos 3 Trains

The ACR is one of the options that may be integrated into the Urbos 3, CAF's new generation of trams and light rail trains CAF, which, according to the company "responds to the ecodesign needs for sustainable urban transport. It incorporates light materials, highly-efficient equipment and, as an option, the ACR system, all of which leads to great savings in energy". In Urbos 3, concepts from previous generations are incorporated as standard. In addition, other concepts are developed and implemented and improvements introduced to some of the aspects of the previous series, such as modularity and flexibility, which are especially relevant.

It is also a platform upon which different solutions may be applied with the aim of achieving the maximum adaptation to the particular case of each operation and administration: possibility of having the two standardized box widths of 2.400 and 2.650 mm., the two widths of metric track (1,000 mm.) and UIC (1,435 mm.) and other individually-chosen characteristics in each project.

In addition, the level of accessibility is maximized for all users, even those with reduced mobility. It must also be mentioned that maintenance help systems, remote operations and other post-sale services are developed in parallel.

Design and Materials Respectful of the Environment

Other designs which have been modified are the exclusive interior and exterior designs of the trains. In addition, new techniques and materials have been introduced which offer improvements in weight, resistance and energy consumption. A reduction in the environmental impact has also been attempted during both the

ACR TECHNOLOGY BASED ON ULTRACAPACITORS

The Concept
- Capacitive storage
- Charge and discharge through physical processes
- No chemical reaction
- Scalable by series/parallel association

The Technology
- High-speed recharge
- Very high capacity cells
- High energy and power density
- Increase in capacity thanks to the double layer of electrodes

Characteristics
- Controlled by the traction inverter
- Integrated into the train's computer network
- Increase in power compared with other storage systems
- Braking resistances are minimized
- Protections against energy discharges to guarantee arrival at a charge point

construction phase and final recycling of materials. This innovation has the no-less-important side effect of improving train reliability. Changes to cabins have also been introduced, designed using advanced ergonomic, comfort and driving visibility concepts. CAF group's technological companies have made, in parallel, great advances in the fields of signalling and fleet management systems. ■

ADVANTAGES AND ACHIEVEMENTS OF THE ACR SYSTEM IN TRAMS

Catenary-free running between stations
Energy saving
Autonomy up to 1,200 metres depending on route conditions and performances between stops or due to incidents on the line
Modularity and scalability
Can be used in existing rolling stock 20-second charge times, compatible with stop times
Non-slave system (rolling stock - infrastructure independence)
High development expectations

Example of the new URBOS 3 line.

CAF's daughter company, Trainelec, has helped in the development of the system.