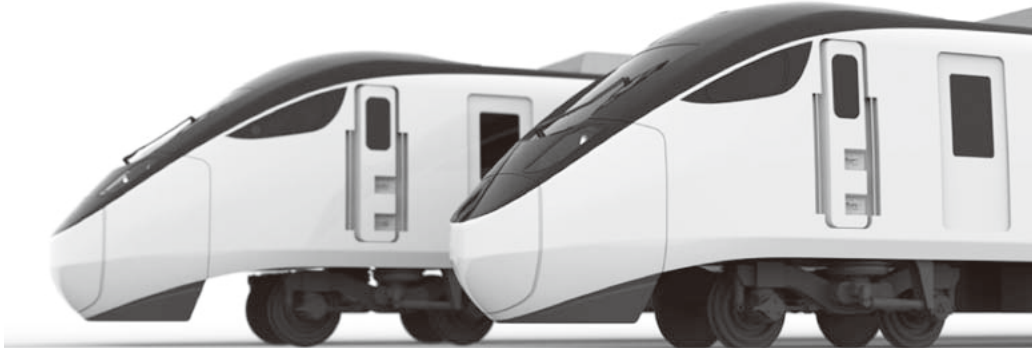


# Technology Innovation: Mobility



1 CG model Intercity EMU for TRA

## 1 Design of Express Train for Taiwan

Based on a 10-year procurement plan (covering 2015 to 2024), Taiwan Railways Administration, MOTC (TRA) is undertaking a major procurement and expansion program to increase capacity and replace aging rolling stock. Under this plan, Hitachi has received an order from TRA and its procurement agent, the Bank of Taiwan, for 600 Intercity Electric Multiple Units (EMU) (50 trains of 12 units each). The contract was finalized in January 2019.

The design of the rolling stock was based on the concept of building Intercity EMU that would be internationally admired and was undertaken through a joint study by TRA, its invited design experts from Taiwan, and Hitachi. Along with the exterior and interior designs, this work also included measures to verify whether the designs would be accepted by the trains' many stakeholders and whether they would find it easy to use on the basis of operation, universal design, and other such considerations.

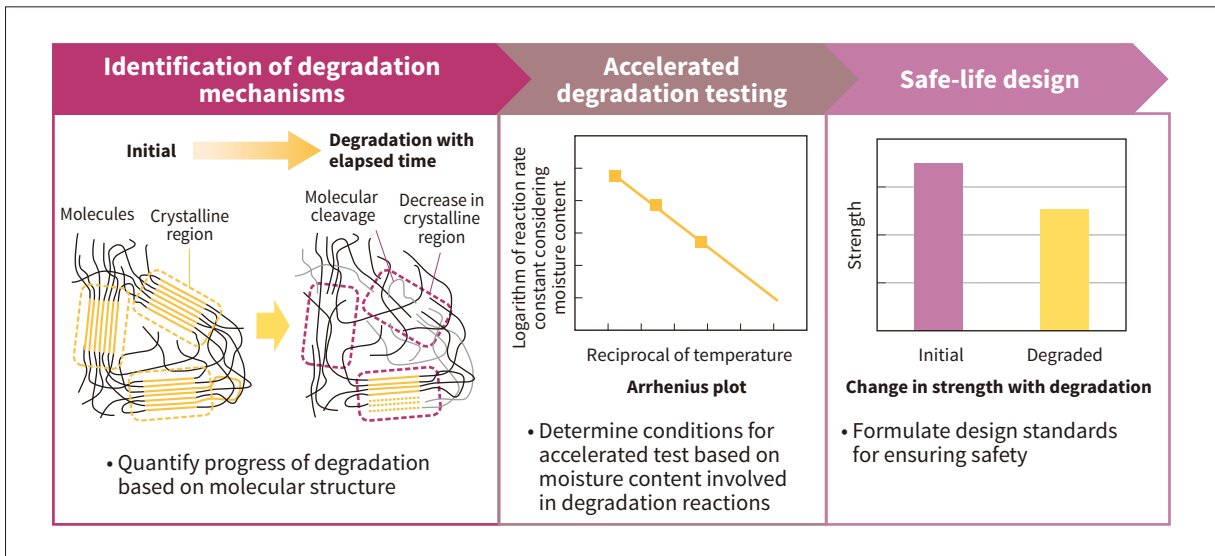
Press conferences were held during December 2019 in Hualien and Taitung on the east coast of Taiwan and the design was exhibited at Taipei Station. The exhibit attracted a lot of attention, such that the initial three-day schedule was extended for another week. The project has now moved on to the rolling stock manufacturing phase and is making steady progress toward delivery in 2021.

## 2 Development of Durability Assessment Technique for Plastic and Its Application to Structural Parts

Hitachi has developed an accelerated degradation test method for plastic that replicates long-term use under actual conditions, and also a safe-life design method.

Being lighter than metal, plastic is increasingly being applied to structural materials in mobility components. Meanwhile, environmental factors such as heat and moisture degrade plastic to cause a decrease in strength. When applying plastic to parts that require safety for several decades, it is necessary to identify the effects of plastic degradation under actual conditions and to formulate design standards that ensure product safety.

Hitachi has developed testing and assessment techniques for plastic applied to elevator pulleys. Focusing on the molecular structure and water content involved in plastic degradation, The company established an accelerated test method that replicates plastic degradation equivalent to the useful life in a short period through analysis based on reaction kinetics. Furthermore, Hitachi has also developed a design method for ensuring the safety of parts by taking into account the decrease in plastic strength during long-term use and deformation due to water absorption. The methods were utilized to apply plastic pulleys to standard elevators. The company achieved a weight reduction of 85% and a cost reduction of 40% compared to conventional metal pulleys.



2 Flowchart of development of durability assessment technique for plastic

### 3 System for Driving Technique Visualization

The railway industry has in recent years been collecting very large amounts of onboard data, with expectations for putting this big data to use in improving operational efficiency and providing greater value to customers in the form of higher levels of service. Through collaborative creation with customers, Hitachi has been investigating solutions that combine use of this onboard data with Hitachi technologies. This has led to the development of a visualization system for driving technique that can solve the problem of how to transfer train driving skills, one of

the issues identified in workshops with railway operators.

This involves using the train control and management system and a tablet computer running this new system to collect and analyze onboard data records and present this information to drivers. By doing so, it provides them with an objective view of their own performance and helps improve their driving skills for the future.

It can also compare their performance against an optimal energy-efficient speed profile obtained using an integrated railway simulator. Whereas driver training has been done verbally in the past, this use of visual data to show drivers where and how they can improve should enable a more effective transfer of driving skills.



3 Driving performance review screen