Newsletter on the Latest Technologies Developed by RTRI

Railway Technology Avalanche

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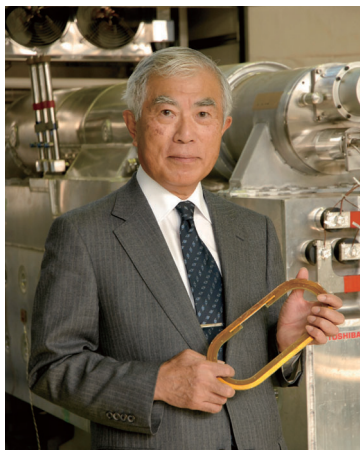
Railway Technical Research Institute
2-8-38 Hikari-cho, Kokubunji-shi
Tokyo 185-8540, JAPAN

URL: http://www.rtri.or.jp

Brightening the Future of Railways Using New Technologies

Eisuke MASADA
Chairman



Reflecting the mounting concern over global warming, the sharp rise in energy costs, and the aging of society, public demand for railway use has been ever-increasing in Japan. Most of the main intercity railways and high-density urban railways are making a good showing today, especially owing to the improved convenience for passengers who use extensive railway networks, such as the development of a new fare collection system using contact-free IC cards. Many local railways, on the contrary, are suffering hard times because of the continued decrease in ridership, which has been absorbed by more convenient forms of road transportation. From a long-range viewpoint, the main intercity railways and urban railways also have a problem with the human resources that are required to maintain the safety and comfort of railways as transportation facilities.

In order to solve the above problems, consolidate the position of railways as transportation facilities and expand the scope of railway services, it is indispensable to introduce new technologies. Backed by the brisk world economy, various seeds of technologies that can have an enormous impact on the future of railways are growing. These include fuel cells, low-cost solar cells, effective power storage devices including SMES[1] systems and Ni-H batteries, high voltage endurance and low-loss SiC and GaN compact power devices, and the Y-based high-temperature superconductor. Extensive studies aimed at applying these new technologies to railway facilities are being conducted.

Moreover, to solve the long-term problems that railways are faced with, new system concepts will need to be presented and those new technologies applied to clarify the feasibility of materializing those concepts for the public. As an example concept to ensure both the safety and profitability of low-demand local railways, a combination of minimized wayside facilities, on-board concentrated operation control functions and self energy supplies using high performance batteries can be proposed. More research must still be conducted to accomplish such systems, but some of the operation control functions have been validated in ARAMIS[2] and ATACS[3].

Turning our eyes to the Maglev railway system, which was once called "a railway of dreams," the Transrapid Shanghai system has been operated practically since 2003. Recently railway operators have announced practical use plans for both a Superconducting Maglev system and a Transrapid system. Including HSST, which already operate in Japan as an urban transport system, I think we can expect the use of Maglev systems to spread throughout the world. However, it should be noted that we still have a large barrier—the problem of cost—to overcome before the system can be widely used. Nonetheless, the innovative concept of Maglev transport should be introduced for broader applicability.

In conclusion, I believe the public strongly expects us to integrate the newly developed seed technologies, propose a "railway of tomorrow" that meets current social demand, and consolidate the technological foundations of innovative systems.

1 Superconducting Magnetic Energy Storage
2 Agencement en Rames Automatisées de Modules Indépendants dans les Stations (Arrangement in automated trains of independent modules in stations)
3 Advanced Train Administration and Communications System