EMU for Taiwan Taoyuan International Airport Access MRT System

In February 2006, MKH Consortium (Marubeni Corporation, Kawasaki Heavy Industries, Ltd., and Hitachi, Ltd.) received an order from Bureau of High Speed Rail (BOHSR) of the Ministry of Transportation and Communications (MOTC) in the Republic of China (Taiwan). This order was for a contract to build a complete railway E&M system and depots for Taiwan Taoyuan International Airport Access MRT (TTYMRT).

Kawasaki manufactured and delivered 123 EMU (Electric Multiple Unit) cars; 68 Commuter cars and 55 Express cars. The Commuter and Express cars have different exterior and interior designs. However, they are identical in the major carbody structure and the operating performance, and a common design has been adopted as much as possible.

Introduction

Taiwan Taoyuan International Airport is the key portal to international communities. One important sign for being a developed country is her capability to provide airport passengers with a safe, convenient, comfortable and high quality transit service.

As one item of the government-funded "i-Taiwan 12 Projects," this airport link transit system Project will connect the Taoyuan International Airport with surrounding transportation hubs such as Taipei Main Station, High Speed Rail Taoyuan Station, etc. so that international airlines may tie closely to the local transportation web.

This Project can also stimulate prosperity along the route in coordination with the existing urban developments, to reach a more balanced city vs. countryside status.

1 Main specifications

Taiwan Taoyuan International Airport Access MRT System (TTYMRT) is a new MRT railway line that is 51.2 km long in total and connects Taipei Station (A1) and Huanbei Station (A21) in Zhongli District in Taoyuan City, via Taiwan Taoyuan International Airport. It is planned to be extended for two stations from Huanbei Station to Zhongli Station in the future.

On this railway, two types of trains will be operated: Commuter trains connecting between Taipei Station and Huanbei Station for local service, and Express trains

Table 1 Main specifications

Maximum number of passengers [persons] (Number of seats)	Commuter	DM car: 261 (44), M car: 278 (50)
	Express	DM car: 207 (48), M car: 216 (56)
Track gauge [mm]	1,435	
Maximum length [m]	DM/DMB car: 20.78, M car: 20.25	
Maximum width [m]	3.03	
Maximum car height [m]	3.763	
Floor height [m] (From top of rail)	1.133	
Distance between bogie centers [m]	13.5	
Current collection	750-VDC third-rail system	
Maximum service speed [km/h]	100	
Acceleration rate [m/s^2]	1.1	
Deceleration rate [m/s^2]	Service brake	1.0
	Emergency brake	1.3
Main circuit	IGBT VVVF inverter Three-phase squirrel-cage induction motor Continuous rated power 185 kW	
Brake system	Electro dynamic (regenerative and rheostatic) and friction brake with parking brake	
Auxiliary power system	380 VAC, 60 Hz, three-phase: 180 kVA 110 VAC, 60 Hz, single-phase: 2 kVA 110 VDC, 19 kW	
Battery	Nickel-cadmium alkaline battery, 130 Ah	
Communication system	Train radio equipment, Public address system, Passenger alarm equipment, Flight Information Display System, CCTV monitoring system	
ATC system	ATC, Event recorder	

connecting between Taipei Station and Taiwan Taoyuan International Airport for express service. Table 1 lists the main specifications of the cars.

2 Features

(1) Train configuration

Kawasaki delivered 17 sets of four-car Commuter trains (DM-M-M-DM) and 11 sets of five-car Express trains (DM-M-M-M-DMB), in total 123 cars. The car types are; DM cars (cars with a driving cab) and M cars (middle cars) for passengers, in addition, Express trains are accompanied with a DMB car (baggage car with a driving cab and baggage handling equipment), allowing passengers to check-in to their flight and check in their baggage at the in-town check-in counter, so that the passengers can travel with only carry-on baggage to the airport.

In order to travel continuous 4.92% steep gradient for 3.92 km on this line, all cars are equipped with driving motors.

Figure 1 shows the exterior view of Commuter DM car, Express DM car, and DMB car.

(2) Carbody

The car end underframe is made of low-alloy high-tensile steel (LART steel), while other portions are made

(a) Commuter DM car

(b) Express DM car

(c) Express DMB car

Fig. 1 Exterior view (DM/DMB car)

(a) Commuter - Interior

(b) Express - Interior

(c) Express - Baggage compartment

Fig. 2 Interior

of stainless steel. It has been confirmed by a static load analysis/test and crash-worthiness analysis that the carbody satisfies the strength and crash-worthiness performance required by the client.

The front section of the DM and DMB cars consist of an FRP bonnet with an emergency detrainment door.

A floating floor structure, in which the floor panels are supported with rubber, has been adopted to reduce interior noise. A fire resistant structure, in which a thermal insulation is installed between the floor panel and the stainless-steel subfloor, has been adopted to satisfy the standards defined by the National Fire Protection Association (NFPA).

(3) Facilities

Three-pairs of sliding plug passenger doors, which reduce noise, are equipped on each side of passenger cars. DMB cars are baggage cars, and have no windows, and are equipped with five pairs of sliding plug doors on each side of the car.

Figure 2 shows the interior of cars. The seats on Commuter trains are longitudinal seats made of FRP, while those on Express trains are transverse seats with cushions. Commuter trains have two luggage racks for carry-on luggage in each car. Express trains have three luggage racks in each car. Express DMB cars are cars dedicated for baggage and have baggage handling equipment.

The interior of Commuter trains is equipped with two liquid crystal displays for displaying advertisement, news, flight information, etc. (flight information panel: FIP). The interior of Express trains is equipped with four FIPs.

(4) Bogie

Bogie is radius arm type for primary suspension, and bolstered type with air springs for secondary suspension. The bogies are all driving motor bogies to cope with traveling aforementioned long steep gradients along the route.

Conclusion

TTYMRT is currently undergoing a trial run before going into service. When in service, it will directly connect Taoyuan International Airport, Taipei City and Taiwan High Speed Rail, and will contribute to improving airport access, as well as to the development of cities and towns along the route.

Hisataka Tamaki

Contact
Overseas Engineering Department 2,
Engineering Division,
Rolling Stock Company
Tel: +81-78-682-3022 Fax: +81-78-682-3065