Super High-Speed Model Launching Test Apparatus

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1. Necessity of model launching test apparatus

The model launching test apparatus is used to launch a model train at a very high speed for analysis of aerodynamic phenomena which occur when an actual train passes along an open space or rushes into a tunnel. It consists mainly of a launching device, a brake device and take-up devices (Figure 1). Although RTRI already had a test apparatus capable of launching a model at a maximum speed of 450 km/h, a new launching test apparatus capable of a higher speed became necessary for the development of high-speed railways of the 500 km/h class.

The new apparatus has the same basic launching mechanism as the existing one, but it has been fabricated so that it secures a 20 m section in which a model tunnel or the like can be installed for testing, and is capable of maintaining a moving speed of 500 km/h or more while it is passing through the section.

2. Launching device and brake device

The launching device consists of four pairs of upper and lower wheels (launching wheels), which are rotated at high speeds to send out the model train set in between. The cross-section shape of the rubber bonded to the rim of each launching wheel to obtain the force of friction with the model train surface was designed so that the rubber would not peel off due to the centrifugal force resulting from high speed rotations of the wheel. As the model train is sequentially pushed out by the four pairs of launching wheels, it is accelerated in stages. When the target speed is attained by the front-end pair of wheels, the model train is launched (Figure 2).

The brake device consists of a cylinder lined with a laminated plate of rubber sheets. As the model train passes through the cylinder, it is decelerated by the friction between its surface and the rubber lining till it stops. The main braking apparatus is about 3 m in length and capable of completely stopping the rapidly running model train within the section. This braking apparatus is provided with another braking apparatus with cushion toward its front (Figure 3).

In order to make the model train run along a prescribed course, steel wire is stretched from the launching device to the brake device by the take-up device so that the model is guided by the steel wire.

3. Attaining maximum speed of 500 km/h

One of the most difficult challenges was how to allow the model train sent out by the launching device to reach the brake device 20 m ahead without causing it to slow down. The pushing force was determined by adjusting the axle-to-axle distance of launching wheels sandwiching the model train. In addition, the rotational speed of each individual launching wheel was adjusted. As a result, we were able to launch a model train at a speed exceeding 500 km/h. It was confirmed that the speed of the model train at the time when it reached the brake device 20 m ahead was 500 km/h. The brake device could stop the model whose mass was some 600 grams without being damaged.

Thus, the purpose of the present development was to devise means of increasing the speed of model train and decelerating it effectively. We expect that the new apparatus will be extensively used for various test purposes.

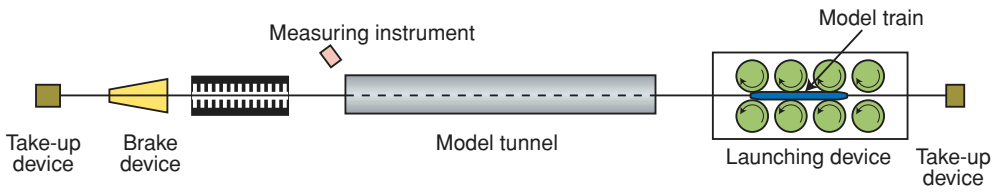

Figure 1. Scheme of model launching test apparatus

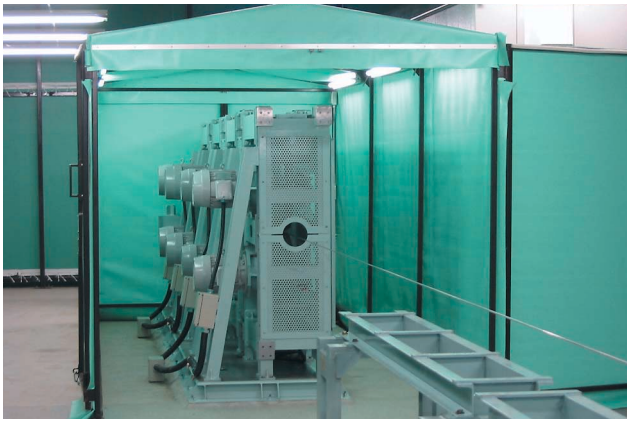

Figure 2. Launching device

Figure 3. Brake device