High speed bogie
- Mutual development JR EAST - DBAG

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1 Introduction

For the purpose of the improvement in railway technology, JR EAST and DB AG concluded general agreement for the technical research and development of the railway in 1993. On the basis of this agreement, we exchanged railway technology through the exchange of information and the running tests of the bogies manufactured by MAN Technology in Germany by STAR21 etc.

In this technical exchange, we have agreed with developing jointly the high-speed bogies which aimed at application to high-speed rolling stocks of the next generation in 1995. On the basis of this agreement, we made jointly the specifications of the high-speed bogies, and are developing the bogies according to the specification, respectively.

JR EAST and DB AG are developing two kinds of bogies, for E2 and for ICE2, respectively, and carry out the running test for the performance check by own company. Subsequently, we are going to carry the bogies into the partner country and to carry out the running test for the performance comparison.

In this paper, we introduce the outline of the performance tests about mutual development.
2 Schedule of the tests

The schedule of the performance tests is shown in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>JR Bogie</th>
<th>DB Bogie</th>
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</thead>
<tbody>
<tr>
<td><strong>For E2</strong></td>
<td>1997.11</td>
<td>1999.3</td>
</tr>
<tr>
<td></td>
<td>1998.5</td>
<td>1999.10</td>
</tr>
<tr>
<td><strong>For ICE2</strong></td>
<td>1998.10(JR)</td>
<td>2000.9</td>
</tr>
<tr>
<td></td>
<td>1999.11(DB)</td>
<td>2001.5</td>
</tr>
<tr>
<td></td>
<td>2000.2</td>
<td>Running test</td>
</tr>
</tbody>
</table>

As shown in this table, JR EAST and DB AG manufactured 4 kinds of bogies in total. We carried out the roller rig tests and the running tests of these development bogies.

3 Outline of the Development bogie

3.1 Development Bogie for E2 by JR EAST

The bogie for E2 Shinkansen which JR EAST developed is shown in Figure 1.
The main features of this bogie are as follows.

1) Adoption of the brake disk, caliper and axle box made of aluminum alloy. (Lightweight design)
2) Equipment of the active suspension system using pneumatic actuators. (Improvement of riding comfort)
3) Equipment of the noise damped wheel which installed the sound-proofing ring. (Decrease of noise)
4) Equipment of the sprit type for up and down axle box which only the wheelset is removed easily from the bogie. (Low maintenance)

3.2 Development Bogie for E2 by DB AG

The bogie for E2 Shinkansen which DB AG developed is shown in Figure 2.

The main features of this bogie are as follows.

1) By use of inside bearing of the wheelsets and consistent lightweight design important weight reductions can be achieved with the wheelsets and the bogie frame.
2) The primary anti-rolling device which controls the rolling between the bogie frame and the wheelset and the secondary anti-rolling device which controls the rolling
between the car body and the bogie frame.
3) The type of axle suspension is the link type.

3.3 Development Bogie for ICE2 by JR EAST

The bogie for ICE2 Shinkansen which JR EAST developed is shown in Figure 3.

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![Image of bogie]
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Basically, this bogie has the same specifications as the development bogie for E2 Shinkansen by JR EAST. However, this bogie is modified about the following points for the adaptation to ICE2.

1) Equipment of the anti rolling device between car body and bogie frame.
2) Equipment of the electromagnetic rail brake.
3) Equipment of four yaw dampers per 1 bogie.

For the next generation vehicle, this bogie is considered that the eddy current brake will be able to be installed on the bogie.

3.4 Development Bogie for ICE2 by DB AG

The bogie for ICE2 which DB AG developed is shown in Figure 4.

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![Image of bogie]
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Basically, this bogie has the same specifications as the development bogie for E2 Shinkansen by DB AG. However, this bogie is equipped with the semi-active dampers between the car body and the bogie frame in the vertical direction.
4 Roller rig tests

For the confirmation of the basic performance, we carried out the roller rig tests of the development bogies at the Railway Technical Research Institute in Japan and DB AG Research and Test Centre in Germany.

In the roller rig tests, we confirmed the running stability, riding comfort etc. of the development bogies. The roller rig tests of the E2 bogies were carried out by the half car body model, and the roller rig tests of the ICE2 bogies were carried out by the full car body model.

The scenery of the roller rig tests with the development bogies for E2 at RTRI are shown in Figure 5.
The scenery of the roller rig tests with the development bogies for ICE2 are shown in Figure 6.
5 Running tests

5.1 Running tests of the Development Bogie for E2

After the confirmation of the basic performance by the roller rig tests, we carried out the running tests of the development bogies by E2 Shinkansen. The outlines of the running tests are as follows.

1) Period of the running test :
   JR Bogie : May 24 - Jul. 9, 1998
   DB Bogie : Oct. 12 - Nov. 17, 1999

2) Test section : (Fig. 7)
   Tohoku Shinkansen : Sendai – Kitakami
3) Test car:
   E2 Shinkansen train _8 cars formation_
   Development bogies are mounted on No.8 car of E2 Shinkansen train.
4) Maximum speed : 320km/h
5) Test items :
   Running safety, Riding comfort, Active, Braking test etc.

5.2 Running tests of the Development Bogie for ICE2
The outlines of the running tests of the development bogies for ICE2 are as follows.
1) Period of the running test :
   DB Bogie : Mar. 5 - July 13, 2001
2) Test section : (Fig. 8)
3) Test car:
ICE-S testing train _4 cars formation_
2 Development bogies are mounted on ICE2 coach.
4) Maximum speed: JR Bogie 385km/h DB Bogie 393km/h
5) Test items:
Running safety, Riding comfort, Braking, Curving performance test etc.

6 Conclusion

We developed the high-speed bogies for E2 and ICE2, and confirmed the performance of these bogies by the roller rig tests and the running tests.

We will arrange these test results and the result of mutual development, and on the basis of these results, we will examine the design method and the evaluation method of the development bogie.

BIBLIOGRAPHY