

TRA's Train No.3297 at Longtian Station Occurrence Investigation

Executive Summary

On August 6, 2022, at 23:09, Train No. 3297, a local train operated by the Taiwan Railways Administration (TRA, now restructured as Taiwan Railway Corporation, Ltd.), traveling from Houli Station to Tainan Station, made a stop at Xinying Station. During this stop, the station master discovered smoke emanating from under the first car. Following the train driver's isolation of the third and fourth motors of the car's second bogie, the train resumed operation at 23:20.

The train arrived at Longtian Station at 23:38. The station master noticed that smoke was still emerging from under the first car. After the train driver disembarked to inspect, flames were discovered under the second bogie. The train driver moved the train to the end of the platform at 23:42, and with train station staff extinguished the fire. No casualties were reported in this occurrence. No casualties were reported in this occurrence.

In accordance with the Transportation Occurrences Investigation Act, R.O.C., and the definition of major transportation occurrences specified therein, the Taiwan Transportation Safety Board was the independent agency in charge of investigating the railway accident. The agencies (institutions) invited to participate in the investigation include the Railway Bureau, MOTC and TRA.

On the basis of comprehensive factual information and analyses, TTSB proposes the following 8 findings and 3 recommendations:

Findings

Findings Related to Probable Causes

1. The probable cause of this occurrence may be insufficient torque force

applied to fasten the bolts during the motor assembly. As a result, the bolts may have fallen off before the occurrence occurred. After the upper bolts fell off, the stress was concentrated in the area of the bogie frame near the motor saddle, becoming a source of stress that led to fatigue failure. The fatigue failure continued to grow until the cross-sectional area of the bogie frame bearing load was reduced to the point where it could not bear the weight of the motor and breaks, causing the motor to lose support and fall and tilt.

2. The train's motor was tilted, causing continuous contact between the rotor and stator during operation. Even though the train driver isolated the motor, the rotor continued to rotate as the train operated and continued to rub against the stator, generating heat that caused the temperature to rise and eventually catch fire.
3. The torque value of the TRA's EMU600 motor fasten bolts does not meet the specifications outlined in the original manufacturer's manual, and the bolt specifications are not clearly defined. This lack of clarity is not conducive for on-site maintenance staff to perform motor assembly according to SOP.
4. The TRA does not have defined stages in its emergency Standard Operating Procedure (SOP) for traction motors emitting smoke, thereby being unable to prevent the occurrence of similar accidents.

Findings Related to Risk

1. The TRA has not standardized the inspection method after assembling the EMU600 motor, and the motor assembly process, the maintenance staff, and the component cannot be traced in the maintenance documents, which is not conducive to controlling the quality of motor assembly and maintenance results.

2. Before the occurrence, the abnormal motor isolation is recorded by train drivers frequently. However, the TRA continued to dispatch the train on duty, missing opportunities to prevent the occurrence.

Other findings

1. In this incident, TRA permitted personnel who did not pass the operation staff physical examination to persist in their operational duties.
2. The content within the Train Control and Monitoring System (TCMS) records for TRA's EMU600 electric multiple units is overly concise, and the time of the TCMS for the occurrence train was not calibrated.

Safety Recommendations

To the Taiwan Railway Corporation, Ltd.

1. Review the maintenance and assembly specifications for traction motors and bogies in trains equipped with traction motors. Additionally, examine maintenance records and identify key maintenance points, along with rules and torque values for the bolts during motor assembly. Document personnel details, construction methods, parts, and other operating procedures in records for the convenience of on-site operators. This will aid in maintenance control and tracking.
2. Review the standard operating procedures for responding to motor smoke incidents, consider the handling procedures for each phase, and implement education and training on these procedures.

To the Railway Bureau, MOTC

1. In accordance with Article 41 of the Railway Law, the Railway Bureau may include safety recommendations related to training and regulation

revision in regular and irregular inspections and supervise the Taiwan Railway Corporation, Ltd. to execute the safety recommendations.

Note: The language used in the occurrence investigation Final Report is in Chinese. To provide a general understanding of this investigation for the non-Chinese reader, the Executive Summary of the Final Report was translated into English. Although efforts are made to translate it as accurately as possible, discrepancies may occur. In this case, the Chinese version will be the official version.