

Executive Summary

TRA's Train No. 4206 at Xinma Station

At 18:22 on April 28, 2021, Train No.4206, local Train of Taiwan Railways Administration, MOTC (TRA), departed from Yilan station to Hualien station, was on fire underneath car 4 when entering Xinma Station of Yilan City. The TRA staff extinguished the fire with extinguishers, and the train continued. There were no fatalities or injuries in this occurrence.

According to the Transportation Occurrences Investigation Act, the Taiwan Transportation Safety Board is responsible for investigating major transportation occurrences that arise in the R.O.C. territory. This accident is considered as a major transportation occurrence within the scope of investigation. The Railway Bureau and TRA were invited to participate in the investigation.

The investigation report was approved by the 47th Board Meeting on February 2, 2023, and published on February 10, 2023.

After comprehensive investigation and analysis of the factual data, a total of eight conclusions and four safety recommendations were obtained, which are detailed as follows:

Findings

Findings related to probable causes

1. Due to oil deterioration owing to the oil change interval extension and inadequate cleaning of the oil discharge port, the bearings of the D-end of the traction motor suffered friction increased from insufficient lubrication, increasing the operating temperature of the traction motor

after the accident train departed from Luodong Station. As the temperature detector was not installed in the motor stator winding, the traction control device was unable to receive the actual operating temperature of the motor, and measures such as traction inhibition and fault indication lights were not activated to remind the driver that a traction motor abnormality had occurred.

2. After the accident train departed from Dongshan Station, the continuous high-temperature operation of the traction motor caused it to catch fire and emit smoke, and the oil-stained rubber sleeve of the brake cylinder piston rod and the outer case of the gearbox burnt.

Findings related to risk

1. When the EMU500 gearbox upper and lower covers were reassembled and sealed, TRA had no SOPs for inspecting, testing, and sealing. TRA replaced the sealing material recommended by the manufacturer without considering its performance, which may result in inadequate sealing and insufficient heat resistance of the gearbox, leading to oil leakage.
2. TRA did not follow the original manufacturer's gearbox lubrication oil change interval at Level 2 inspection, leading to oil deterioration which was not favorable for bearing lubrication, increasing abnormal wear between the gears and motor D-end bearing due to insufficient lubrication.
3. The lubrication oil types listed in the work items for various maintenance levels of TRA EMU500 do not match the actual oil types used in practice, indicating that the maintenance documents were not updated promptly, which is unfavorable for ensuring maintenance quality.
4. When TRA carried out traction motor rotor cleaning, the bearings were

not also replaced following the original factory instructions, increasing the risk of bearing damage after prolonged operation.

Other findings

1. When TRA carried out EMU500 gearboxes cleaning, the join of the upper and lower covers had a small amount of dirt and the interior of the gearbox had oil gunge.
2. The TRA traction motor inspection and maintenance record items and the “TRA EMU500 regular inspection and maintenance items” are inconsistent, increasing doubts for frontline repair personnel.

Safety Recommendations

To TRA

1. Check the installation position of the temperature detector in all EMU traction motors to ensure it meets the original manufacturer's requirements.
2. Establish SOPs for selecting, testing, and applying methods of non-original manufacturer materials for each type of EMU.
3. Add gearbox lubrication oil change schedule, reflow port and the oil discharge port of motor rotor D-end cleaning schedule, and traction motor rotor bearings exchange schedule in every class of inspection and maintenance items of EMU500; review the model of gearbox lubrication oil for every class of inspection and maintenance.

To Railway Bureau, MOTC

1. The Railway Bureau, MOTC, based on its authority supervision, and management responsibilities, should integrate all safety recommendations made in this case to TRA into periodic and non-periodic inspection items in accordance with the Railway Act, to

supervise TRA and track their progress.

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.