KOCHI METRO RAIL LIMITED

KMRL TECHNICAL INCIDENT REPORT

Report ID: KMRL/TECH/INC/2023/10/025

Subject: Technical Fault Analysis – Recurring Traction Inverter Failure in Train Set 14 (TS-14)

Date: October 26, 2023

Priority: High

Confidentiality: Strictly Confidential – For Internal Use Only

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1. EXECUTIVE SUMMARY

Priority: HighThis report details the analysis of a recurring technical fault in Train Set 14 (TS-14), involving the failure of Traction Inverter Unit (TIU) in Car B. The third occurrence within six months on October 25, 2023, caused an 8-minute service disruption. Preliminary findings suggest a systemic issue beyond component failure, potentially related to electrical harmonics or cooling system inadequacy.

2.INCIDENT DETAILS

- Train Set: TS-14 (6-Car Formation: 14A-14B-14C-14D-14E-14F)
- Car & Component Affected: Car 14B, Traction Inverter Unit (Part No.: KMRL-TIU-M450-V3)
- Date & Time of Fault: October 25, 2023, 10:15 Hrs
- Fault Code: E-TIU-107 (DC Link Overvoltage)
- Location: Between Maharaja's College and Ernakulam South Stations
- Immediate Action: Train operated in degraded mode to next station; passengers offloaded.

3.TECHNICAL SPECIFICATIONS OF AFFECTED COMPONENT

Component: Traction Inverter Unit (TIU)

Model: M450-V3

Manufacturer: M/s. Bharat Traction Systems

Power Rating: 1.2 MW

IGBT Technology: 3.3 kV, 1200A

Cooling System: Liquid Cooled

4. ROOT CAUSE ANALYSIS

A. Previous Occurrences

First Incident (May 10, 2023): TIU failure attributed to faulty IGBT module. Replaced under warranty.

Second Incident (August 22, 2023): DC Link capacitor failure. Entire TIU replaced.

B. Current Failure Analysis:

Data Logs: Show repeated DC Link voltage spikes exceeding 1800V (limit: 1650V) during regenerative braking.

Physical Inspection: Burnt IGBT modules and damaged gate driver boards found.

Hypothesis: Voltage spikes are likely due to:

Inadequate Filtering: Insufficient suppression of electrical harmonics from the 25kV OHE.

Cooling Inefficiency: Reduced coolant flow leading to overheating under peak load.

Software Anomaly: Flaw in the control algorithm managing regenerative braking.

CONCLUSION

The recurring TIU failure in TS-14 indicates a systemic issue requiring comprehensive technical intervention. Implementing the recommended actions will enhance system reliability and prevent future service disruptions. A detailed investigation report will be submitted after the harmonic analysis is completed.

End of Memorandum

Report Certified by:

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