- Focussing on using the TDS tool for ECU flashing-

After a successful report on the complete production, I was given the task of majorly focussing on the defects in the ecu and provide solutions minimizing repetition.

Situation

During my internship at Tata Motors' Electric Vehicle (EV) Business Unit in Pune (2021-2022), I worked in the EV shop assembling the Nexon EV. A significant challenge was the high incidence of electrical defects in the ECUs detected during the Level 2 quality check, which caused delays in the final inspection process. These defects, often related to ECU firmware or connectivity issues, required time-consuming rework, impacting production efficiency for the upcoming Kanger 2.0 variant.

Task

My task was to use the TDS Tool (Tata Diagnostic System Tool) to flash ECUs with errors or issues during the Level 2 process, aiming to minimize process time and reduce electrical defects. I needed to ensure that ECU-related issues were resolved quickly and accurately to prevent delays in the production line and improve the overall quality of the Nexon EV before dispatch. Major objectives were

- To identify the types of defects that are captured at Level 2 and analyse the data obtained so that the production time of the vehicle can be reduced.
- The data obtained needs to be categorized according to respective agency and the cause of the defect needs to be identified.
- The respective agencies involved can be notified so that the root cause is eliminated, and fewer fallouts are visible in the upcoming months.

Image 1 1- This is the TDS tool that I used to detect ECU flashes

Action

I took the following SOP to address the task:

1. Understanding the TDS Tool: I familiarized myself with the TDS Tool's functionality, which involved a specialized program for flashing ECUs to update firmware or resolve connectivity errors. I collaborated with the Electronic Division (ED) team to learn the tool's setup and operation, ensuring I could use it effectively during the Level 2 checks.
2. Defect Diagnosis: During the Level 2 quality check, I connected the Nexon EV to the TDS Tool via a CAN cable to diagnose ECU issues. I analysed the tool's output, which provided a printout of the ECU status, identifying specific errors such as firmware mismatches or communication failures between ECUs and other vehicle systems.
3. ECU Flashing: For ECUs with identified issues, I used the TDS Tool to flash updated firmware or reset configurations. This involved selecting the appropriate program from the tool's interface, executing the flashing process, and verifying the ECU's functionality post-flashing. I ensured each flashing operation was completed within 2-3 minutes to minimize downtime.
4. Process Optimization: Recognizing that ECU defects were a bottleneck, I proposed using the TDS Tool proactively during earlier stages (e.g., post-Station 4 assembly) to catch issues before Level 2. I worked with the ED team to streamline the flashing process, reducing the time required for each ECU check by optimizing the tool's diagnostic sequence.
5. Documentation and Feedback: I documented the results of each flashing operation, noting the types of ECU errors and their resolution status. I shared these findings with my mentors, Mr. Nitin Kolekar (DGM EVBU) and Mr. Vaijnath Gochikar (TCF Head), to improve the EV shop's defect tracking system. I also provided feedback to the ED team on the TDS Tool's performance, suggesting interface improvements for faster error detection.

I am uploading some tables about the defects that a TDS tool identifies.

Sr No.	ECUTYPE	BL_NO	BL_VER
1	PEPS	5123162516R01	C2
2	EPAS	5123162516R01	C2
3	ESCL	5123162516R01	C2
4	BCM HELLA	5123162516R01	C2
5	FATC	5123162516R01	C2
6	IPC	5123162516R01	C2
7	IHU	5123162516R01	C2
8	DC DC	5123162516R01	C2
9	MCU	5123162516R01	C2
10	VECU	5123162516R01	C2
11	TELEMATICS	5123162516R01	C2
12	BMS	5123162516R01	C2
13	OBC	5123162516R02	C3
14	AIRBAG	5123162516R01	C2
15	ESP MANDO	5123162516R01	C2

Sr. No.	ECU Name
1	Vehicle Control Unit (VECU)
2	Battery Management System (BMS)
3	Multipoint Control Unit (MCU)
4	Passive Entry Passive Start (PEPS)
5	Antilock Brake System (ABS)
6	Electrical Power Assisted Steering (EPAS)
7	Fully Automatic Temperature Control System (FATC)
8	On board Charger (OBC)
9	Telematics
10	Airbag
11	Instrument Panel Cluster (IPC)
12	Music Harman (IHU)
13	DC-DC
14	Electronic Steering Column Lock (ESCL)
15	Body Control Module (BCM)

Result

My work with the TDS Tool significantly reduced the time required to resolve ECU-related defects during the Level 2 quality check, cutting rework time by approximately 50% for electrical issues (from an estimated 5-10 minutes per vehicle to 2-3 minutes). The proactive use of the TDS Tool helped identify and fix ECU errors earlier in the process, reducing the defect rate at Level 2 by ensuring more vehicles passed the final inspection on the first attempt. My contributions were acknowledged by the ED team, and the TDS Tool's application became a standard part of the EV shop's quality assurance process. This experience enhanced my technical skills in

automotive diagnostics, ECU programming, and collaboration with cross-functional teams, preparing me for future roles in automotive engineering.

Below are some pictures of the prints from the TDS tool showing OK and Not OK tags

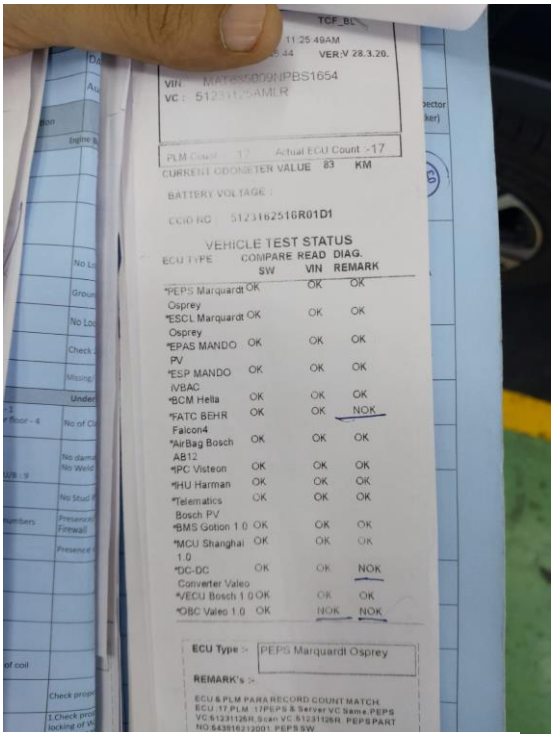

Image 1 7.1

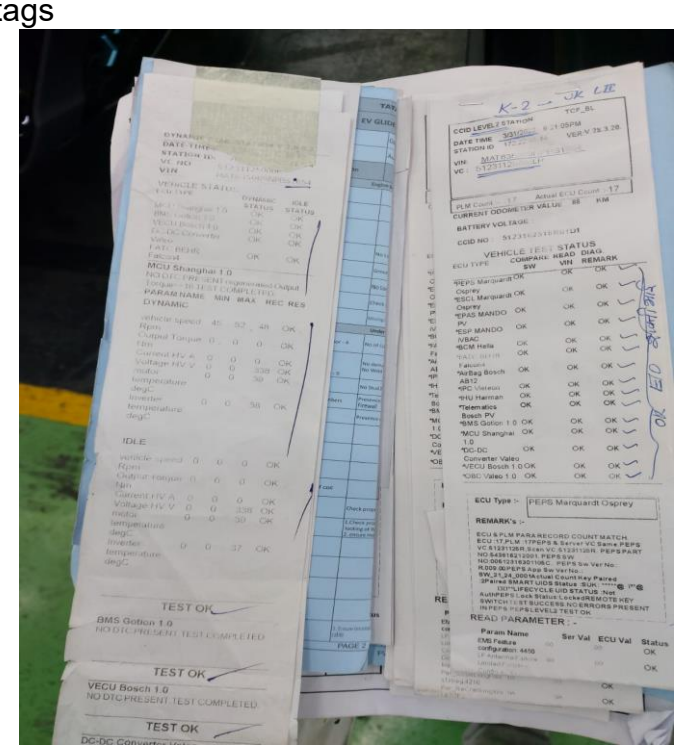

Image 1 2.2

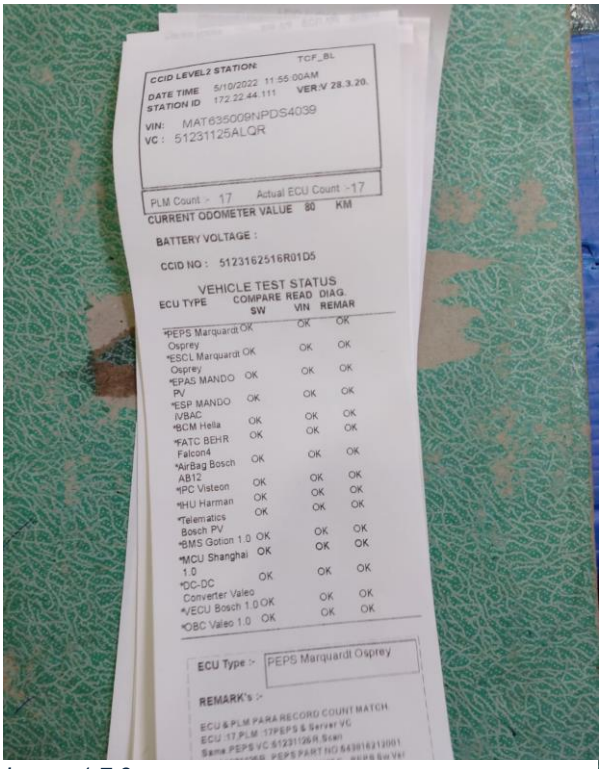

Image 1 7.3

Image 1 7.1 shows the not ok tags received

Image 1 7.2, 7.3 show the OK tags after defect correction