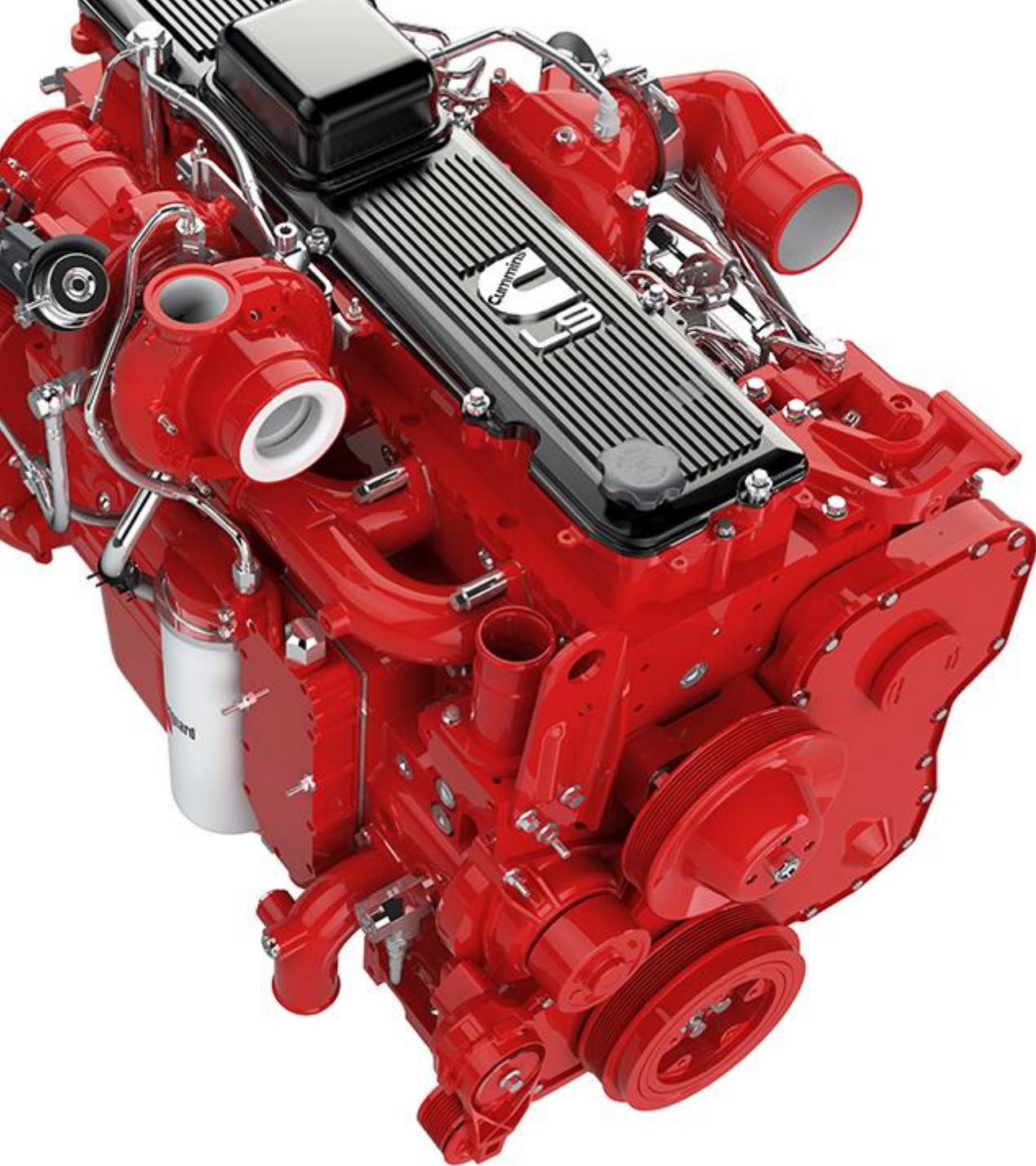




L9 – Jake Brake

#5 Intake rocker pedestal cap screw not fully torqued

March 26, 2018

Confidential

Navistar SAP found ESN 74273427 was running rough and had high smoke

- ESN: 74273427
- OEM: Navistar SAP
- Model: L9 370 Hp with Jake brake
- Lineset: 2/16
- Defect reported: 3/13
- Hours/Miles: 2.2hrs / 2 miles
- Troubleshooting:
 - The Cummins Service Technician performed a cylinder cutout test with Insite to identify Cylinder 5 had an issue
 - After removing the valve cover, the #5 Intake rocker pedestal cap screw was found standing proud
- Repair:
 - Torqued the cap screw to 65Nm and the issue was resolved

74273427 – Cap screw standing proud



Suspect causes

1. Inadequate repair completed at RMEP

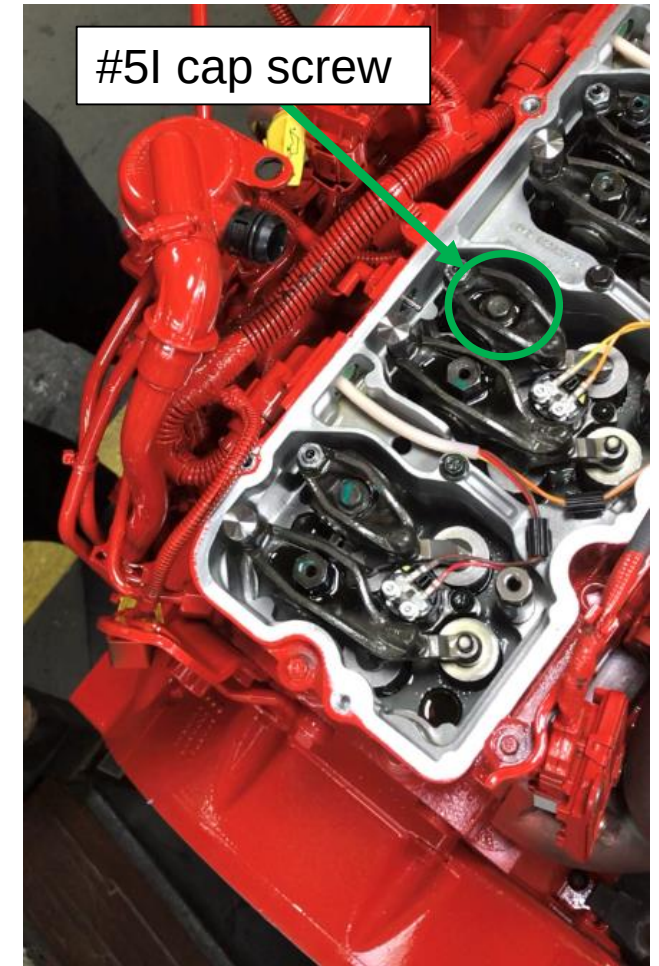
- The engine history was reviewed and found no issues with out of process, hot test or repairs

2. Incorrect torque applied by the rocker pedestal torque unit

- **Critical finding:** A Quality torque over check found the #5 intake rocker pedestal cap screw was not fully torqued on a Jake Brake engine after the rocker pedestal torque unit

The product was contained and a clean point was established

- Dock closure 5439 on all Jake brake engines – (3/23)
 - Verify the #5 intake rocker pedestal cap screw is torqued to 65Nm
- Reteach #5 intake on the Jake brake program – (3/23)
 - Quality verified the proper torque was applied after the change
 - ESNf **74291280**



An error was made during the robot relocation teaching

- On 3/23, maintenance reviewed a Jake brake engine run through the cycle
 - It was noted that robot 1 was torquing cylinder #6 intake twice instead of moving to next step which is cylinder #5 intake
 - The engine received a pass status
- Reviewed video footage of the torque robot
 - October 23rd shows the 5l cap screw receiving torque
 - November 11th shows the 6l cap screw being torqued twice
 - 5l does not receive torque
- There is a maintenance work order from October 25th that modified the Jake brake torque program due to high rejects for mislocations

Video from 10/23 shows the c/s receiving torque



Video from 11/11 shows the c/s not receiving torque



There is no product verification after modifying the robot's program

Current Process Mapping

1. Quality reviews “critical torque equipment reject rates vs control limits” failures using “ToolsNet”
 - This analytical tool captures ESN, engine model, robot, time, bolt, torque values, reject/accept status and angle of fastener if subjected to angle requirements
2. Items out of the control limits are reviewed in the daily production meeting
3. Maintenance will review the data to understand possible correlation to product models, equipment, symptoms of failure and devise a course of action to address the failure

The process failed to detect the issue

- Station 445 runs down the cap screws to 15Nm so #5I appeared tight and was able to pass hot test
- Toolsnet data for the engines all passed
 - The rocker pedestal cap screw program loosens the cap screw and performs a burnished step before applying the 65Nm torque

The permanent solution will validate the product after robot program changes

No.	Description	Target Date	Status
1	Implement a quality alert regarding MCR requirement for re-teaching torque related program changes	3/23	Complete
2	Establish quality verification process for any changes made #449 robot and torque programming (Standard QSI procedure, check list for product verification and notification/signoff(s))	3/26	In process
3	Establish plan for periodic product verification for all robot cells	3/28	In process
4	Revisit FMEA and control plans for all robot cells	3/30	In process
5	Need to investigate to add break away torque monitoring condition or add forward cycle and monitor re-hit condition before rotating counter clockwise for burnishing cycle	4/5	In process

The permanent actions are in the process of being implemented

- More information to be provided after implementation

Monitor effectiveness

- More information to be provided after Step 6 implementation



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