Cummins continues to invest in technology to meet emissions while providing better performance and reliability. Here are a few examples of that work that have directly benefitted the fire service over the last several years:

EGR coolers

1. Air in the cooling system is the number one contributor to EGR cooler issues.
2. Cummins published an 8- step coolant fill process to prevent failures due to air entrapment.
3. Vacuum filling of cooling systems remains the most preferred method.
4. In 2014, an EGR cooler and venting arrangement were released that included vertical tubes vs. horizontal in the cooler and improved venting to reduce the possibility of entrapped air in the cooler.

Turbocharger

1. Custom fire apparatus installations challenge the limits of temperature capability of engine components.
2. In 2019, we added additional coolant plumbing for MMRO turbos that are most used on fire apparatus. This reduces the temperature seen by the actuator.
3. To further address heat concerns, we have gone to a smaller crystal in the turbo actuator that reduces the possibility of cracking due to overexpansion.
4. A new turbo actuator calibration has been released to further improve reliability

Head Gasket

1. Like turbos, the heat in custom chassis engine tunnels creates challenges in material selection. Issue is not present in other applications.
2. Higher incidence of oil leak complaints in southern US, especially the Southwest due to higher average temperatures.
3. Cummins has developed and tested a higher temperature material for the head gasket grommets.
4. Production fix began December 2019.

EGR Valve

1. There have been several reliability and durability improvements on the L9 EGR valve.
2. In 2009, the seal around the poppet, EGR motor, and calibration for self-cleaning the EGR valve stem were all improved.
3. In 2014, sealing was improved to resist water intrusion and a calibration was released for deicing in cold climates.

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SCR Catalysts

1. Multiple improvement projects completed on SCR catalysts since 2013.
2. There was an SCR product change in 2015 (more robust) along with improved diagnostics (high fix effectiveness)

Fuel Injector Supply Lines

1. Multiple projects completed that address fuel injector supply lines that have delivered high fix effectiveness.
2. Improvements have been implemented into production.
3. Field actions have been released to address failure modes proactively.

NOx Sensors

1. Multiple projects completed that address NOx sensor failures.
2. Identified improvements have been expedited into production.
3. 25% improvement rate on failures.

Summary-Continuous Improvement – Product and Support

1. Cummins is continuously improving the product.
2. Free access to Quick Serve Online is provided as part of the Limited Owners Plan (up to 5 ESNs). Technical Service Bulletins of many other improvements are posted in the service area for a given ESN. Go to **quickserve.cummins.com** for additional information.
3. In 2014, many improvements were made to diagnostic fault code logic which has reduced the number of check engine lights.
4. New aftertreatment warm up strategies were introduced with all 2017 engines to further reduce the number of regenerations.
5. Industry leading coverage availability
   Standard 5 year/100,000 warranty
   6, 7, and 8-year coverage available on 2017 and newer engines
6. Support
   We have stepped up when it made sense – mobile service
   Use the most capable locations
   Escalation path

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