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**FUEL QUALITY IMPACTS ON TIER 2-4 OFF ROAD DIESEL ENGINES
HAVING COMMON RAIL FUEL SYSTEMS**

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Abstract

Modern diesel engines are designed to meet US EPA Tier 2-4 and EU stringent exhaust emission requirements through exhaust aftertreatment, in-cylinder and air handling improvements but also through fuel system improvements. Modern high pressure common rail (HPCR) fuel systems are being applied by Cummins to large engines having 19 through 60 liter displacements and beyond. The high injection pressure at all speeds, multiple injection events and fuel injection timing and rate shaping flexibility of these systems are key enablers to achieving low emissions and fuel consumption. However, these systems are challenged by widely varying world wide commodity diesel fuels, even with some conforming to ASTM, ISO and other fuel specifications. Operational problems encountered with these fuels and HPCR fuel systems will be described in the presentation, along with known countermeasures. Improvements in fuel cleanliness, water content, stability, storage and handling are essential parts of the effort to achieve high reliability and durability in these modern fuel systems. Filtration and water separation (on engine and off engine) must also be improved to maintain the fuel clean and dry. Deposit formation due to thermal stressing of the fuel must be avoided through selective additization or refinery improvements.