Better Every Call.
Cummins 2010 Solution for Fire Truck Applications

Why Selective Catalytic Reduction (SCR) is the Right Technology for 2010

- Increased Horsepower and Torque without increasing displacement
- Improved Operator Satisfaction
  - Improved throttle response and driveability
  - Easy operation for driver
- Improved Reliability and Durability with SCR Technology
  - In-cylinder technology necessitates massive Exhaust Gas Recirculation (EGR) flow which may produce excessive acidic condensation resulting in power-cylinder corrosion and rapid deterioration of lube oil
  - In-cylinder technology significantly increases EGR rates up to 50% (more than double) over an SCR solution
- Fully Integrated Subsystems efficiently reduce emissions and lessen the need for frequent Diesel Particulate Filter (DPF) regenerations.
  - Fewer DPF Regenerations than current engines with SCR technology
- Minimal Change in Heat Rejection vs. today’s product
  - With SCR, no need to adapt cooling packages to accommodate higher heat rejection
  - With SCR, no major redesign, if any, of radiator, charge air cooler, and/or fan systems
  - In-cylinder technology increases EGR rates up to 50% over an SCR solution, leading to increased heat rejection
- Fuel Economy is 5 - 9% better with SCR technology than with in-cylinder technology for both Heavy-duty and MidRange engines.
  - With SCR technology, combustion efficiency is significantly improved as compared to an in-cylinder technology and leads to:
    - Fewer engine pumping losses
    - Lower intake and exhaust manifold pressures
    - Decrease in DPF regenerations
- SCR is a proven technology
  - Cummins has extensive experience with this technology and has been using it in Europe since 2006
  - Cummins Emissions Solutions has built and shipped over 250,000 SCR systems
  - Cummins has built and shipped over 50,000 engines with SCR systems
Cummins Aftertreatment System

- Proven Cummins Particulate Filter reduced particulate matter by over 90%. New for 2010 is the SCR Catalyst for NOx reduction.

How SCR works

- Exhaust gas containing Oxides of Nitrogen (NOx) exits the Cummins Particulate Filter and enters a tube called the Decomposition Reactor, where a fine mist of Diesel Exhaust Fluid (DEF) from the holding tank is sprayed into the hot exhaust stream.
- DEF breaks down into ammonia (NH3) during a chemical reaction in the Decomposition Reactor through a process known as hydrolysis.
- The NOx and ammonia (NH3) pass into the SCR element where a catalytic reaction takes place, converting the NOx into harmless nitrogen gas (N2) and water vapor (H2O).
- The result - near zero emissions.

To watch a video on How SCR Works, go to www.everytime.cummins.com

How much DEF will be needed?

- DEF consumption will be approximately 2% of your fuel consumption.
- DEF tank size will be determined by the vehicle manufacturer. Cummins recommends a DEF tank size at 6% the size of the vehicle fuel tank. (If the vehicle has a 50 gallon fuel tank, the DEF tank would need to be a minimum of 3 gallons.)

Here’s an example:

- Annual miles for average truck (urban setting) = 7,000 miles
- Assume average MPG = 5 mpg
- 7,000 miles / 5 mpg = 1,400 gallons diesel fuel per year
- DEF usage @ 2% of fuel consumption = 28 gallons of DEF / year
- **28 gallons / 5 gallon tank = only 6 DEF fill-ups / year**

**Based on 5 gallon DEF tank sizing and a 50 gallon fuel tank

To calculate specific fleet usage, go to www.cumminsfiltration.com.
Where can DEF be found?

- All Cummins Distributor locations will have DEF available for sale in October 2009.
- DEF will be readily available for customers to purchase in thousands of locations in US and Canada. Cummins Filtration will offer DEF in a variety of sizes of packaging from bulk to 1, 2.5 and 5 gallon jugs.
- Customers can be confident in the availability of DEF. To talk to a Cummins representative about questions on DEF or for the nearest retail outlet, customers can call:
  - Cummins Filtration at 1-800-22FILTER
  - Cummins Customer Assistance Center at 1-800-DIESELS

The Facts about DEF

- **FACT:** DEF is a solution of 32.5% automotive grade urea and 67.5% deionized water.
- **FACT:** DEF is SAFE to handle and store. It is NON-toxic, NON-polluting, and NON-flammable.
- **FACT:** DEF will freeze at 12 F (-11C). Frozen DEF does not impact the start up of or the operation of the vehicle.
- **FACT:** DEF and urea do not become toxic – even if stored at extreme temperatures.
- **FACT:** DEF is slightly alkaline with a pH of approximately 9. That’s about the same as household baking soda.
- **FACT:** DEF pricing will be at or below the price of diesel fuel in 2010 as the population of SCR equipped engines enters the marketplace.

Driver Training and Tips

- Drivers can expect better driveability and better performance with Cummins 2010 engines.
- Drivers can expect to see a new DEF Lamp. This lamp will illuminate when the DEF level is low.
### How the Competition Stacks Up

<table>
<thead>
<tr>
<th>Engine Model</th>
<th>Displacement</th>
<th>Horsepower</th>
<th>Peak Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISB6.7</td>
<td>6.7 liters</td>
<td>260 - 360 Hp</td>
<td>660 - 800 lb-ft</td>
</tr>
<tr>
<td>ISC8.3</td>
<td>8.3 liters</td>
<td>270 - 380 Hp</td>
<td>800 - 1050 lb-ft</td>
</tr>
<tr>
<td>ISL9</td>
<td>8.9 liters</td>
<td>345 - 450 Hp</td>
<td>1150 - 1300 lb-ft</td>
</tr>
<tr>
<td>MaxxForce 10</td>
<td>9.3 liters</td>
<td>310 - 350 Hp</td>
<td>1050 - 1150 lb-ft</td>
</tr>
<tr>
<td>ISX11.9</td>
<td>11.9 liters</td>
<td>370 - 500 Hp</td>
<td>1450 - 1645 lb-ft</td>
</tr>
<tr>
<td>MaxxForce 13</td>
<td>12.4 liters</td>
<td>410 - 475 Hp</td>
<td>1450 - 1700 lb-ft</td>
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<tr>
<td>DD13</td>
<td>12.8 liters</td>
<td>350 - 500 Hp</td>
<td>1350 - 1650 lb-ft</td>
</tr>
<tr>
<td>ISX15</td>
<td>15 liters</td>
<td>455 - 600 Hp</td>
<td>1750 - 1850 lb-ft</td>
</tr>
</tbody>
</table>

**Better Every Call.**

- Cummins is the only engine manufacturer to design and manufacture all critical subsystems, from air intake to exhaust aftertreatment, in-house.
- Cummins will maintain consistency in proven SCR technology to meet the ever-changing emissions standards.
- Maintenance Intervals for 2010 engines are the same as today’s engines. There will be one new maintenance item, a DEF Filter, which will need to be changed every 200,000 miles.
- Cummins support network is the best in the industry with over 3,500 authorized Cummins dealers and distributors throughout North America.
- For further details on why SCR is the Right Technology for meeting EPA 2010 emissions, visit us at www.everytime.cummins.com.