

Western States Highway Equipment Managers Association

August 18, 2009

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Cummins Rocky Mountain, LLC.

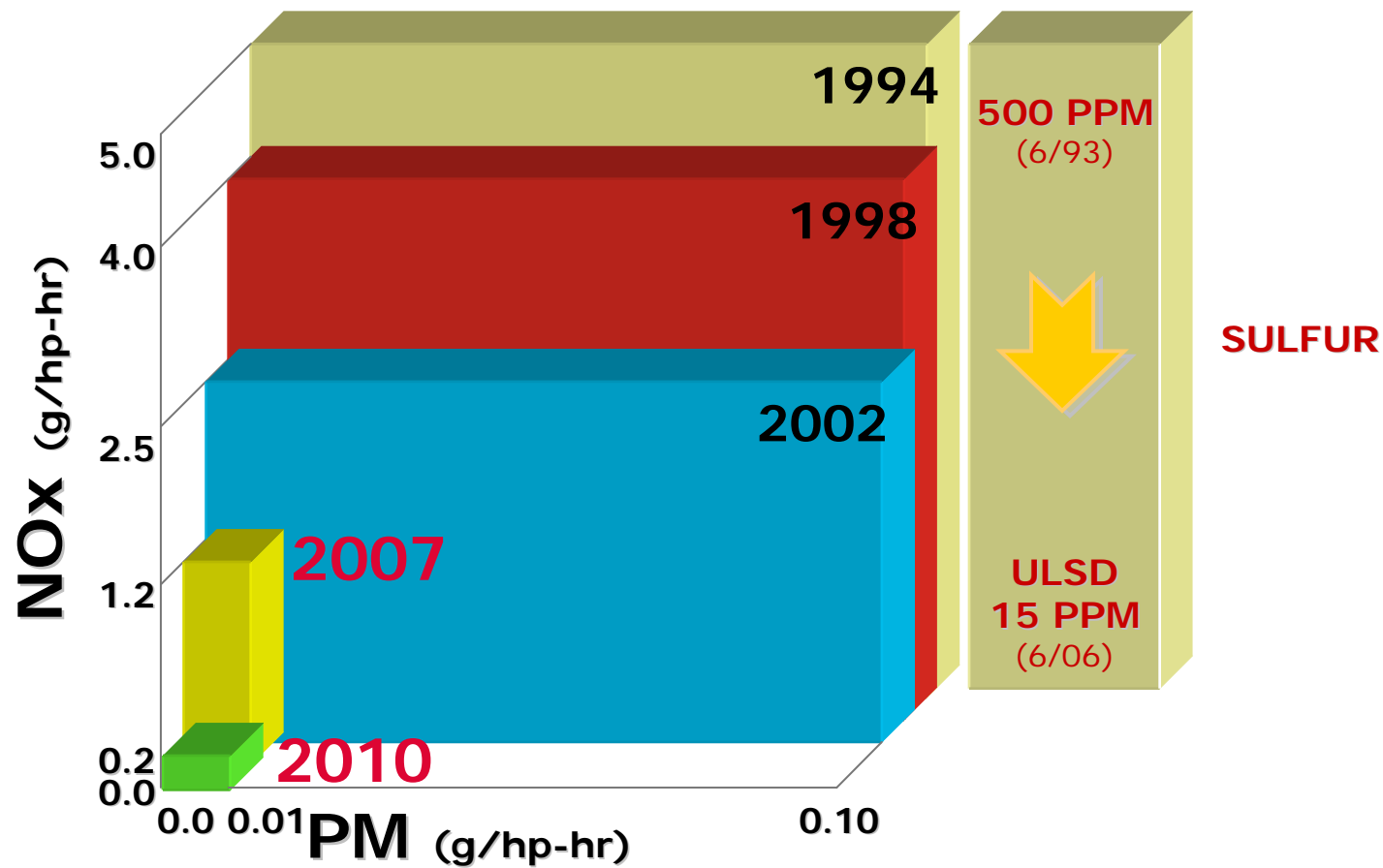


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Agenda

- EPA Emission Standards
- SCR vs “in-cylinder” Technology
- 2010 Technology
- DEF (Diesel Exhaust Fluid) Facts
- 2010 Products
- Biodiesel, Natural Gas & Off-Road Engines

On-Highway Emission Regulations Timeline





SCR vs “in-cylinder” Technology



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Fuel Economy

- Cummins testing on our products shows a 5-9% advantage with SCR vs “in-cylinder” solutions on both midrange and heavy-duty engines.

Performance & Power Density

- Cummins 2010 engines will deliver the same horse power & torque as today's products without increasing displacement.
- Cummins experience with “in-cylinder” technology confirmed a loss of 50-100 hp performance for the same displacement.

Throttle Response

- Will be improved relative to today's excellent products
- Will be much more responsive than a 2010 "in-cylinder" solution

Driveability

- Cummins 2010 engines will have a larger “sweet spot” for easier driveability resulting in optimum fuel economy and performance, substantially better than an “in-cylinder” solution

Reliability

- SCR technology provides:
 - No increase in EGR rates
 - No increase in heat rejection
 - Engine out NOx/PM ratio favorable for improved DPF passive regeneration

Reliability con't.

- “in-cylinder” technology requires significant changes to the:
 - EGR system
 - Air handling system
 - Vehicle cooling system
- Cummins experience with “in-cylinder” technology showed a significant impact to durability & engine life due to internal engine condensation and acid formation issues

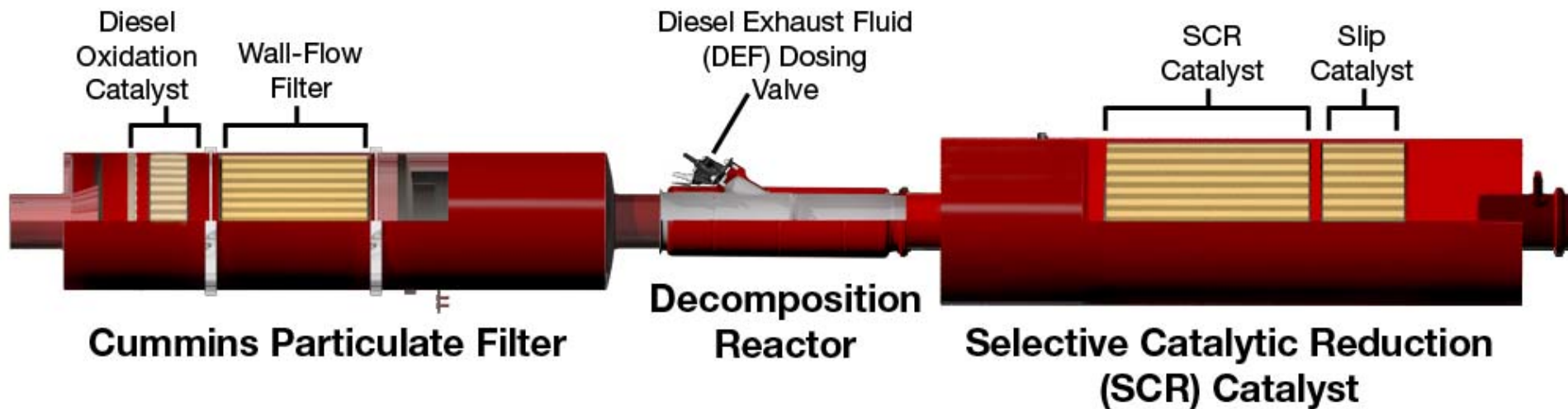


Cummins 2010 Technology



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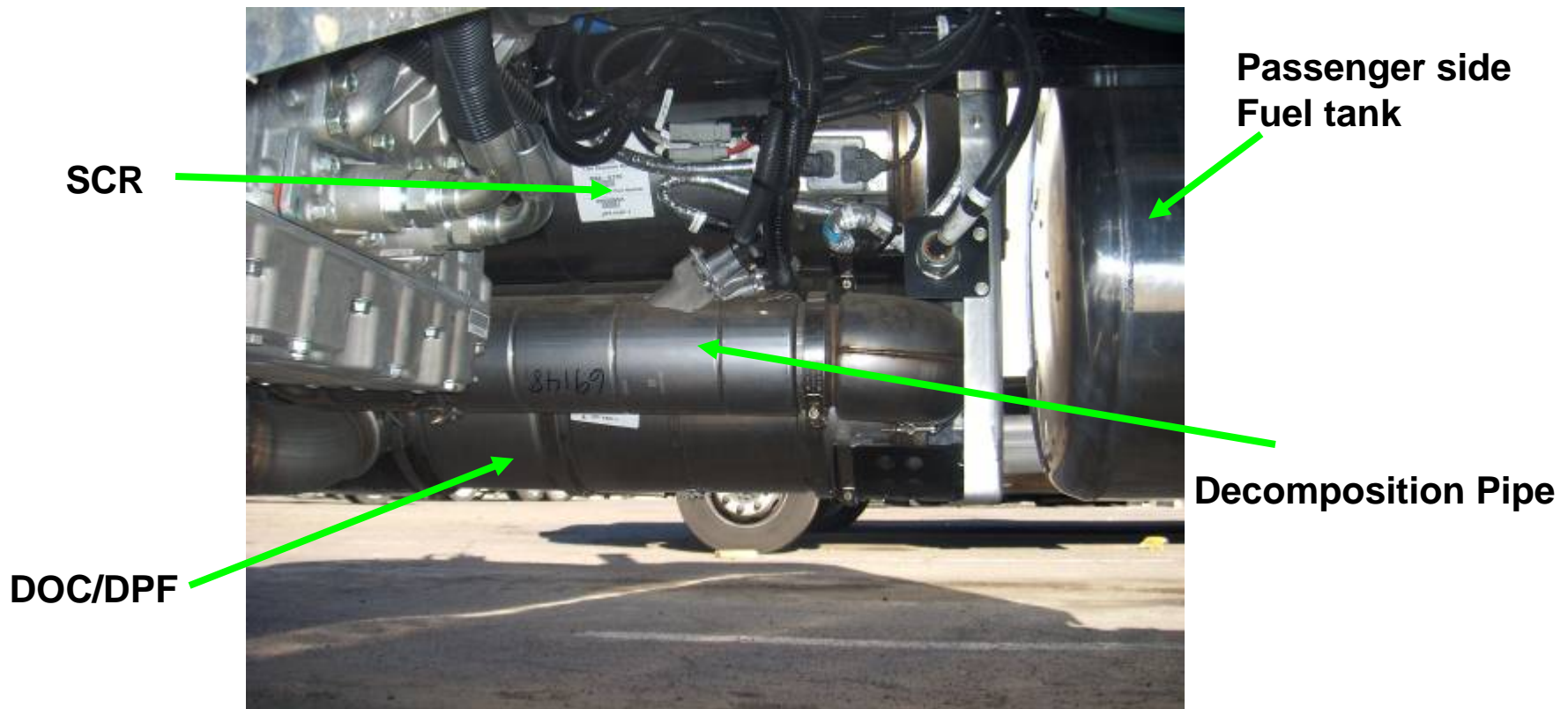
Cummins Aftertreatment System



Cummins SCR Technology

- Technology is proven and works very well
- Cummins has sold over 50,000 SCR equipped engines in Europe
- Cummins Emissions Solutions has sold over 250,000 SCR systems in Europe

DOC/DPF, Decomposition Pipe and SCR (Very Compact Design)



***All of these components are under the passenger step.**

DEF Tank (location & size will vary by OEM)





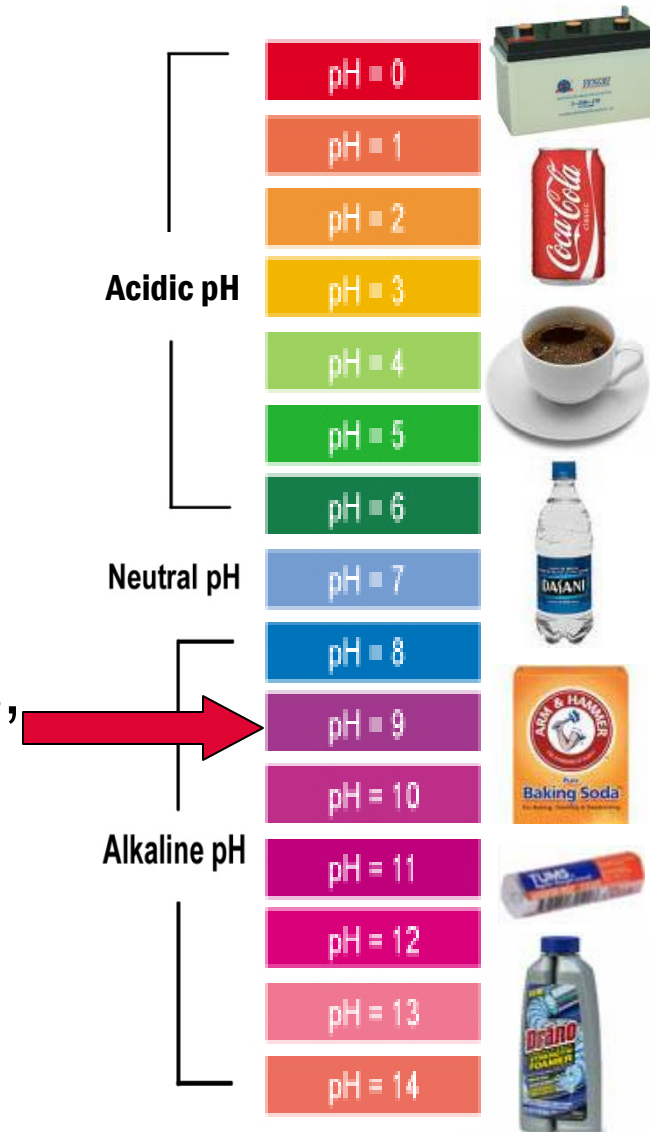
DEF Facts



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DEF Properties

- 32.5% urea & 67.5% deionized water mixture
- Non-toxic and non-flammable
- Safe to handle and store
- Poses no serious risk to humans, animals, equipment or the environment if properly handled
- The product is slightly alkaline with a pH of approximately 9.0



DEF Storage

- Shelf life of DEF is a function of ambient storage temperature
- ISO Spec 22241-3 details the Storage, Handling and Shelf Life minimum expectations for DEF throughout the distribution chain
- Expectations for shelf life as defined by ISO Spec 22241-3 are the *minimum* expectations for shelf life when stored at *constant* temperatures

DEF Storage con't.

- Storage temperature below 86° F is recommended to maintain shelf life
- Storage temperature above 11° F is recommended to avoid freezing
- The maximum temperature of stored diesel exhaust fluid on the vehicle should not exceed a continuous 122° F
- Estimated shelf life is 18-24 months

DEF Freeze Point

- Freezing of DEF begins at about 11°F
- If DEF freezes, start up and normal operation of the vehicle is not inhibited so the operator is not impacted
- The SCR system is designed to provide heating for the DEF tank and supply lines which will reduce the melting time for frozen DEF
- Once the DEF has melted, it can be used without problem. The first melted drop has the same consistency as defined in the Diesel Exhaust Fluid specification

How Can I Determine how Much DEF I will Use?

- **Example...Heavy duty**
- **Annual miles for average truck = 120,000 miles**
- **MPG for average truck = 6 mpg**
- **$120,000 \text{ miles} / 6 \text{ mpg} = 20,000 \text{ gallons diesel fuel per year}$**
- **DEF usage @ 2% of fuel consumption = 400 gallons of DEF / year**
- **$400 \text{ gallons} / 20 \text{ gallon tank (average size)} = 20 \text{ DEF fill-ups / year}$**

How Can I Determine how Much DEF I will Use?

- **Example...Medium Duty**
- **Annual miles for average truck = 50,000 miles**
- **MPG for average truck = 10 mpg**
- **50,000 miles / 10 mpg = 5,000 gallons diesel fuel per year**
- **DEF usage @ 2% of fuel consumption = 100 gallons of DEF / year**
- **100 gallons / 10 gallon tank (average size) = 10 DEF fill-ups / year**

DEF Infrastructure

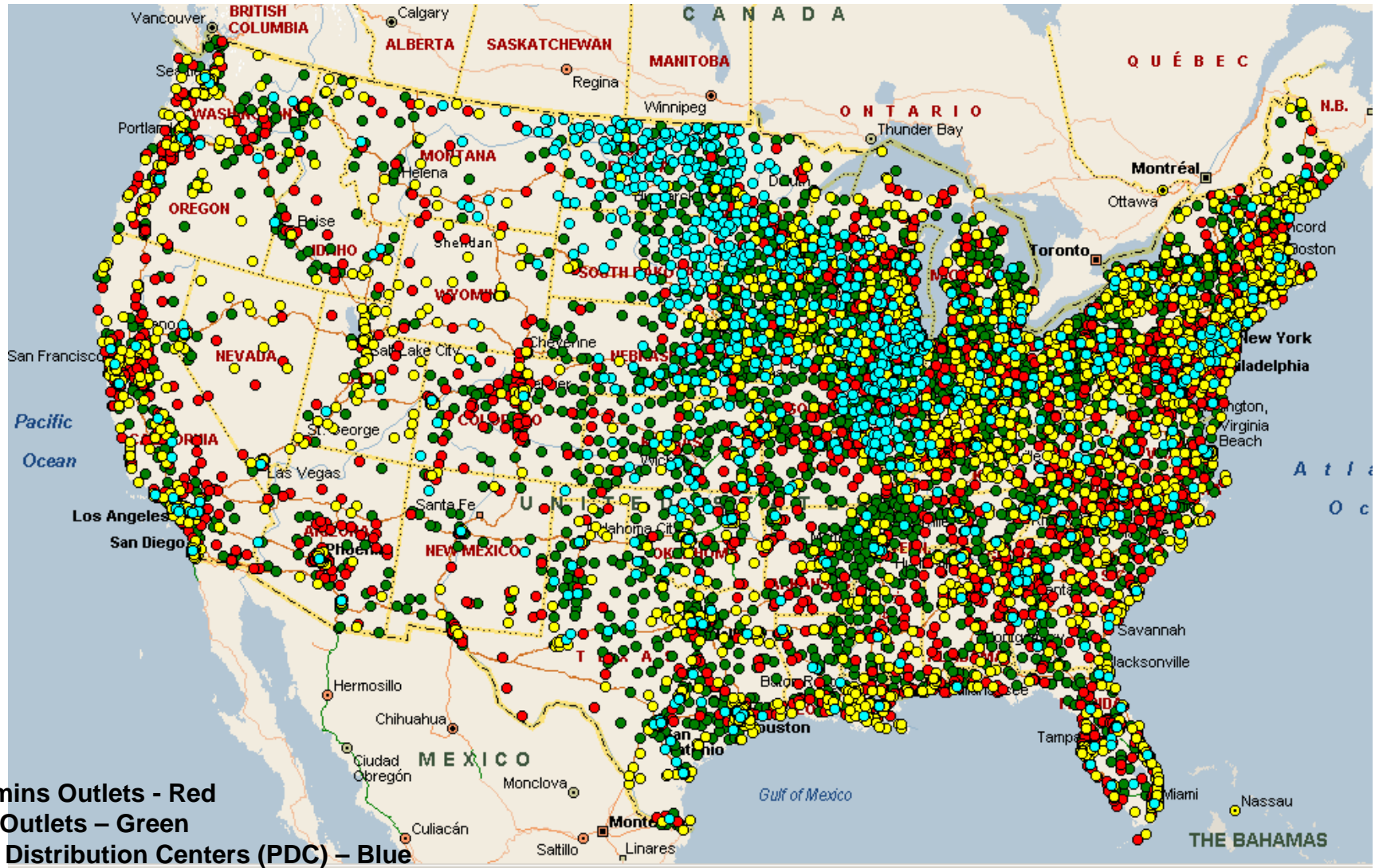
- Major investments in DEF production to serve the on-highway market are currently being made and will be in place in 2010.
 - Engine Distributors and most truck dealers will stock DEF
 - Pilot has announced it will carry DEF at the pump.
 - Flying J, TravelCenters of America & Love's will carry DEF, but still determining at what level.



Fleetguard DEF – The Facts about the Fluid

- Cummins Filtration will ably support the DEF needs in the industry with a broad product line
 - Bulk (>5000 gal.)
 - Plastic and Disposable Totes (330 and 275 gal.)
 - Drum (55 gal.)
 - Small Packages (1, 2.5 and 5 gal.)
 - Dispensing Equipment
- Pricing of bulk DEF will be around the price of diesel, in the \$2 - \$3 range
- Smaller package pricing will vary based upon size and delivery method

All Outlets



Cummins Outlets - Red
OEM Outlets - Green
Parts Distribution Centers (PDC) - Blue
Independent Distribution - Yellow

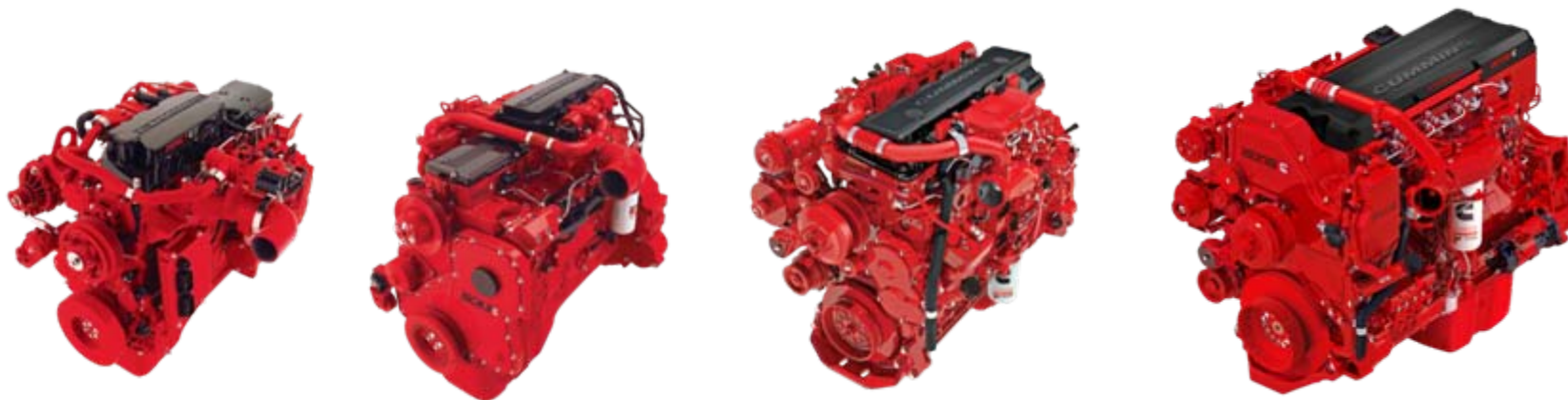
2010 Engine Platforms



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2010 Engine Platforms & Ratings

■ ISB6.7	200-325 HP
■ ISC8.3/ISL9	260-380 HP
■ ISX11.9	310-425 HP
■ ISX15	400-600 HP



2010 Technology

- **All Cummins 2010 Automotive engines utilize:**
 - A common ECM (Engine Control Module)
 - XPI (High Pressure Common Rail) Fuel Systems
 - CEGR (Cooled Exhaust Gas Recirculation)
 - CCF (Crankcase Coalescing Filter)
 - CPF (Cummins Particulate Filter)
 - SCR (Selective Catalytic Reduction) Catalyst
 - Using DEF (Diesel Exhaust Fluid)
 - ULSF (Ultra Low Sulfur Fuel, 15 ppm vs. 300 ppm)
 - CJ engine oil preferred
 - CI oil is acceptable (will shorten DPF maintenance interval ~50K)
- **All 2010 technology is In-House by Cummins Companies**

2010 Maintenance

- Midrange & Heavy Duty maintenance intervals will be the same as today's products:
 - Oil, fuel & coolant filters
 - Overhead adjustment
 - DPF cleaning
 - CCV filter
- Only one new maintenance item:
 - DEF supply pump filter every 200K miles, 2 years or 6,000 hours
- NOx/PM ratio favorable for DPF passive regeneration



Biodiesel, Natural Gas and Off-Road Engines



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Biodiesel Update

- Cummins has approved B20 blends for use in 2002 and later emissions compliant engines, including 2007 and 2010 engines
- Must meet ASTM (American Society of Testing Materials) spec ASTM D6751, an important stability specification for B100 biodiesel
- Must be from a BQ-9000 Certified Marketers & Accredited Producers of biodiesel
- **NOTE:** Vegetable oil and/or filtered “french fry oil” is NOT biodiesel..... Biodiesel must be manufactured, usually from soy beans in the US and rapeseed in Europe.

Natural Gas Engines

- ISL G engine from Cummins Westport (CNG)
 - Running at 2010 emission levels today
- ISX HPDI (High Pressure Direct Injection) engine from Westport (LNG)
- Available in a variety of applications from about 20 OEM's
 - Popular in refuse trucks, sweepers and yard spotters, shuttle & transit buses
 - Recent availability announced in MD and HD trucks

Off-Highway Engines

- Emissions reductions phased in over time based on HP range
 - Five step process; Tier 1 through Tier 4 Final
 - First Tier 1 regulations began January 1, 1996
 - Last Tier 4 Final will begin January 1, 2015
- Regulations are closely harmonized with Europe and Japan

Off-Highway / Industrial Engines

- Tier 1 through Tier 3 are being met with “in cylinder” technology by utilizing:
 - HPCR fuel systems
 - Combustion optimization
 - Electronic engine controls
 - Air handling (VG or waste gated turbo’s, CAC, etc.)
- Tier 4 Interim will utilize exhaust aftertreatment
 - Cummins Particulate Filters
 - Basically the same technology as 2007 on-highway engines
- Tier 4 Final will utilize exhaust aftertreatment
 - Cummins Particulate Filters
 - Selective Catalytic Reduction (Urea injection)
 - Basically the same technology as 2010 mid-range an heavy-duty on-highway engines

A handshaking image with a red background and a yellow icon in the top left corner. The image shows two hands shaking in a firm grip, symbolizing agreement or partnership. The background is a red-tinted landscape with mountains and a road. The text is overlaid on the image.

Cummins Commitment

**The Right Technology
Delivered On Time
You Can Depend On Cummins**

**Thank you for your
support and business**

?? Questions ??