

# “Clearing the Air” on 2007 diesel pusher engine emissions.

The EPA has enacted the **2007 Heavy-Duty Highway Engine Rule** (Heavy Duty Diesel engines) to help clean the air, Much like the addition of the Catalytic converter to the automotive gasoline engine and the removal of leaded gasoline of the 70's.

## **The new rule includes two components**

1. Diesel fuel regulation (How much sulfur can be in the fuel) no more than 15 parts per million (ppm)
2. Emission standards (What the diesel engine exhaust emits)

It basically boils down to how much particulate matter (PM) a diesel engine can emit. PM is measured in gm/hp-hr>

## **To reduce PM two things need to happen**

1. Start using Ultra Low Sulfur Diesel fuel. (ULSD fuel)
2. Installation of a Diesel Particulate Filter (DPF) traps the soot (carbon) and through the various regeneration processes the carbon is converted (oxidized) to and invisible gas.

# “FAQ” for 2007 Diesel Emissions

**Q. Will all 2008 Winnebago and Itasca diesel pusher engine motor homes comply with the new 2007 Heavy-Duty Highway Engine Rule?**

A. The good news is that all 2008 Winnebago and Itasca motor homes will be compliant to the 2007 Heavy Duty Highway Engine Rule.

**Q. Will my maintenance cost go up on my new 2008 Diesel pusher Winnebago and Itasca motor home?**

A. Regular maintenance intervals will not be effected. There will be a slight increase in the price of the new low ash oil required to meet the new emission rule. 2007 engines do incorporate the new crankcase filter which will require maintenance every two years.

**Q. Will I need to change the oil more often on this new engine?**

A. No, the Cummins 2007 engines with exhaust aftertreatment have the same oil change intervals as engines produced in 2006.

# “FAQ” for 2007 Diesel Emissions

## **Q. Are all model year 2008 motor homes required to use ULSD?**

**A.** Yes, all model year 2008 motor homes are required to use ULSD fuel to comply with the 2007 Heavy Duty Highway Engine Rule. All 2008 Winnebago and Itasca motor homes will be compliant to the 2007 Heavy Duty Highway Engine Rule.

## **Q. Where can I purchase ULSD fuel?**

**A.** The new fuel standard had to take place by beginning Oct. 1, 2006, through September 1, 2010 (100% participation). And although it is true retailers are not required to sell ULSD at a particular location, there is a requirement that a minimum 80% of the fuel sold must be ULSD.

# “FAQ” for 2007 Diesel Emissions

## **Q. How will I know which pump is dispensing ULSD fuel?**

**A.** Federal regulations require the labeling of all diesel fuel pumps to specify the type of fuel dispensed by each pump (except in California where all diesel fuel must be ULSD by June 1, 2006). Similar instrument panel and fuel inlet/fill cap labeling is being mandated for 2007 and later model year engines and vehicles that require ULSD fuel. Consumers are advised to check the pump labels and vehicle labels to ensure they are refueling with the proper diesel fuel consistent with their vehicle warranties.

## **Q. Will ULSD and LSD fuels differ in appearance?**

**A.** The refining process that removes the sulfur can cause ULSD fuel to generally look lighter in color and possibly have a colored tint. ULSD fuel may have less odor than other diesel fuels due to the reduced sulfur content. Changes in color and smell will not impact the performance of ULSD fuel. ULSD and LSD fuels for non-taxable use may be dyed red, similar to today's non-road diesel fuel.

# “FAQ” for 2007 Diesel Emissions

**Q. What if I accidentally use LSD fuel or can I use LSD fuel in my new 2008 Winnebago or Itasca motor home in an emergency?**

A. Use of any fuel other than ULSD (15 ppm or lower diesel fuel) will result in the engine not being compliant with 2007 EPA emissions requirements and could result in damage to the exhaust aftertreatment device.

**Q. Can I still let my new 2008 Winnebago or Itasca motor home idle for prolong periods of time?**

A. The Cummins exhaust aftertreatment systems are sized to allow a significant amount of idling before requiring a filter regeneration event. Depending on the soot load of the filter prior to an idling event, the filter should accept several hours of idling before alerting the driver the need for a regeneration event is approaching. The Chassis and Vehicle Manufacturer's operation manuals should be consulted for details describing the alert logic.

# “FAQ” for 2007 Diesel Emissions

## **Q. Will ULSD fuel be more expensive than the current Low Sulfur Diesel fuel?**

**A.** What we have seen so far is a 3-5 cent per gallon increase. ULSD fuel costs more to refine and distribute than Low Sulfur Diesel fuel. Visit the Energy Information Administration web site for more information on [fuel prices](#).

## **Q. How will ULSD fuel affect the power and fuel economy of existing diesel motor homes?**

**A.** Under typical operating conditions, there should be no noticeable impact on overall power or fuel economy using ULSD fuel.

# “FAQ” for 2007 Diesel Emissions

## **Q. How will the new fuel effect my current diesel engine?**

**A.** From everything we have been told, ULSD will neither harm your current engine, nor require expensive modifications.

## **Q. May I continue to purchase Low Sulfur Diesel fuel if I prefer to use it in my older Winnebago or Itasca motor home?**

**A.** Owners of 2007 and earlier model year motor homes may use Low Sulfur Diesel or ULSD fuel during the transition period. Owners of 2008 and later model year diesel-powered Winnebago or Itasca motor homes must refuel only with ULSD fuel.

# “FAQ” for 2007 Diesel Emissions

**Q. Can Low Sulfur Diesel fuel be burned without operational problems in 2008 model year and later Winnebago or Itasca motor homes?**

**A.** 2008 and later model year Winnebago or Itasca motor homes are designed to operate only with ULSD fuel. Improper fuel use will reduce the efficiency and durability of engines, and may permanently damage advanced emissions control systems, reduce fuel economy and possibly prevent the vehicles from running at all.

**Q. Why do I want this new diesel emissions engine in my next Winnebago or Itasca motor home?**

**A.** According to the EPA, the combination of new emissions equipment and the use of ULSD fuel will dramatically reduce PM emissions by 90 % and Nitrogen oxides by 95%. Clean diesel engines emit lower levels of certain emissions compared to gasoline engines. Diesel emits only small amounts of carbon monoxide, hydrocarbons and carbon dioxide. In addition, the fuel efficiency of diesel engines means they burn considerably less fossil fuel.

# “FAQ” for 2007 Diesel Emissions

**Q. Will I need to put an additive in my fuel tank to replace the lubricity that was provided by the higher sulfur content?**

**A.** No, additives to increase lubricity and to inhibit corrosion will be added to ULSD fuel prior to its retail sale. With these additives, ULSD fuel is expected to perform as well as Low Sulfur Diesel fuel.

**Q. Can I use biodiesel in my new class A 2008 Winnebago or Itasca Diesel pusher motor home?**

**A.** Yes, you may use up to a B20 blend of Biodiesel in your new 2008 Winnebago or Itasca Diesel pusher motor homes.

# “FAQ” for 2007 Diesel Emissions

**Q. I have heard that I have to take my new 2008 Winnebago or Itasca motor home in to have the DPF cleaned on a regular basis?**

**A.** The only maintenance requirement associated to the Cummins Particulate Filter is a service event which is designed to occur between 200,000 and 400,000 mile to remove the ash which has accumulated in the filter from the consumption of engine lube oil.

**Q. Will I notice any differences in driving or operating my new 2008 Winnebago or Itasca motor home?**

**A.** There should be no performance differences associated with a 2007 engine and the operation of the new engines is no different than an engine build in 2006. Depending on the Chassis or Vehicle Manufacturer's logic, the driver could be alerted during certain operations of the exhaust aftertreatment system. Consult the Chassis and Vehicle Manufacturer's owner's manual for specific details.

# Diesel Fuel and Lube Oil

## Ultra Low Sulfur Diesel Fuel (ULSD) 15 PPM

- Backwards compatible – works in older engines
- Available as # 2 or # 1 blends
- Approximately 3 cents/gallon cost increase
- Slightly less energy per gallon of fuel (1-2 % reduction)
- 15 PPM Widely available commencing October 15, 2006

## Low Ash Engine Oils

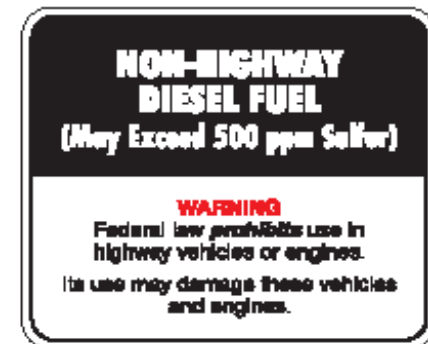
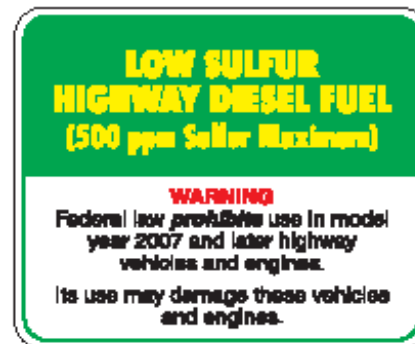
- Backwards compatible also
- Will be designated API CJ-4
- Ash content less than 1%

# Diesel Fuel Pump Stickers



## API Suggested Diesel Pump Labels

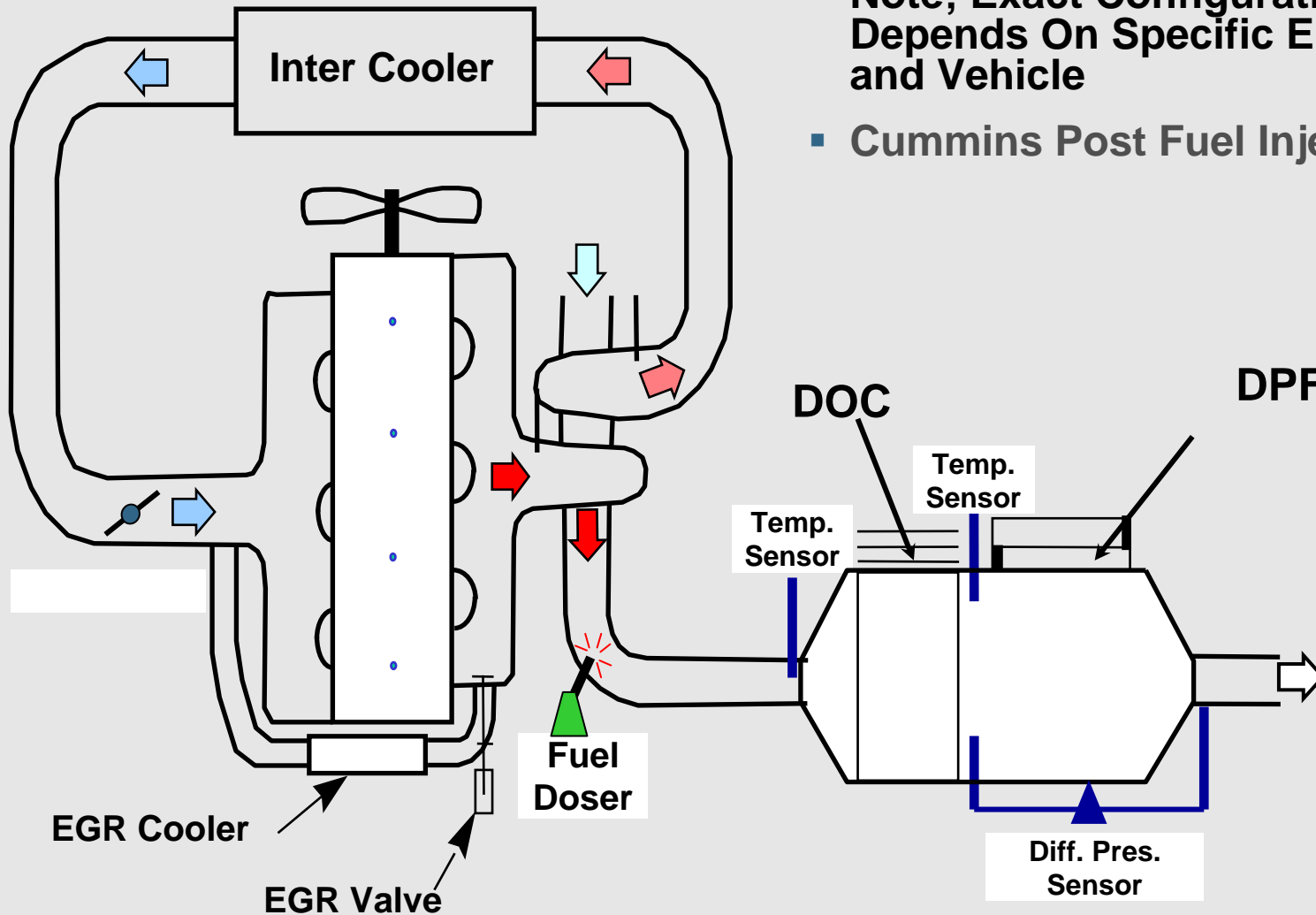
Compliant with EPA 40 CFR 80.570



- Titles of all labels (e.g., Low Sulfur Highway Diesel Fuel) are in 24-point type, Sulfur Level Cap Designations (e.g., [500 ppm Sulfur Maximum]) are in 20-point type, and all other required language is in 14-point type as approved by the EPA.
- Green is chosen as the background for the first two labels because of its strong association with diesel in the gasoline service station network.
- Labels shall be on the upper two-thirds of the pump in a location where they are clearly visible.
- Pumps must be labeled by June 1, 2006.

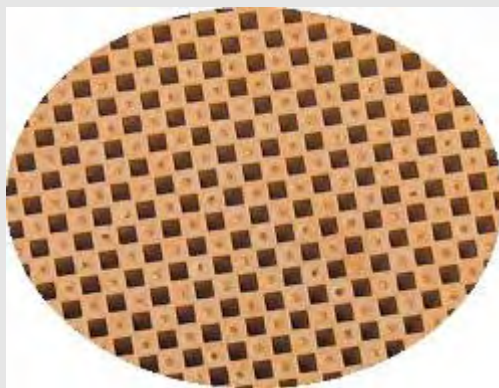
API Suggestion only, many stations post only the text and not the colored label decals.

# Engine-DPF System Schematic



- Note; Exact Configuration Depends On Specific Engine and Vehicle
- Cummins Post Fuel Injected

# Diesel Particulate Filter Substrate

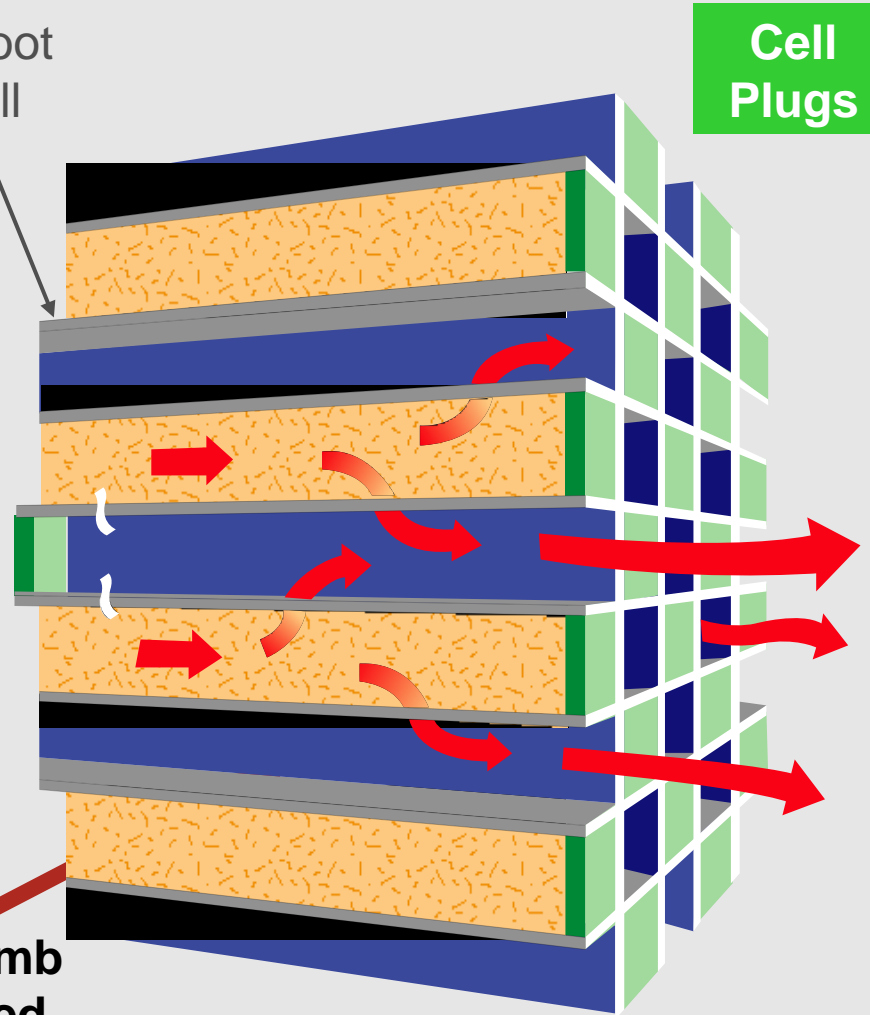


Trapped soot  
on inlet wall  
surface

Exhaust  
(Soot, CO, HC)  
Enter

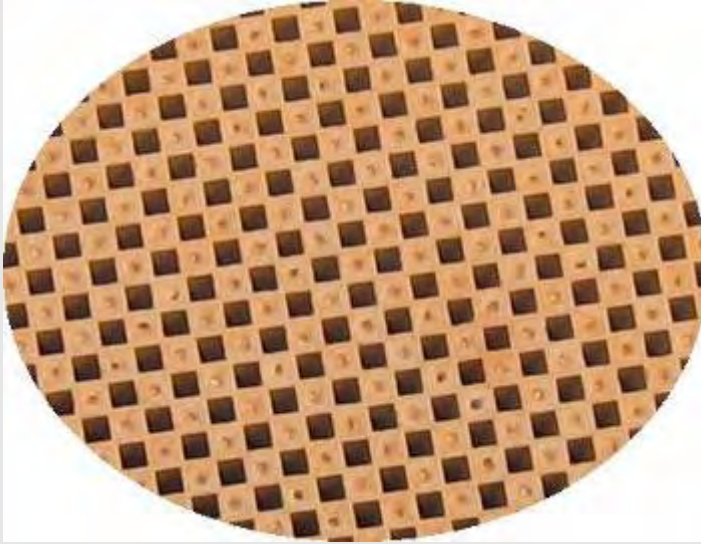
**Ceramic Honeycomb  
Wall with Supported  
Catalyst**

**Cell  
Plugs**



# Diesel Particulate Filter

**Clean**



**Ash  
Loaded**



# After Treatment Device (ATD)

## 2 Modes of Operation - DPF

### ▪ **Passive Regeneration**

- Passive regeneration is what the Diesel Particulate Filter does by itself independent of the engine.
- The DOC reacts with NO in exhaust to form NO<sub>2</sub> which oxidizes the PM/Soot/Carbon trapped in DPF changing it mainly to CO<sub>2</sub> and ash.
- The amount of PM/Soot/Carbon changed to CO<sub>2</sub> and ash in the DPF depends on the temperature of the exhaust and the amount of PM/Soot/Carbon in the exhaust.
- What PM/Soot/Carbon does not get changed to CO<sub>2</sub> and ash is retained in the DPF.

### ▪ **Active Regeneration - Automatic**

- Active regenerations are triggered when the ECM senses an excessive pressure drop across the DPF. This pressure drop is caused by a combination of ash and PM/Soot/Carbon that has not been oxidized by passive regeneration
- Fuel vapor is introduced into the exhaust stream by injecting fuel during the exhaust stroke of the engine
- The DOC reacts with the fuel vapor to increase the exhaust temperature high enough to oxidize (burn off) PM/Soot/Carbon trapped in DPF changing it mainly to CO<sub>2</sub> and ash.
- An active regeneration event usually takes 15-20 minutes of engine operation time. The engine can be stopped and started during this time.

# Two new lights on dash Instrument panel light bar

## High Exhaust System Temperature (HEST) Lamp

- Standard lamp across all vehicle applications
- The purpose of this lamp is to indicate potentially hazardous exhaust temperatures at the outlet of the tail pipe when the vehicle is below a speed threshold
- The HEST lamp will turn solid on if the vehicle speed is below 5 mph and filter outlet temperature > 525 deg C



## DPF Regeneration Lamp

- Standard lamp across all vehicle applications.
- The purpose of this lamp is to inform the driver that a manual regeneration is required.
- On solid when a higher soot level is reached and flashing for increased urgency.
- DPF lamp will go off when a request to initiate regeneration has been received.
- Will return to appropriate state after regeneration (attempt)

# Regeneration Strategies

## Vehicle At-Speed Conditions

The following conditions must always be met in order to ensure vehicle is at sufficient speed before any active regeneration can take place:

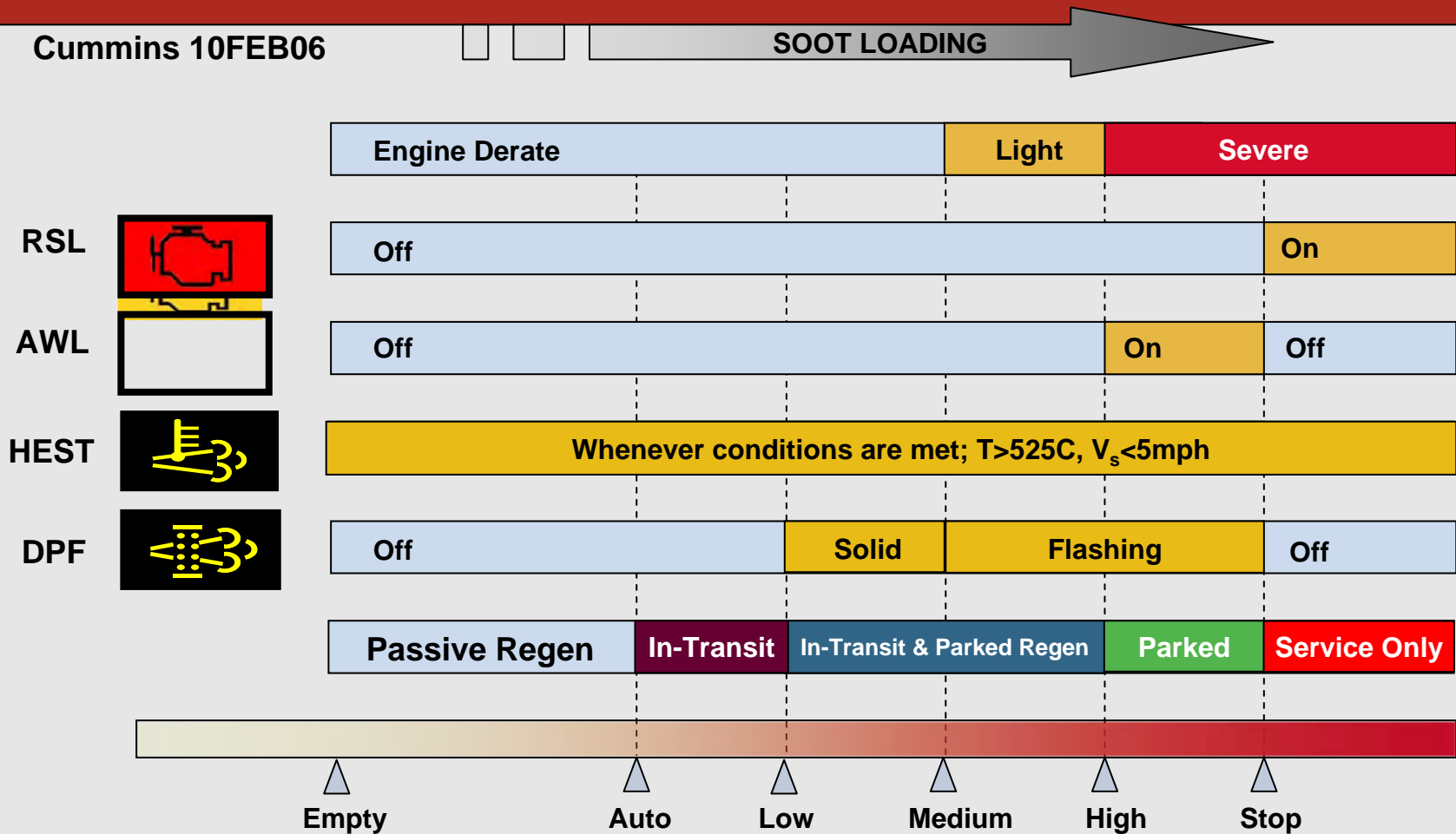
1. Active regeneration can only initiate if vehicle speed is over 30 mph.
2. Active regeneration will terminate if vehicle speed drops under 20 mph.

## Methods of Manual Initiation

A manual regeneration by service tool is required as standard at or past Zone C3. Service tool here is defined as a laptop based tool that will have the capability to initiate and terminate a regeneration event anytime irrespective of any lamp illumination.

This tool available at Freightliner service centers.

# EPA 2007 – Regeneration Strategy



Note: Auto regen will be programmed to not occur below 20 MPH as standard