



*Run Smart*SM

DETROIT DIESEL



2010 Technology Dealer Update

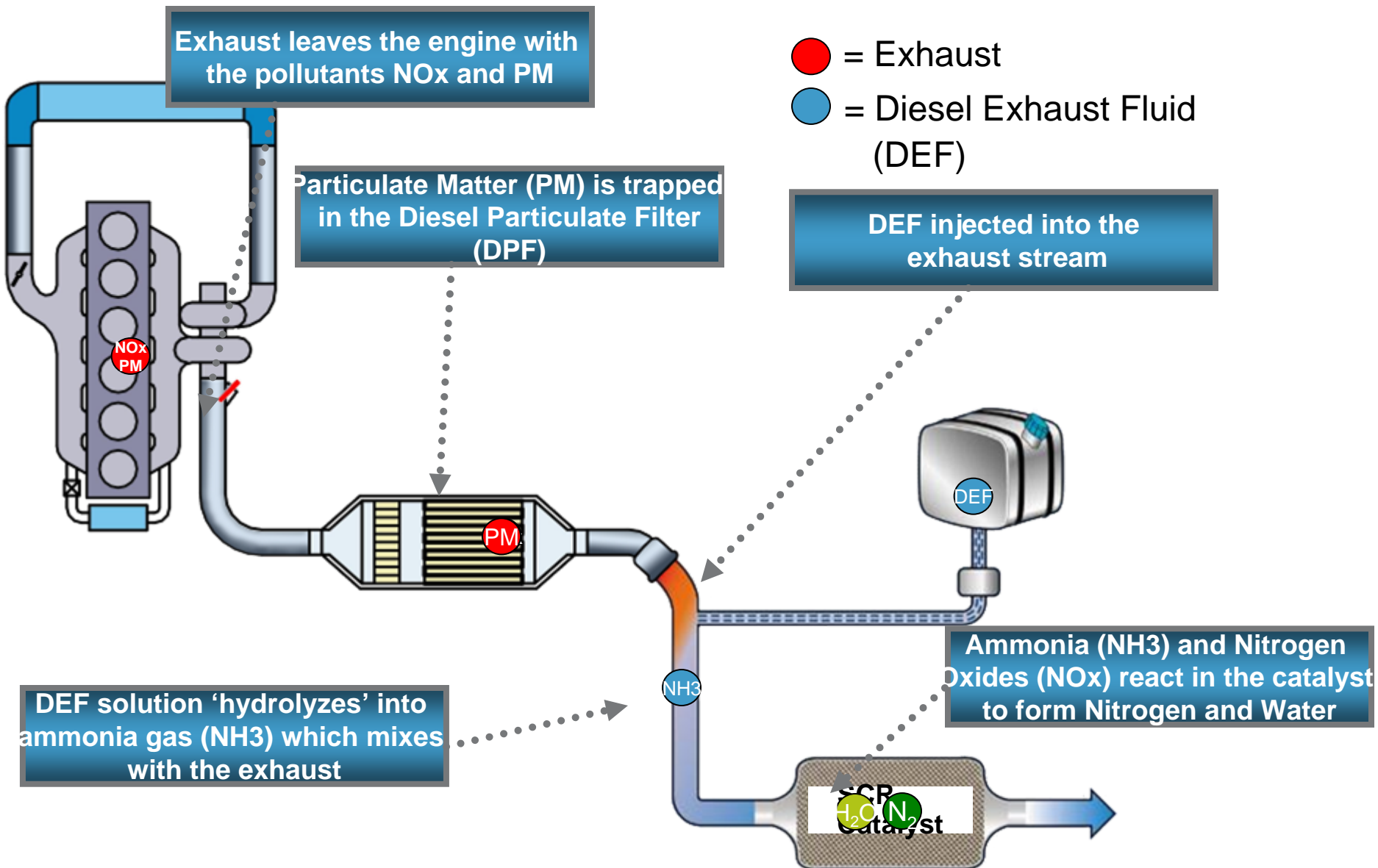
Detroit Diesel / Freightliner Trucks

41st WSHEMA Conference

Wayne Stephan – DDC & Eric Magyar - Freightliner

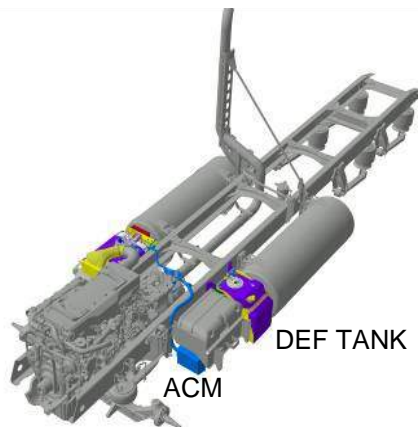
August 18th, 2009

2010 emissions control system

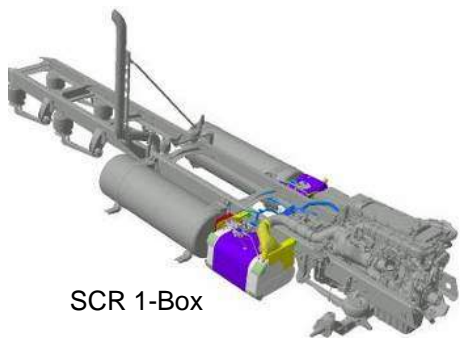
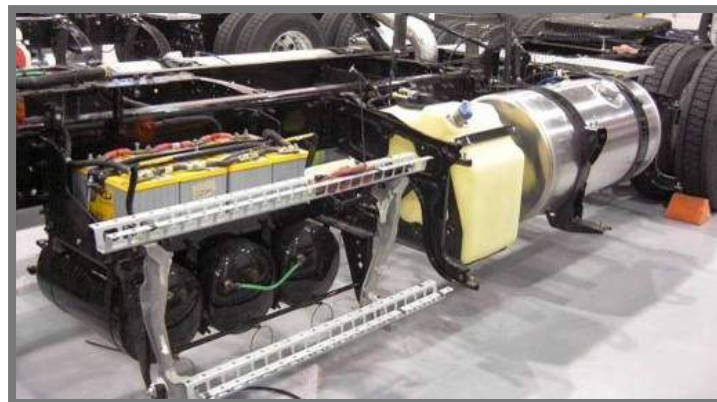


Specifications / Packaging

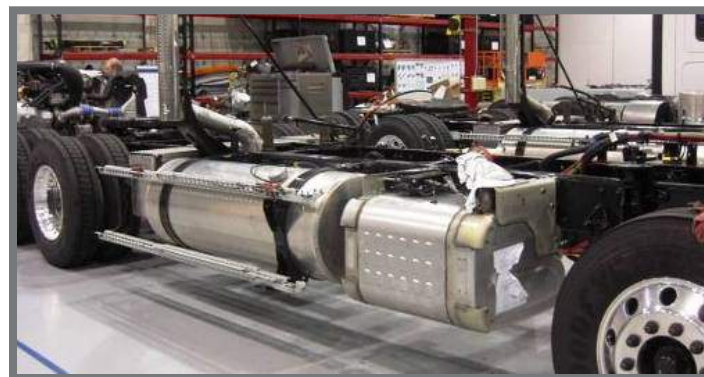
BlueTec technology will add 3 key components [DEF tank, 1-Box configuration or 2-box configuration, Aftertreatment Control Module (ACM)] as well as some supporting hardware to the 2010 product offering. Notice how seamlessly the 1-Box SCR system fits into the chassis.





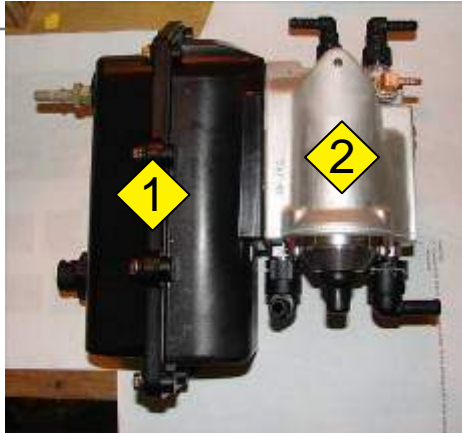
Left View



Right View

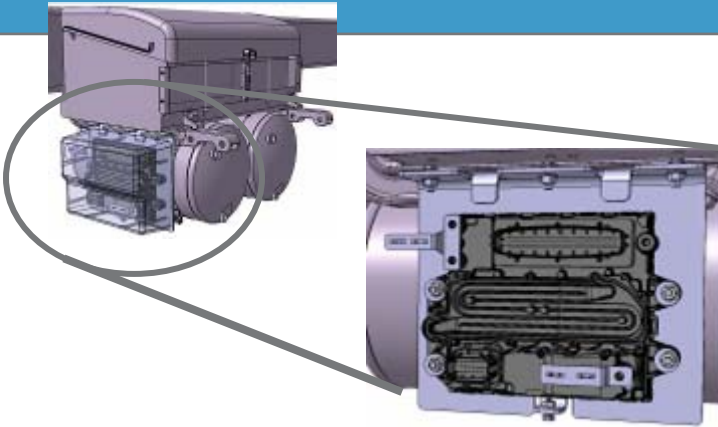

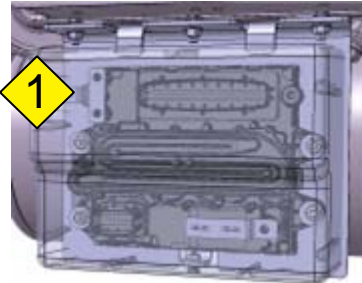



DEF Pump is mounted on the rear of the DEF tank. Its function is to extract DEF from the tank and transfer it to the SCR catalyst for the NOx and DEF reaction that creates Nitrogen and Water.

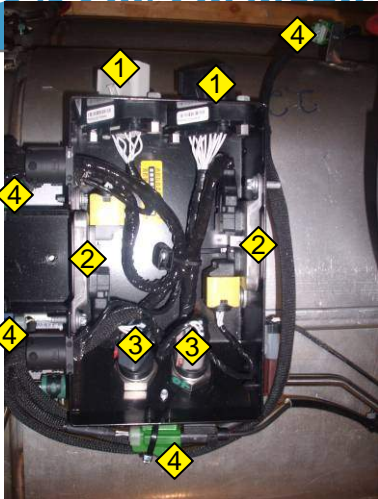

Component	CAD Drawing	CDU/Component Photo											
DEF Pump													
	<table border="1"> <thead> <tr> <th data-bbox="202 901 330 968">Item</th> <th data-bbox="330 901 651 968">Component</th> </tr> </thead> <tbody> <tr> <td data-bbox="202 968 330 1029">1</td> <td data-bbox="330 968 651 1029">Electric Pump</td> </tr> <tr> <td data-bbox="202 1029 330 1090">2</td> <td data-bbox="330 1029 651 1090">DEF Chamber</td> </tr> <tr> <td data-bbox="202 1090 330 1189">3</td> <td data-bbox="330 1090 651 1189">DEF Pressure Bladder</td> </tr> <tr> <td data-bbox="202 1189 330 1250">4</td> <td data-bbox="330 1189 651 1250">DEF Filter</td> </tr> <tr> <td colspan="2" data-bbox="202 1250 651 1388"> Note: DEF Filter has a 300,000 mile change interval. </td> </tr> </tbody> </table>	Item	Component	1	Electric Pump	2	DEF Chamber	3	DEF Pressure Bladder	4	DEF Filter	Note: DEF Filter has a 300,000 mile change interval.	
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Aftertreatment Control Module (ACM)

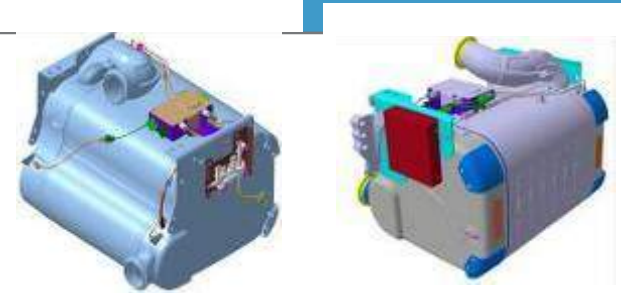

The Aftertreatment Control Module mounted on the air tanks and under to the battery box, is the brains for the BlueTec emissions system, it controls DEF dosing, NOx Sensor, regeneration strategies among many other emissions activities.

Component	CAD Drawing	CDU/Component Photo						
ACM								
<table border="1"> <thead> <tr> <th>Item</th> <th>Component</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>ACM Housing</td> </tr> <tr> <td>2</td> <td>ACM</td> </tr> </tbody> </table> <p>Note: ACM designed to not have to remove the connectors</p>	Item	Component	1	ACM Housing	2	ACM		
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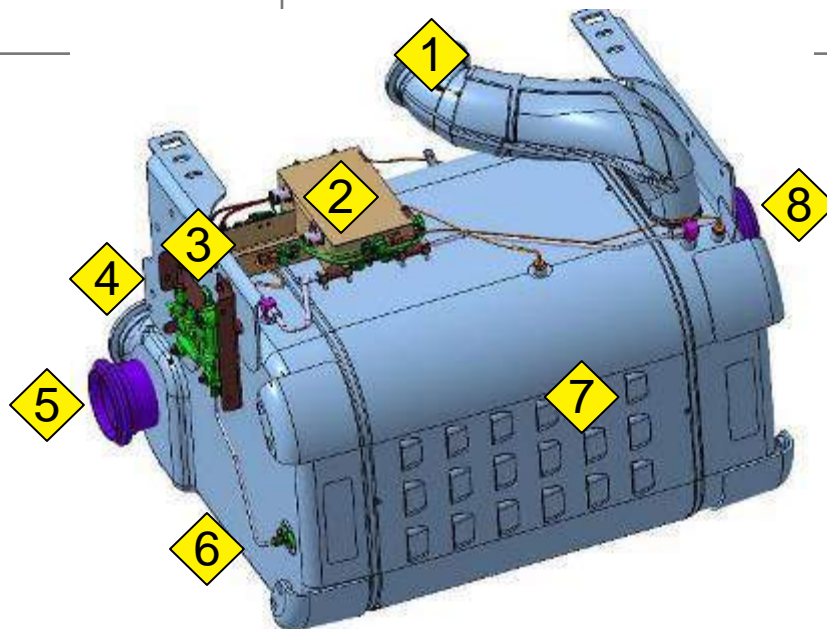
The sensor box is mounted on top of the 1-Box unit and is a central location for NOx, pressure and temperature sensors for the system.

Component	Items		CDU/Component Photo
Sensor Box	Item	Component	
	1	(2) 14 pin Connections to engine harness	
	2	NOx Sensor	
	3	Pressure Sensor	
	4	Temperature Sensor Connector	

The BlueTec 1-Box solution is located under the passenger side of the vehicle, it is easily accessed by removing a side fairing.

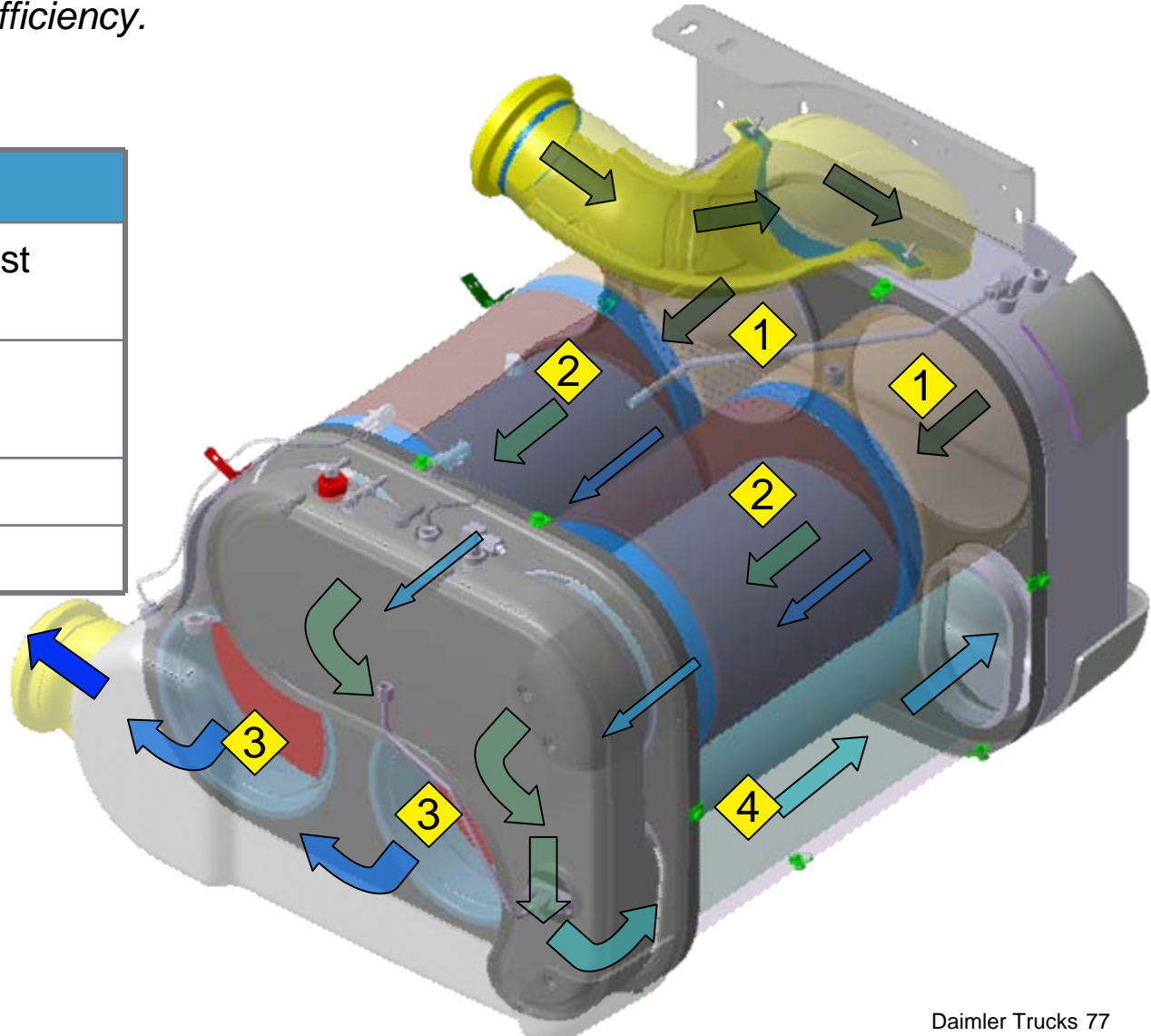
Component	CAD Drawing	CDU/Component Photo
1-Box		

Item	Component
1	Top Inlet
2	Sensor Box
3	DEF Metering Unit
4	Inboard Outlet
5	Rear Face Outlet
6	DEF Injection Nozzle
7	Outer Heat Shield
8	Front Face Inlet
Note: Sensor box is NOT ACM	



The following diagram illustrates the flow of exhaust through the DOC and DPF. Then where the DEF enters the hydrolysis pipe and eventually meets the exhaust in the SCR device. Detroit Diesel's dual parallel flow (ATD & SCR catalyst) reduces backpressure on the engine thus increasing fuel efficiency.

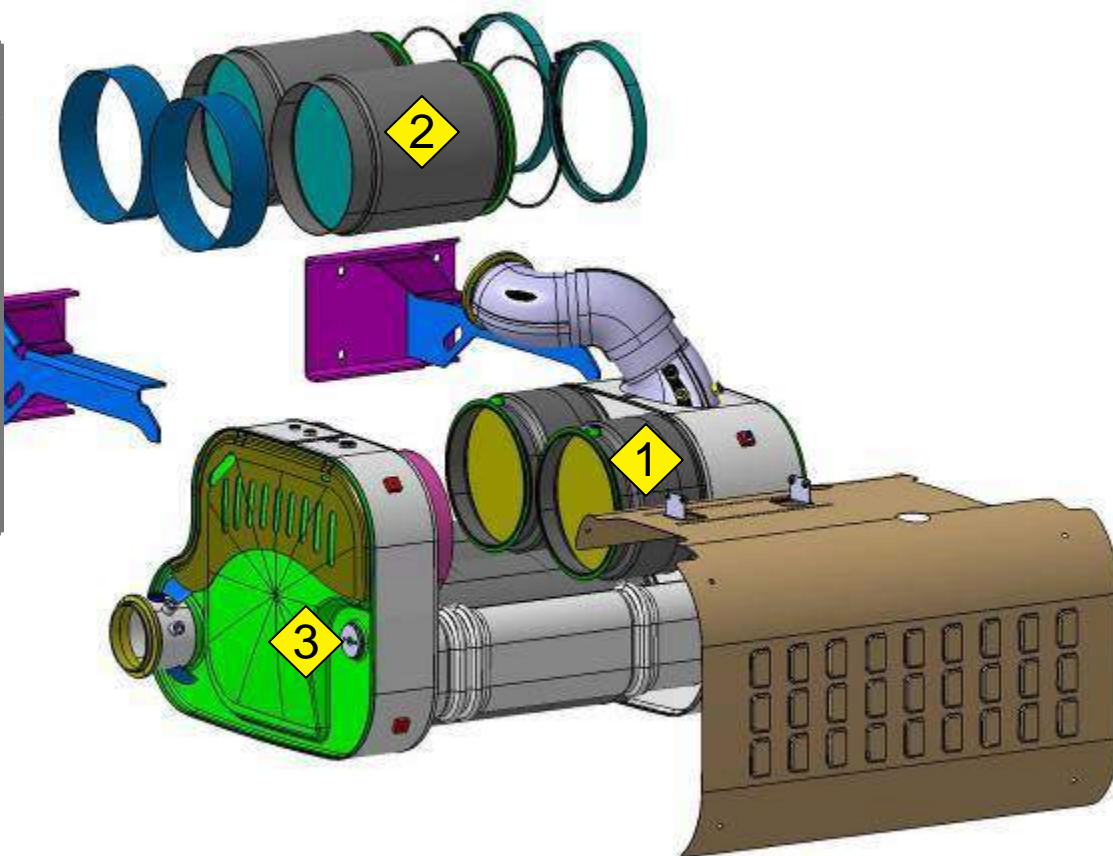
Item	Component
1	Diesel Oxidation Catalyst (DOC)
2	Diesel Particulate Filter (DPF)
3	SCR Devices
4	DEF Hydrolysis Pipe



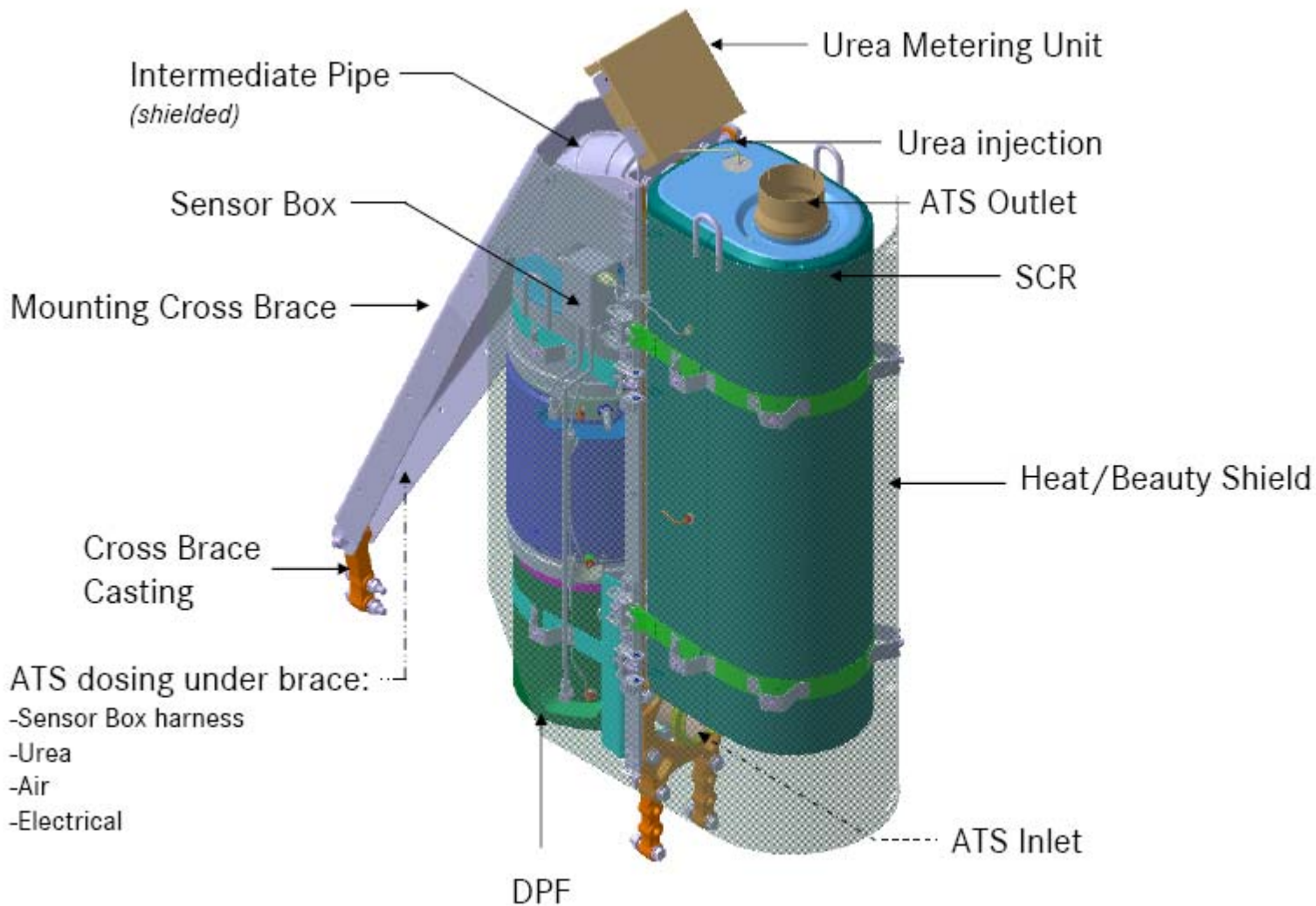
1-Box Serviceability

The Diesel Particulate Filter (DPF) is serviceable. SRT times have not been finalized, however it is estimated to take less than 2 hours to change the DPF. DPF change intervals are being studied, but currently have not changed from the EPA07 levels of 300,000 miles.

Item	Component
1	Diesel Oxidation Catalyst (DOC)
2	Diesel Particulate Filter (DPF)
3	DEF Nozzle
Note: DOC is integrated into the 1-Box system	

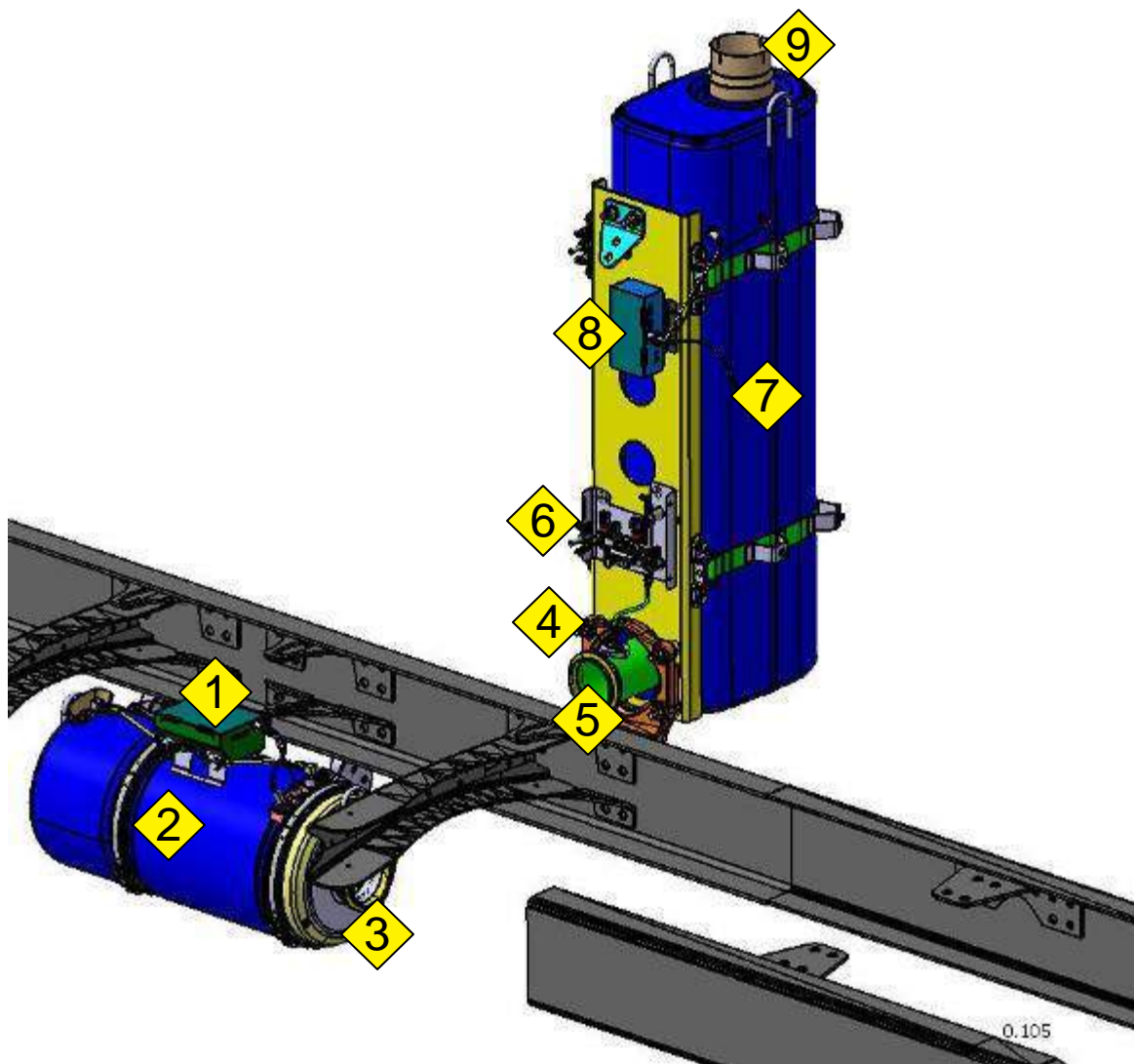


For customers requiring a 2-box BlueTec system, the following is a diagram of the components in that system.



The 2-box Vertical/Horizontal is the third of three BlueTec packaging options. Increasing the options for customers ensures BlueTec packaging can be integrated for our customers.

Item	Component
1	DPF Sensor Box
2	DOC/DPF Module
3	DPF Outlet
4	DEF Injection Nozzle
5	SCR Inlet
6	DEF Metering Unit
7	SCR Device
8	SCR Sensor Box
9	SCR Outlet



0.105

Particulate filter regeneration in 2010

Regeneration is a process in which Particulate Matter is “burned off” the filter in order to keep it clean. There are three types of regeneration:

- Passive Regeneration

- No driver intervention, No fuel dosing
- Burns off soot during normal operation
- If not enough soot is burned off, active regeneration is required

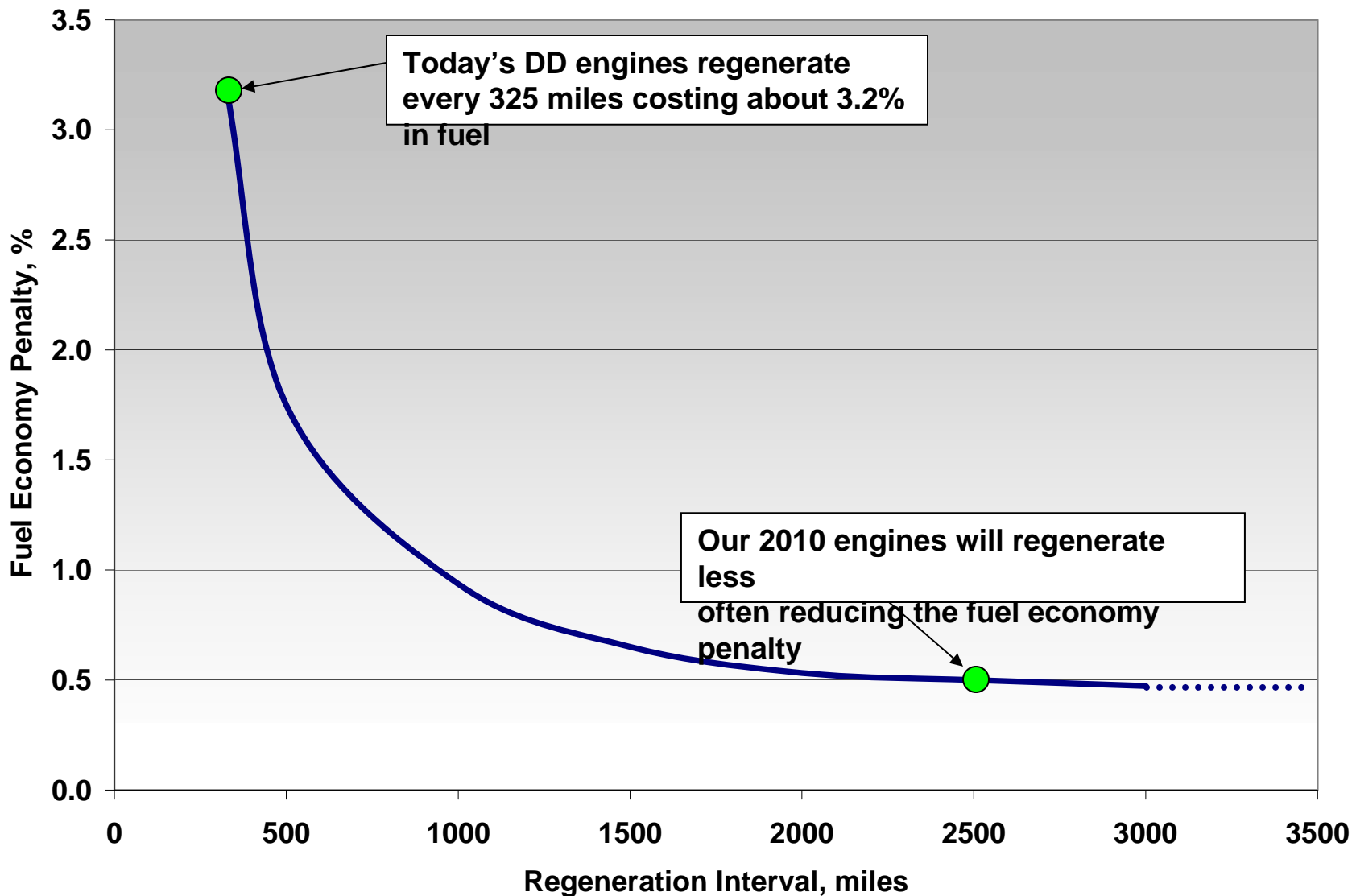
- Active Regeneration

- No driver intervention, requires fuel dosing
- Burns off soot by dosing fuel to attain proper exhaust temperatures
- Active regeneration intervals vary by engine

- Parked Regeneration

- Driver intervention and fuel dosing required
- Burns off soot by dosing fuel to attain proper exhaust temperatures while vehicle is parked

In 2010, Detroit Diesel engines will go 45-90 hours between regenerations.



DDC fuel economy position



2010 Driver Inducements

In addition to the BlueTec hardware is a new DEF gauge. Just like filling up their diesel tank, drivers will need to remember to watch their DEF gauge and fill it when needed.



FULL	DEF Level	Gauge Lamps	DEF Lamp
	75% to 100%	4 green lights	off
	50% to 75%	3 green lights	off
	25% to 50%	2 green lights	off
	10% to 25%	1 green light	off
	5% to 10%	1 yellow light	on solid
	0% to 5%	1 red light flashing	on flashing



EMPTY Check Engine Lamp

25% Engine Derate

55 MPH Vehicle Speed Limit

Malfunction Indicator Lamp (MIL)

Vehicle speed will be limited to 5 mph once one of the following conditions occur:

- Fuel tank is refilled by more than 30%
- Engine consumes 350 gallons of fuel and is re-started

If the driver accidentally puts an improper fluid into the DEF tank, the SCR system will detect the error and the malfunction indicator lamp will illuminate.

- The following action will be employed once this condition is detected:
 - 25 % engine derate
 - 55 mph speed limit imposed
- After 1,000 miles or 20 hours of operation without remedy a vehicle speed will be limited to 5 mph once one of the following conditions occur:
 - Fuel tank is refilled by more than 30%
 - Engine consumes 350 gallons of fuel and is re-started
- Similar actions will be employed if the engine detects any tampering or failure with the after-treatment sensors or hardware.
- Under no circumstances will the engine be shutdown due to running the vehicle out of DEF or putting the improper fluid in the DEF tank



**Malfunction Indicator
Lamp**

The Driver can remove all engine derates and speed limits by simply filling the DEF tank with the proper fluid.

- It is recommended that the DEF tank be filled to at least 25% capacity with the proper fluid at any given fill.
 - Engine derates and vehicle speed limits will be removed after 1 minute of condition detection.
- At a minimum, the DEF tank must be filled to at least the 10% capacity with the proper fluid.
 - Engine derates and vehicle speed limits will be removed after 4 minutes of condition detection.
- If the improper fluid was placed in the tank, the DEF tank must be drained completely before adding additional DEF to avoid contamination of the new fill.

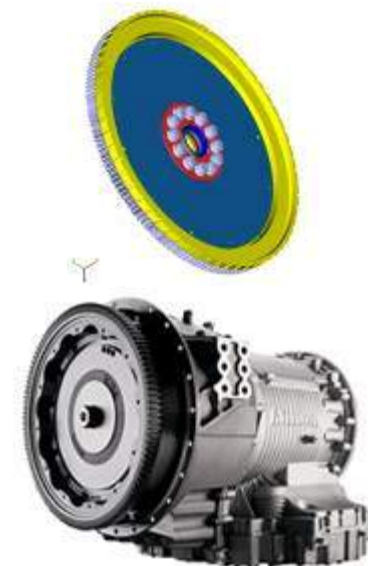


DDC Engine Changes for 2010

Option	DD15	DD13
Oil sample valve	Available	Available
Oil ESOC (short ver.)	Available	Apr 09
Extended Oil ESOC	Apr 09	Apr 09
Davco 482 (under hood)	Available	Available
Fuel ESOC	Available	Available



Option	DD15	DD13
Allison 4000/4500 - P2 and P3 Chassis - Western Star	- May 09 - Sep 09	- May 09 (P3 only) - Sep 09
Penray Need Release	Est. May 09 (service only)	Est. May 09 (service only)
Trailer Heat	TBD	TBD
APU Install (P3 Chassis)	Available	Available
Beauty Cover	2010	NA





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Questions & Answers

Thank you