Diesel: Frequently Asked Questions

Question 1: What is a diesel retrofit?

- Diesel retrofits are a type of control device that can be installed on diesel powered engines in order to reduce exhaust emissions. Diesel retrofit control technologies include diesel particulate filters (DPF), diesel oxidation catalysts (DOC), closed crankcase ventilation system (CCV), exhaust gas recirculation (EGR), selective catalytic reduction (SCR) devices, and lean NOx catalysts (LNCs).
- A DPF is a ceramic device that collects particulate matter in the exhaust stream. The high temperature of the exhaust heats up the ceramic device which allows the particles in the exhaust to break down, or oxidize, into less harmful components.
- A DOC is a device that uses chemical processes to break down pollutants in the exhaust stream into less harmful components. The device is made of a porous ceramic honeycomb-like structure that is coated with materials which catalyze a chemical reaction reducing harmful pollution.
- A CCV is designed to capture and return the crankcase gases that have leaked through the engine piston rings. These crankcase emissions can be substantial, thus a CCV is used to control the flow of gases and return the emissions to the engine for combustion. This effectively prevents the crankcase emissions from entering the atmosphere.

Question 2: What are the benefits of DPF and DOC retrofits?

- DPFs reduce emissions of particulate matter 2.5 microns or smaller (PM2.5), hydrocarbons (HCs), and carbon monoxide (CO) by 60-90 percent. DPFs require the use of ultra low sulfur diesel fuel (ULSD).
- DOCs reduce PM2.5 emissions by about 30 percent as well as reduce emissions of HCs by 50 percent and CO by 40 percent. DOCs do not require the use of ULSD.
- CCVs reduce PM2.5 by 10-15 percent, HCs by 30-40 percent, and CO by 50-90 percent.

Question 3: What is the cost of a diesel retrofit?

- DPFs cost between $4,000 and $10,000. The cost is dependent on the specific engine and operating characteristics, such as exhaust temperature.
- DOCs cost between $1,000 and $2,000.
- CCVs cost between $1,200 and $2,000.
Question 4: Which products are EPA verified/CARB certified?

For the Clean Diesel Grant Program the Oklahoma Department of Environmental Quality Air Quality Division (DEQ) requires products that have been verified by the US Environmental Protection Agency (EPA) and/or the California Air Resource Board (CARB). For a complete list please check the EPA Verified Retrofits Technologies List or the CARB Diesel Reduction Program, verified technology at:

- http://www.epa.gov/otaq/retrofit/verif-list.htm
- http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm

Question 5: How does a Diesel Oxidation Catalyst (DOC) work?

A DOC is a form of “bolt on” technology that uses a chemical process to reduce the concentration of pollutants in the diesel exhaust. They replace mufflers on vehicles, and require no modifications. More specifically, this is a honeycomb type structure that has a large area coated with an active catalyst layer. As carbon monoxide and other gaseous hydrocarbon particles travel along the catalyst, they are oxidized thus reducing pollution.

Question 6: How does a Diesel Particulate Filter (DPF) work?

DPFs are the most effective at reducing emissions, but are also the most sensitive. These have a yearly maintenance cycle, and the filter periodically needs to be cleaned out due to accumulation of particulates. The filter is typically placed inline of the diesel exhaust flow to collect particulates. These systems are on average heavier and larger than your standard muffler, thus some modifications may need to be made for proper installation. Additionally, the exhaust gas temperature must be high enough to regenerate the filter. This can be done by either an active control system or a passive control system. Some examples of this for school buses include longer bus routes and wrapping the exhaust pipe in insulated material to retain as much heat as possible.

Question 7: How does a Closed Crankcase Ventilation System work (on-road vehicles only)?

During the engine combustion process crankcase emissions are created. These emissions are typically composed of particulate matter, unburned fuel, and hydrocarbon vapor. CCVs effectively close off this crankcase, thus eliminating the emissions without impacting engine performance. The general maintenance of the CCV system involves replacing the filter which is similar to what is done when changing the engine oil. Higher mileage on-road engines will typically need maintenance every 25,000 miles, while low-mileage vehicles are recommended to have annual maintenance.

Question 8: What are the maintenance requirements for each type of device (DOC, DPF, and CCV)?

DOCs essentially require no maintenance except for a periodic visual inspection of brackets and hangers. DPFs, due to their reliance of wall flow filters, will capture all of the lube oil ash that would normally go out the tailpipe as lube oil is consumed. As such, a periodic cleaning of the filter is necessary as the backpressure of the system increases. Visual inspections of hangers, bolts, backpressure monitors are also recommended. CCVs require periodic filter replacement.