



Diesel Retrofit Technology and Verification Overview

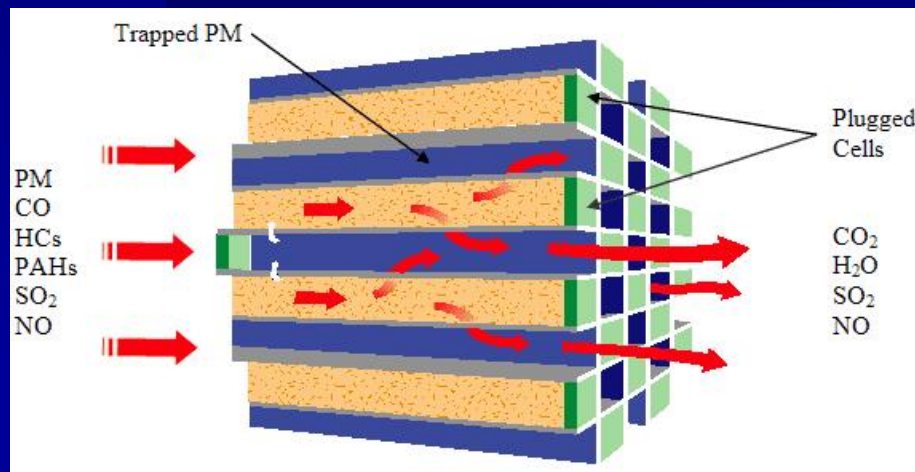
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For the West Coast Collaborative
Hawaii Partners Meeting

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DPF – Diesel Particulate Filter

- “Wall-flow” Filter with a ceramic substrate
 - Cordierite or Silicon Carbide
- Passive Systems – Require high exhaust temperature
- Active Systems – No exhaust temperature requirement
- Routine Maintenance Required
- Must use ULSD fuel

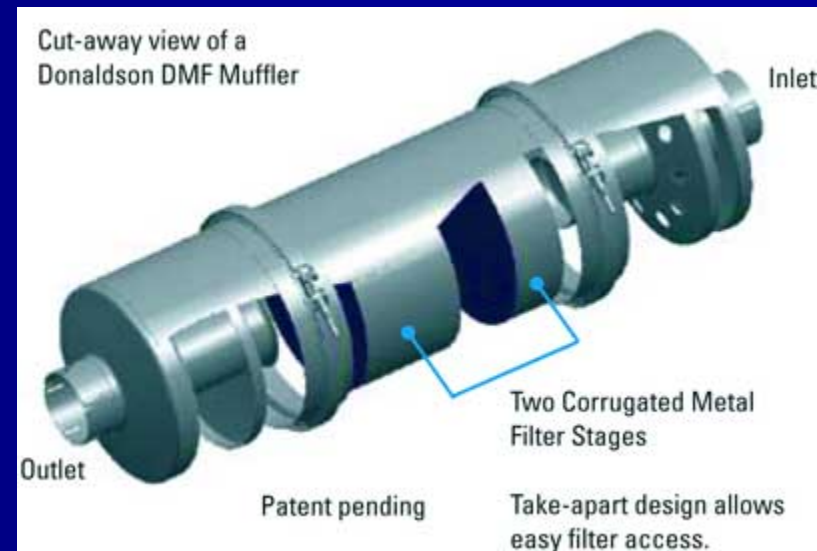
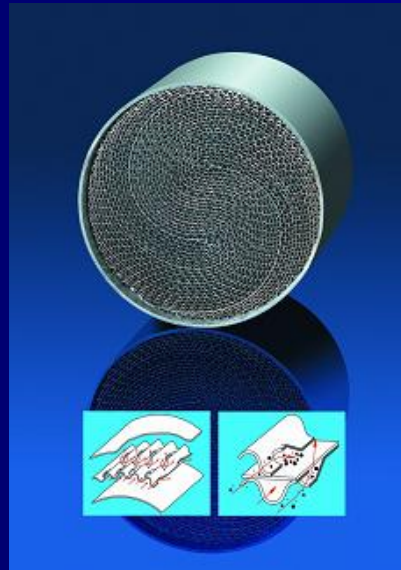


DMF – Diesel Multistage Filter

DPR – Diesel Particulate Reactor

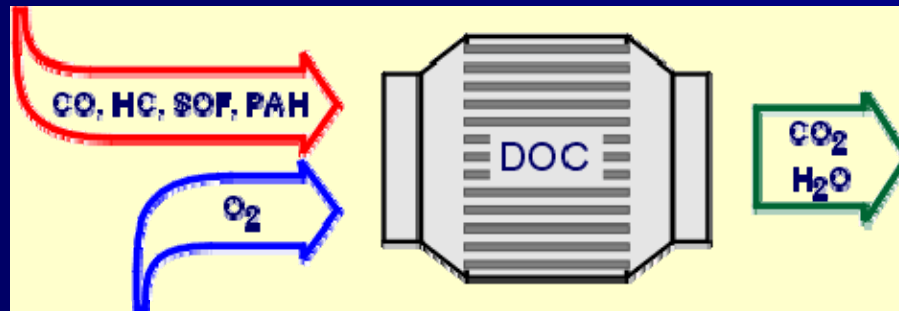
FTF – Flow Through Filter

- Stainless steel substrate
- No maintenance required, but can be taken apart in the event of engine failure
- Must use ULSD fuel
- Less stringent exhaust temp requirements than DPF



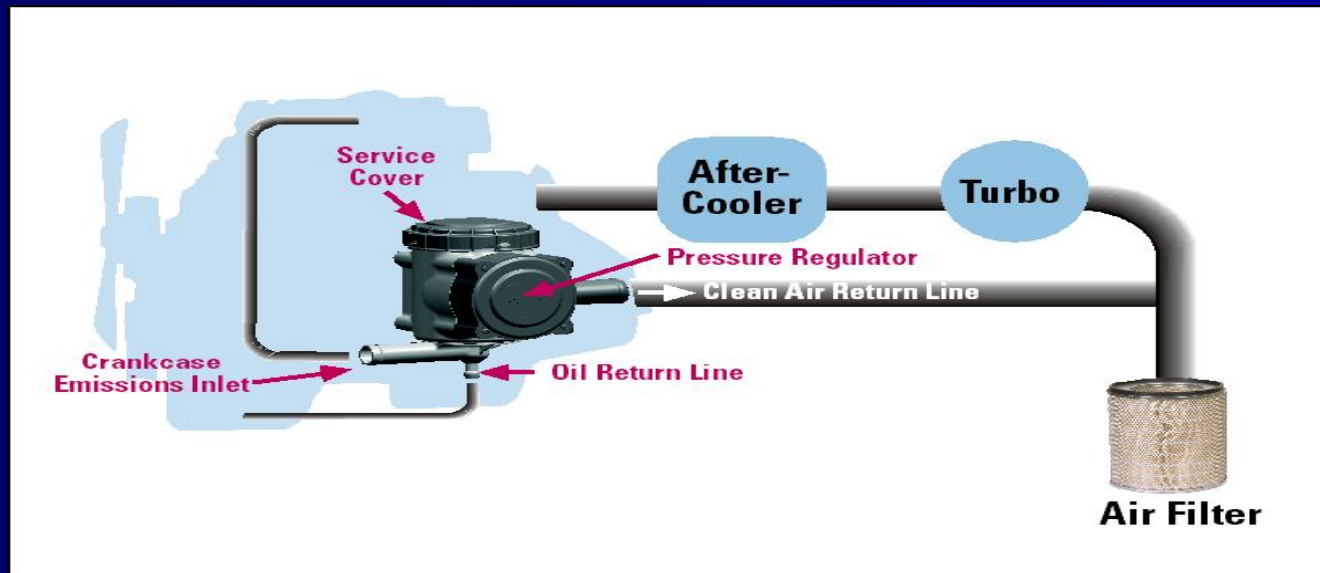
DOC – Diesel Oxidation Catalyst

- Most widely used and available technology
- No maintenance required
- Can be integrated with the muffler
- Can be used with almost any fuel



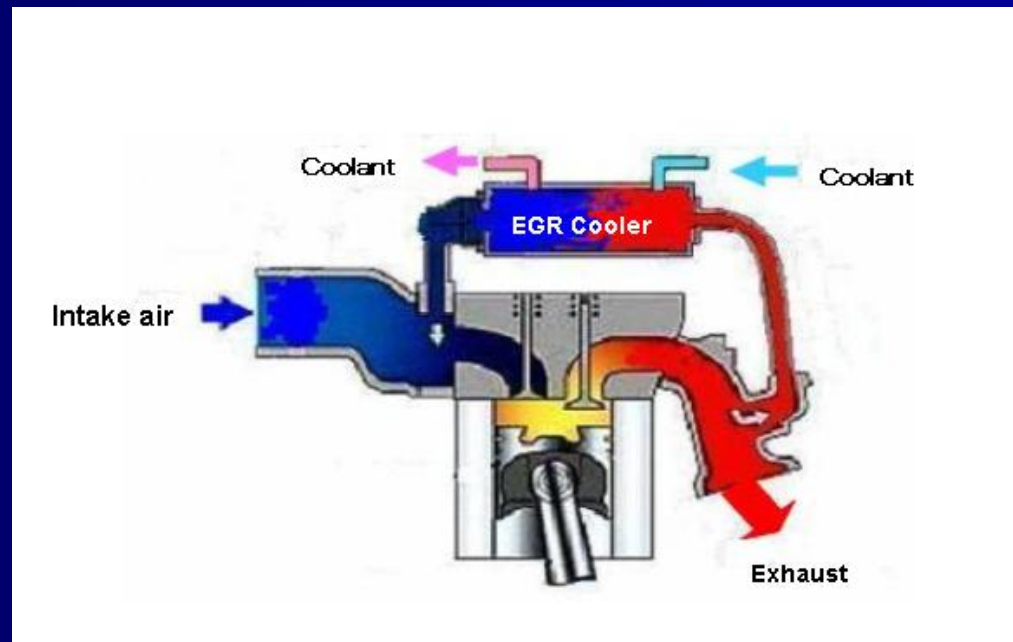
CCV – Closed Crankcase Ventilation System

- Eliminates crankcase emissions (“blow-by”)
- Oil is returned to the oil pan
- PM is trapped in an air filter, which must be replaced periodically



EGR – Exhaust Gas Recirculation

- Exhaust gas is recirculated back into the pistons
- Less oxygen causes a reduction in NO_x emissions
- PM emissions increase when EGR is employed



SCR – Selective Catalytic Reduction

- Designed to reduce NOx emissions
- Reducing agent (e.g., urea) is injected into the exhaust flow
- Can be coupled with a DPF to also target PM emissions



LNC - Lean NOx Catalysts

- Similar to SCR, but more modest NOx reductions
- Diesel fuel is injected into the exhaust flow (instead of urea)
- Slight impact on fuel economy due to injection of diesel fuel
- Can be coupled with a DPF to also target PM emissions



Diesel Retrofit Verification

- Retrofit manufacturers thoroughly evaluate retrofit devices
 - Quantifiable emissions reduction
 - Durability of the products
- Data is submitted to the EPA and/or CARB for verification
- Devices are verified for specific engine families and years
- Additional criteria are included
 - Fuel type (e.g., Biodiesel, ULSD)
 - Fuel additives
 - Existing emissions control devices (e.g., EGR)
 - Engine characteristics

Diesel Retrofit Verification

- Level 1 – 25% PM reduction
- Level 2 – 50% PM reduction
- Level 3 – 85% PM reduction