PERFORMANCE OF JOHNSON MATTHEY EGRT ä EMISSION CONTROL SYSTEM FOR NO_X AND PM EMISSION REDUCTION IN RETROFIT APPLICATIONS

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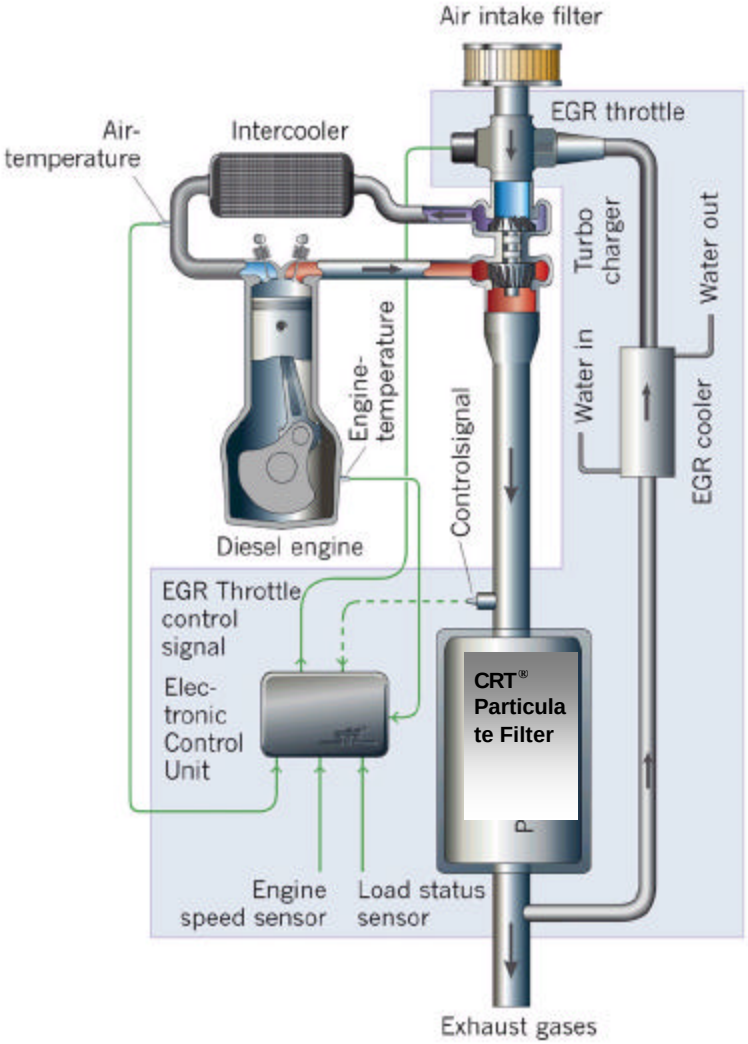
With growing concerns about NO_x and particulate matter (PM) emissions from diesel engines, stricter emission regulations are being implemented which require advanced emission control technology. In that regard, Johnson Matthey has combined the Continuously Regenerating Technology (CRT®) diesel particulate filter system with a low-pressure exhaust gas recirculation (EGR) system to provide four-way emission control of NO_x, PM, CO, and HC from existing heavy-duty diesel engines. This is known as the EGRT™ system.

The CRT filter is a highly effective technology for diesel PM reduction. The CRT system provides a unique and successful solution to the filter regeneration issue by using NO_2 to combust engine soot under the diesel engine operating temperature without any external heating. The overall system consists of a platinum metal-based oxidation catalyst upstream of the particulate filter. The catalyst oxidizes a portion of the exhaust NO_x into NO_2, which carries out continuous combustion of accumulated soot trapped by the filter, at temperatures above 250°C. In addition, the system also eliminates most of (greater than 90 percent) the CO and HC in the diesel exhaust.

The EGR system used is a low-pressure system which recirculates a portion of the clean exhaust gas from downstream of the CRT filter into the engine intake through an EGR throttle valve. The recirculated exhaust is cooled using an EGR cooler. The EGR flow is controlled by the EGR throttle valve, based on signals from an EGR throttle control unit. The EGR flow is designed based on the engine speed and load conditions as well as exhaust parameters which allow the CRT filter system to operate effectively. The flow is also optimized for NO_x emission reduction.

The EGRT™ system has been used in Europe over the past 4 years, with over 1200 systems installed on urban buses and other on-road applications. This system has shown 40-60 percent NO_x reduction in addition to greater than 90 percent CO, HC, and PM reductions. Recently, several field trial programs have been initiated to evaluate the performance and durability of the EGRT™ system under U.S. operational conditions. These include retrofit applications on urban buses and on a construction truck. FTP tests on an engine dynamometer have demonstrated 48-58 percent NO_x reductions with these systems while chassis dynamometer tests have indicated 50-60 percent NO_x reductions. Simultaneously, the CRT filter has shown greater than 90 percent CO, HC, and PM reductions in these tests. Emissions and on-road performance data of EGRT™-equipped vehicles from these programs will be presented in this paper.


Air intake filter
EGR throttle
Air-
temperature
Intercooler
Turbo
charger
Water out
Water in
EGR cooler
Engine-
temperature
Controlsignal
Diesel engine
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control
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Engine
speed sensor
Load status
sensor
Exhaust gases