

APPLICATION OF JOHNSON MATTHEY CRT™ PARTICLE FILTER SYSTEM FOR RETROFIT EMISSION CONTROL OF HEAVY DUTY DIESEL ENGINES

S. Chatterjee, R. Conway, C. McDonald, and H. Windawi
Johnson Matthey Catalytic Systems Division
North American Diesel Group

Particulate emission from diesel engines is one of the most important pollutants in urban areas. With growing concerns over health effects associated with diesel "soot", the reduction of diesel particulate emissions is increasingly becoming a major requirement in urban areas.

EPA's UBRR (Urban Bus Rebuild & Retrofit) program was one of the first attempts to regulate diesel engine PM emission in urban areas. In phase I of this program a catalytic muffler was used on rebuilt (pre-1994) urban bus engines to reduce PM emission by 25%, while an engine rebuilt with a 0.1 technology in phase II limited PM emission to 0.1 g/bhp-hr. However, recently, regulations have been proposed for more stringent PM emission requirements on new engines as well as existing diesel engines, necessitating the application of advanced PM emission control technology using a particle filter system.

Ceramic based particle filters are well known to be highly effective for diesel PM reduction. However, the lack of an effective and durable regeneration system has limited such filter applications. Johnson Matthey's Continuously Regenerating Technology (CRT™) filter system provides a unique and successful solution to the regeneration issue, by using NO₂ to combust engine soot under the diesel engine operating temperature without any external heating. The CRT filter 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 NO₂, which carries out continuous combustion of accumulated soot trapped by the filter, at temperatures above 2500C. In addition, the

system also eliminates most (>90%) of the CO and HC in the diesel exhaust.

The long term durability of the CRT™ filter system is substantially enhanced by the use of ultra low sulfur (<30 ppm) diesel fuel. This system has been widely in use in Europe over the past 5 years. With the current availability of such fuel in the US (Equilon, ARCO), several demonstration programs are being run successfully with the CRT™ system to exhibit the performance and durability.

One of the programs is in NY City, which is being coordinated by NY City Transit, NY DEC, JM, Corning, Equilon, and Environment Canada. In this program, DDC Series 50 and 6V92 engine buses from NY City Transit have been retrofitted with CRT™ systems and are being tested for on-road durability and chassis dyno emission testing.

In California, in a technology validation program organized by ARCO, the CRT™ filter is being evaluated in seven different fleets consisting of fuel trucks, grocery trucks, school buses, LA MTA transit buses, sanitation trucks, etc, with the ARCO EC Diesel. In addition, the CRT™ system is also being evaluated as a retrofit option on older school buses with SCAQMD. Emissions testing is also being carried out in the ARCO program.

In this paper, the operational and emissions test data from the various CRT™ filter demonstration programs are discussed.