

## Diesel Emission Standards - The Role of Insulation

As emission standards for both off-highway and stationary diesel engines become increasingly stringent, emission control technologies are becoming increasingly sophisticated. New engines being introduced by the major diesel engine manufacturers are designed to minimize emissions, and a variety of catalytic filters are available to treat harmful exhausts. A perhaps lesser-known but nonetheless important aspect of effective emissions reduction is the maintenance of **high exhaust temperatures**. Properly insulated exhaust and emissions reduction equipment is crucial in order to ensure that emission reduction targets are met.

### Background: Off-Highway and Stationary Engine Emission Standards

Although Diesel Emission Standards for off-highway engines have been around since the early 1990's, it wasn't until relatively recently that **stationary** diesel engines became subject to similar controls. In the U.S., beginning in January 2007, all new diesel engines, whether off-highway or stationary, will be required to conform to the Environmental Protection Agency's off-highway emission regulations. These regulation levels, also known as Tier levels, depend on the kW rating of the engines.

The regulations are to become increasingly stringent over the next number of years. By 2015, all off-highway and stationary diesel engines will be subject to the EPA's highest Tier 4 level of emissions control. Other jurisdictions, including Canada and the European Union, have standards that closely match those of the EPA. (For more information on diesel emission standards, please visit [www.dieselnet.com/standards](http://www.dieselnet.com/standards)).

### Response of Industry to Emission Standards

Be it off-highway or stationary, emission control standards for diesel engines are intended to reduce the emission of NO<sub>x</sub> (Nitrogen Oxides), DPM (Diesel Particulate Matter), HC (Hydro Carbons), and CO (Carbon Monoxide). Engine and catalyst manufacturers have responded to the challenge of these new regulations with various strategies aimed at ensuring compliance.

In general, the approach of industry can be divided into two categories:

- Engine Modification: In engine modification, the aim is to reduce harmful emissions at the engine level via a combination of improved electronic engine control, better engine design, and turbo-charging systems.

- After-Treatment: This approach treats the exhaust after it has left the engine. Different types of after-treatment strategies include the use of a variety of catalytic filters, fuel modifications (e.g. biodiesel or ultra low sulfur diesel), secondary fuel injection, and Selective Catalytic Reduction (SCR) systems.

These approaches are by no means mutually exclusive. Indeed, especially for larger stationary engines, engine modifications alone are not always sufficient, and must be complemented with one or more after-treatment strategies in order to meet the mandated emissions target.

## **High Exhaust Temperatures - Role of Insulation Blankets**

Whatever approach one chooses to emissions reduction, proper insulation is an important aspect of ensuring that emission reduction targets are achieved. Many of the technologies require a high exhaust heat [in some cases in excess of 800°F (425°C)] in order to function properly.

Without proper insulation, the exhaust gases lose heat as they travel along the various pipes and components of the engine and the exhaust system. It is imperative that the exhaust, catalysts and SCR systems be properly insulated to maintain internal temperature and ensure optimal performance / burn-off.

Removable insulation blankets are an excellent way to provide the requisite insulation in a cost-effective manner. The fact that they can be removed allows easy access to components during periodic maintenance and replacement. Indeed, major engine users, as well as major catalyst manufacturers, recommend removable insulation blankets as an important component of their emissions reduction strategy.

## **DC Convention Center - Leading by Example**

Over the past 3 years, Firwin has provided the insulation component of the overall emissions control system to a number of major public and corporate building projects. Two of the higher profile projects were Washington DC's Convention Center and the new Fannie Mae Mortgage Company Headquarters.

Both projects required large auxiliary power systems to keep their facilities running in the case of a power shortage. Although the new EPA regulations on stationary engine sets were yet to take effect, both projects chose to lead by example and incorporate emissions reduction technology into their facilities. In both cases, being larger stationary engines, the technology of choice was SCR. Firwin provided the insulation blankets for both the mixing tubes and the catalyst.



**Washington Convention Center  
Washington DC**

*Four Mitsubishi 1100 KW engine sets are needed to provide auxiliary & standby power to service its 2.3 million square feet, 31 elevators, and 38 escalators.*



**Fannie Mae Mortgage Co. Headquarters  
Maryland**

*Fanny Mae installed its urea injection SCR system for its 1st stage of six CAT 3516 engine sets that provide backup power for their corporate computer systems.*

**Conclusion**

As increasingly stringent emission standards for both off road and stationary diesel engines continue to be phased in over the next number of years, we expect insulation will continue to play a significant role in the various emission reduction solutions.