

Automotive Propulsion Materials

Diesel Exhaust Particulate (Soot) Filter

Background

The U.S. Environmental Protection Agency and its counterparts in other developed countries around the world have established that particulate emissions from diesel engines will be regulated. Regulations have been enacted that will eliminate 90% of the diesel particulate emissions in the United States in 2007, and in Europe and Japan in 2008. Compliance with these pending regulations depends upon the development and commercialization of sophisticated filtration technologies.

Diesel exhaust streams present unique filtration problems. Developers must contend with filter exposure to severe chemicals, high temperatures, and high pressures. A more difficult problem is that the filter is blinded rapidly by diesel soot particles and must be cleaned frequently while the vehicle is operating.

With the potential of a \$10 billion per year commercial market for diesel particulate control products, many companies worldwide are working diligently to find a solution. Industrial Ceramic

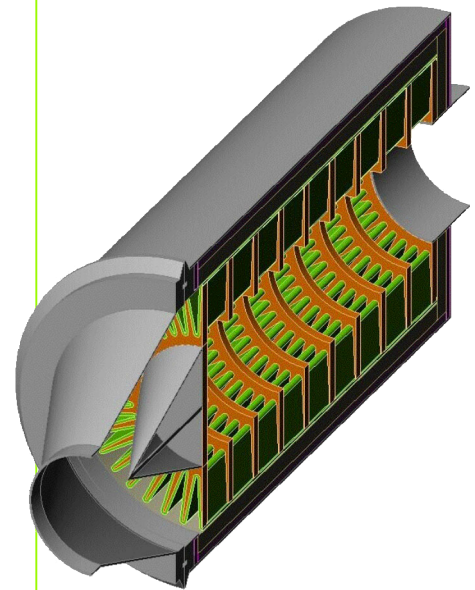
Solutions (ICS), working with Oak Ridge National Laboratory, has developed a unique filter cartridge capable of complying with the future regulations.

The Technology

The current accepted diesel particulate filter solution is based upon an extruded ceramic honeycomb design, similar to catalytic converters that have been installed on American automobiles since the mid-1970s. This design works on large diesel engines, such as highway transport trucks, where exhaust temperatures are high enough to allow catalyst coatings to burn trapped particulate matter and keep the filters clean. There are millions of smaller diesel engines that require auxiliary exhaust heating to clean the filter during engine operation. ICS has developed a pleated ceramic fiber filter cartridge that is especially suited for the lower exhaust temperatures in smaller engines. This cartridge removes more than 95% of diesel soot particles. Its greatest advantage is the fact that it filters at a fraction of the backpressure exerted on the engine compared to competitive products.



Less dependence on foreign oil, and eventual transition to an emissions-free, petroleum-free vehicle



Backpressure on a diesel engine reduces the efficiency of the engine and increases the fuel consumption penalty caused by an obstruction in the exhaust system. The backpressure of the ICS fiber filter is one-tenth that of the extruded honeycomb filter product. In addition, the thermal mass of the ICS filter is one-third that of the honeycomb filter. This means that it requires less auxiliary energy to achieve filter cleaning, again reducing the fuel penalty for the emission control device. These advantages can reduce the fuel consumption penalty from 15% to 1%. The final advantage is the cost of the product in a high-volume market. The simple pleated design is similar to that of millions of air and liquid filtration devices used around the world. It is manufactured by established processes on high-volume equipment.

Commercialization

The ICS diesel particulate filter development program has been funded by the U.S. Department of Energy's Automotive Propulsion Materials Program since FY 2000. ICS is entering product qualification programs with diesel engine suppliers in the United States and Europe. These suppliers require manufacturing capacity for millions of diesel particulate filter units per year. ICS is in final negotiations with a U.S. filter products company, with international sales, to license

the patented technology for volume production. Success of the customer qualification testing and the licensing agreement will lead to thousands of long-term new manufacturing jobs in the United States. The low-cost production of the pleated ceramic fiber filter will also reduce the cost impact of the EPA regulations on the diesel engine industry and their customers.

Benefits

- Ideal for smaller diesel engines
- Reduced fuel penalty for diesel exhaust aftertreatment
- Low-cost production using established processes and equipment

Where Can I Find More Information?

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