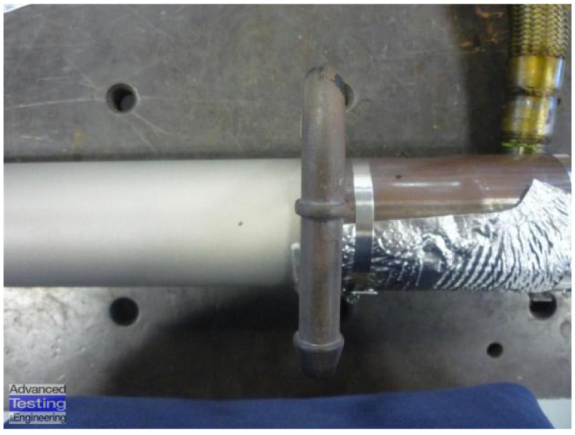
Cerakote™ V-171 Turbine Coat as a Replacement for Heat Shields in Ford Diesel 6.0 L Powerstroke Engine

Cerakote™ high-temperature coatings are durable, heat-resistant coatings characterized by excellent long-term performance. Of these coatings, V-171 Turbine Coat is designed to function as a thermal barrier for a variety of applications. Thermal barriers play a significant role in various automotive applications by reducing the amount of heat escaping to the surrounding environment from the exhaust manifold. Decreasing the temperature under the hood results in lower fuel temperatures, increased horsepower, and improves the service life of various parts. Heat shields are the traditional solution for reducing heat; however, heat shields require more space, add additional weight, and cost when compared to a bare pipe. As an alternative, ceramic coatings effectively reduce heat transfer from the exhaust system and have negligible weight and space constraints.

The thermal barrier capabilities of V-171 Turbine Coat were compared to those of standard heat shields. For this study, one half of the exhaust system of a Ford diesel 6L Powerstroke engine (Ford F-250) was coated with Cerakote™ V-171 Turbine Coat and the remaining portion equipped with factory heat shields. A picture of the experimental setup for this test is shown in figure 1a and figure 1b. The resultant heat change in the surrounding environment was recorded at distances of 20 mm and 40 mm from the radial surface of the exhaust. The changes in ambient temperature when using a heat shield were compared to those recorded when using the thermal barrier ceramic coating. These results of this study are shown below in Figure 2. The average exhaust gas temperature was 1690°F. The average air temperature at 20 mm from the ceramic coating and heat shield were 185°F and 232°F, respectively. At 40 mm from the exhaust system, the temperature of these test portions was 141°F and 186°F, respectively. Coating the system with Cerakote™ V-171 Turbine Coat resulted in a temperature decrease of 1505°F at 20 mm and 1549°F at 40 mm from the surface of the pipe with respect to the exhaust gas temperature. On average, the ceramic coating was 3% more effective in reducing heat loss from the system when compared to the heat shields. Ceramic thermal barrier coatings are an easy, effective solution to decrease cost and reduce weight for heat mitigation applications.

a) 

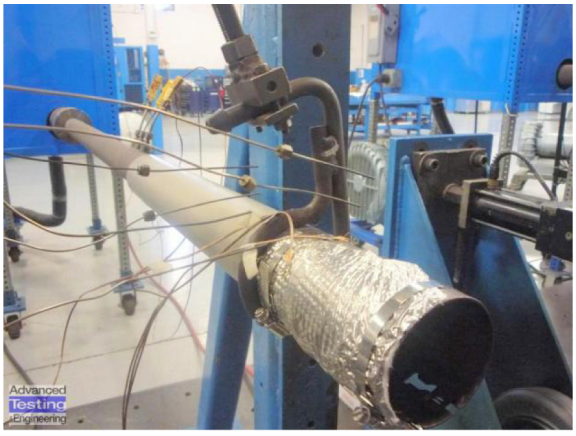
b) 

Figure 1. The thermal barrier efficacy of Cerakote™ V-171 Turbine Coat and heat shields were compared by determining changes in the ambient temperature at distances of 20 mm and 40 mm from the surface of the exhaust test system.

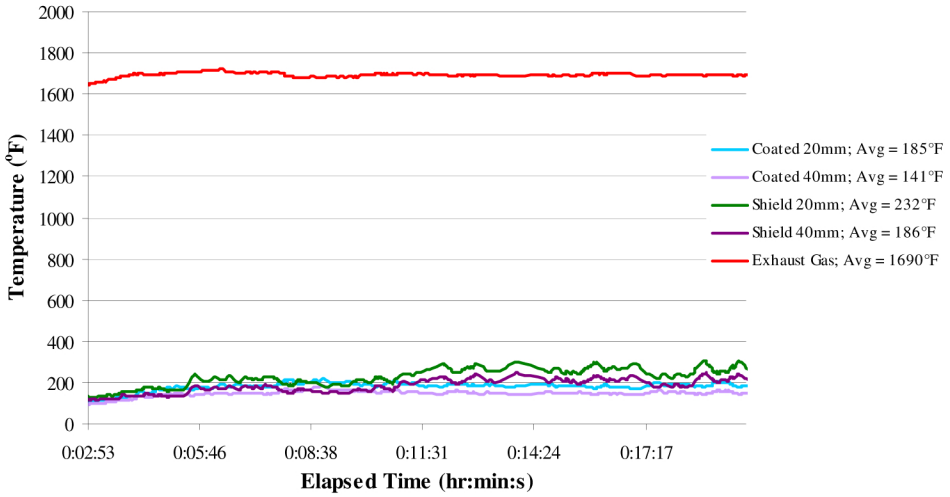


Figure 2. The thermal barrier properties of Cerakote™ V-171 Turbine Coat were compared to those of traditional heat shields. Comparison was made using a Ford 6.0L Diesel Powerstroke engine with average exhaust temperature of 1690°F.

*Testing provided by Advanced Testing and Engineering; Taylor, MI.