USE OF A DIESEL FUEL PROCESSOR FOR RAPID AND EFFICIENT REGENERATION OF SINGLE-LEG NO_x ADSORBER SYSTEMS

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ABSTRACT

NO_x adsorber or NO_x trap systems must be regenerated frequently to convert the adsorbed NO_x to N_2 and to regenerate the NO_x adsorption capacity of the NO_x trap. This regeneration requires a reducing environment and the presence of a reductant capable of reacting with the NO_x trap components. Recent reports have shown that "reactive" reductants such as H_2, CO, and oxygenated species can regenerate NO_x traps more rapidly and at lower temperatures. While this offers a clear potential advantage, providing a reductant in a cost-effective manner is problematic.

A diesel fuel processor has been developed that can operate from low loads to full loads and can produce periodic, high concentrations of a "reactive" reductant from diesel fuel as required during the regeneration portion of the cycle. Engine tests show that the fuel processor produces a "reactive" reductant over a wide exhaust-temperature range and with good control of reductant mass flux.

The benefits of a reactive reductant were demonstrated by tests in which the NO_x trap was regenerated with reductant pulses as short as 1 second. Steady-state tests have shown fuel penalties in the range of 3 percent for a single-leg system with high NO_x conversion. In addition, the fuel processor is designed to produce a desulfation cycle that includes raising the NO_x trap to the required desulfation temperature and then providing the required reducing environment to regenerate the NO_x adsorber system. The use of a "reactive" reductant should allow the desulfation cycle to occur at lower temperatures, thus increasing NO_x adsorber durability. The operating characteristics and performance of the diesel fuel processor will be presented.