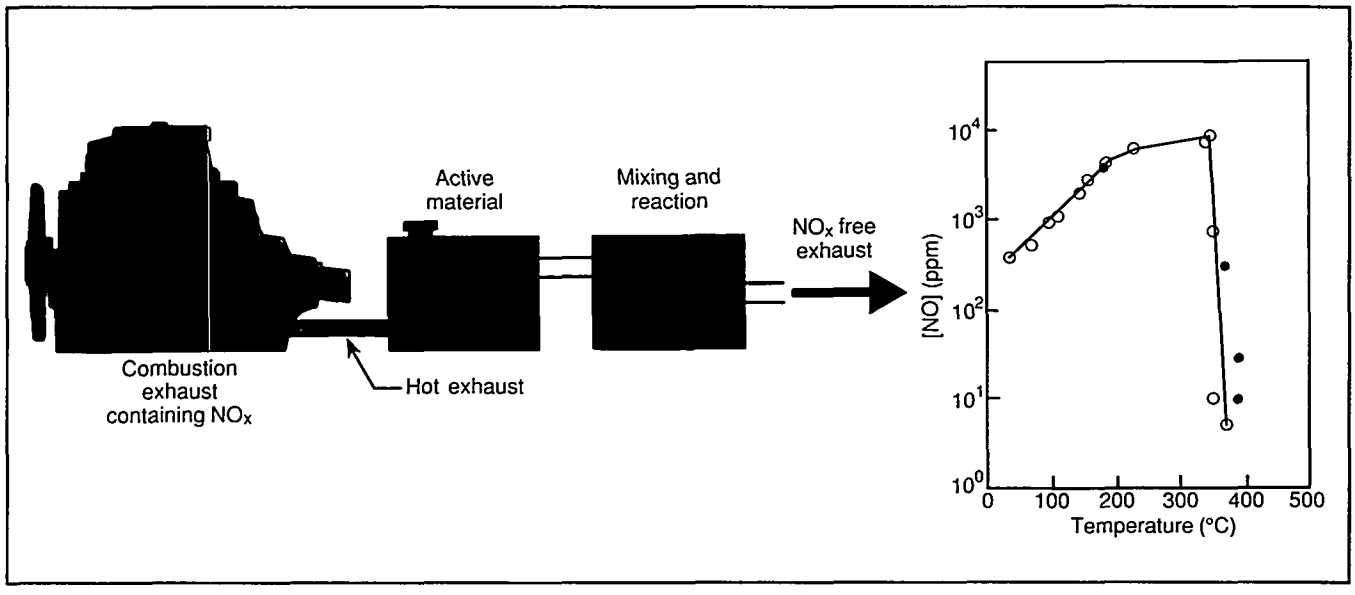
approaches to improving ignition and combustion properties of alternative fuels.

RAPRENOx Process

Nitrogen oxides are the leading contributors to air pollution today. More than 21 million tons of nitrogen oxides are released into the atmosphere in the United States each year as a byproduct of burning fossil fuels. In 1986, Sandia National Laboratories announced the discovery of a new process called RAPRENOx (Rapid Reduction of Nitrogen Oxides), which has the potential to eliminate nitrogen oxides from diesel engine exhausts and coal-burning generating plants. The first phase of the research funded by the DOE Office of Basic Energy Sciences included a series of experiments which determined the basic chemistry of the process. With DOE ECUT funding, the researchers extended the fundamental chemistry experiments by applying the process to the exhaust gases of a real diesel engine. In these applied experiments, it was shown that RAPRENOx could reduce 400 ppm of NOx to less than 5 ppm in diesel exhaust at characteristic operating temperatures. It appears that the RAPRENOx process has a significant potential for reducing NOx from practical combustion systems including stationary and mobile diesel engines, industrial scale furnaces and boilers, and other fossil-fired generating systems. The successful development of a viable product could provide an inexpensive way to comply with mandated federal pollution standards. DOE has waived patent rights to the inventor who has set up a private company, the Technor Corporation, to commercialize applications of RAPRENOx in diesel, natural gas-fired engines, and wood-fired boilers. In addition, Technor has just completed a Phase I DOE-SBIR program for coal combustion. Major engine manufacturers, electric utilities, air quality interests, and industrial processors in the United States and abroad have shown widespread interest in the process and many have begun R&D activities.

Fluid-Elastic Instability in Heat Exchangers

Flow-induced vibration has been identified as the leading cause of catastrophic failures in industrial heat exchangers. By increasing the fluid pumping rate of shell-and-tube heat exchangers, the overall rate of heat transfer can be increased. However, at a high rate of pumping, fluid-elastic pressure waves are often generated at a frequency high enough to



Experiments have shown that the RAPRENOx process can radically reduce NOx emissions.