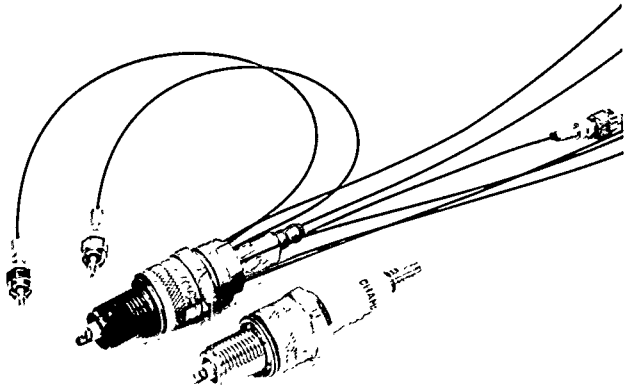


A spark plug instrumented with fiber optics enables researchers to observe combustion events inside production engines.

engine combustion chamber. The laser-based measurement techniques currently used to characterize flame growth, such as laser Doppler velocimetry, require installing optical windows, which may perturb the flow being analyzed and provide inaccurate results.

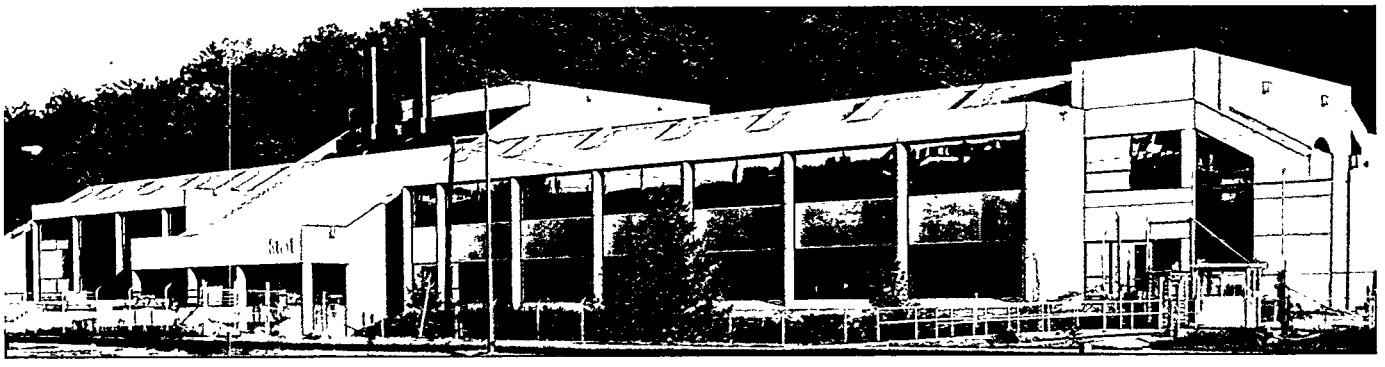
DOE funded the development of a spark plug, instrumented with fiber optics, to observe flame propagation in the combustion chamber of standard automotive engines. The spark plug may be installed in place of the regular spark plug to make measurements without modifying engine geometry or operating conditions. It was tested in both a research and a production (Chrysler) engine. Flame development measurements obtained for eight successive engine cycles showed the flame to be more asymmetric than expected in currently engineered designs. Research will continue into understanding the effects of this asymmetry on swirl and turbulence intensity by studying polar velocity plots.

The development of this new spark plug as a fundamental measuring tool generated considerable enthusiasm in the auto industry. Chrysler Corporation, which has followed its development since the beginning, is scheduled to conduct more extensive demonstrations in the near future. General Motors and the Ford Motor Company requested complete data and design details. Results of the work were presented at the 1988 Society of Automotive Engineers' International Fuels and Lubricants Meeting.

High-Temperature Materials Laboratory

DOE's High-Temperature Materials Laboratory at the Oak Ridge National Laboratory completed its first full year of operation during 1989. The laboratory serves as a focal point for multidisciplinary research on new ceramics and metal alloys that show potential for high-temperature applications. Research at the materials laboratory is designed to help solve high-temperature materials problems that now limit the efficiency and reliability of advanced energy-conversion systems.

The materials laboratory is a DOE User Facility and provides easy access to users from industry and academia. The laboratory operates four User Centers: Materials Analysis, X-Ray Diffraction, Physical Properties, and Mechanical Properties. Investments in instrumentation for the User Centers represent about $6.5 million, or 34% of the total appropriations ($19.1 million) for the facility.



DOE's High-Temperature Materials Laboratory offers state-of-the-art facilities for multidisciplinary research on new ceramics and alloys for high-temperature applications.