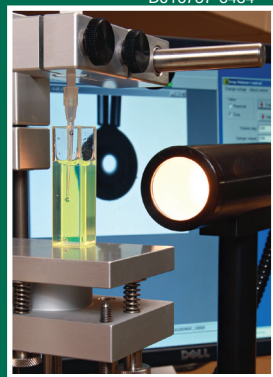


Alternative Fuels, Fluids and Lubricants



SOUTHWEST RESEARCH INSTITUTE®

San Antonio, Texas



Founded in 1947 as an independent, nonprofit research and development organization, Southwest Research Institute provides a significant research, engineering and testing resource for industry, business and government. With 11 technical divisions, SwRI uses a multidisciplinary, integrated approach to solving complex problems in science and applied technology. For more than 60 years, SwRI has been a recognized world leader in the areas of automotive technology and research. As part of a long-held tradition, patent rights arising from sponsored research at the Institute are often assigned to the client. SwRI generally retains the rights to Institute-funded advancements.

Alternative Fuels, Fluids and Lubricants

Developing renewable fuel sources is becoming increasingly important to stem problems associated with fossil fuels and their effects on pollution and the overall global environment. Southwest Research Institute® (SwRI®) has extensive experience in preparing and analyzing conventional and alternative fuels, fluids and lubricants. Finding, producing and transporting fossil fuels, developing and assessing alternative sources, and cleaning up energy byproducts remain core Institute programs. SwRI's blends of field experience, engineering and chemical skills, and design and fabrication capabilities offer an interdisciplinary approach to fuel-related services.

Biodiesel

Biodiesel is a renewable fuel made from the oils of plants such as algae, soybeans, canola and palm, as well as from animal fats. Biodiesel is typically blended with petroleum-based diesel fuels and is non-toxic and biodegradable. Biodiesel is a clean-burning alternative fuel that offers several advantages over conventional diesel fuel, including:

- Decreased smog-forming potential
- Reduced sulfur emissions
- Biodegradable and nontoxic characteristics
- Reduced dependence on foreign oil

In addition to evaluating conventional and other alternative fuels, SwRI has extensive capabilities for analyzing biodiesel and biodiesel blends.

SwRI's modern and extensive facilities are equipped to perform analytical requirements for biodiesel fuels according to ASTM D6751.



SwRI scientists and researchers use a JFTOT (jet fuel thermal oxidation tester) to determine thermal stability of aviation fuels.

Fluids Analysis

SwRI laboratories are equipped with state-of-the-art instrumentation and equipment to perform fluids analysis safely and efficiently. Fuels, lubricants and hydraulic fluids are separated by column methods and analyzed for chemical composition and specific physical properties. Specialized analytical facilities include:

- Inductively coupled argon plasma spectrometer
- High-temperature gas chromatograph
- Infrared spectroscopy
- High-performance liquid chromatograph
- X-ray fluorescence spectrometer
- Gas chromatograph/mass spectrometer
- Interfacial tension (IFT)
- Thermal conductivity
- Bulk modulus
- Dielectric constant

The Institute performs a wide variety of fuels and fluid-related research. Technical strengths include fluid mechanics, heat transfer, sensor development, liquid filtration, contamination control and identification, fuel and water logistics, chemometric methods of analysis, and test methods development.

SwRI also conducts projects in fuel properties, fuel combustion, grease, aviation fuels, thermal stability and specialty fluids. Capabilities in this area include:

- Fuel properties
- Renewable fuels
- Fuel stability
- Fuel combustion
- Flammability
- Alternative fuels
- Aviation fuels and thermal stability
- Additives
- Greases
- Specialty fluids
- Combustion kinetics
- Fuel storage
- Distillate fuel peroxidation



To determine fuel heat characteristics, SwRI staff conduct thermal conductivity tests.

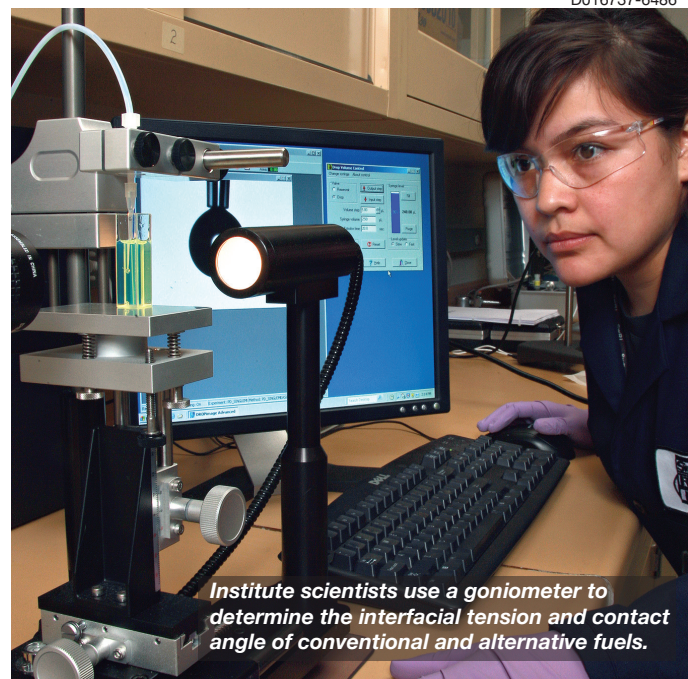
Future Aviation Fuels

With rising costs and dwindling sources for petroleum fuels, use of renewable fuel sources in the aviation industry is of growing interest. Extensive research is being done to find suitable fuels for future aviation use. SwRI is conducting studies in the areas of synthetic paraffins and kerosenes.



Researchers use a rancimat to determine the storage stability of biodiesel fuel.

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Institute scientists use a goniometer to determine the interfacial tension and contact angle of conventional and alternative fuels.

Fuels, Lubricants and Fluids Applications

The Institute performs a wide variety of fuel, lubricant, and engine and fuel system investigations for the Department of Defense, government agencies and commercial clients. Technical strengths and capabilities include:

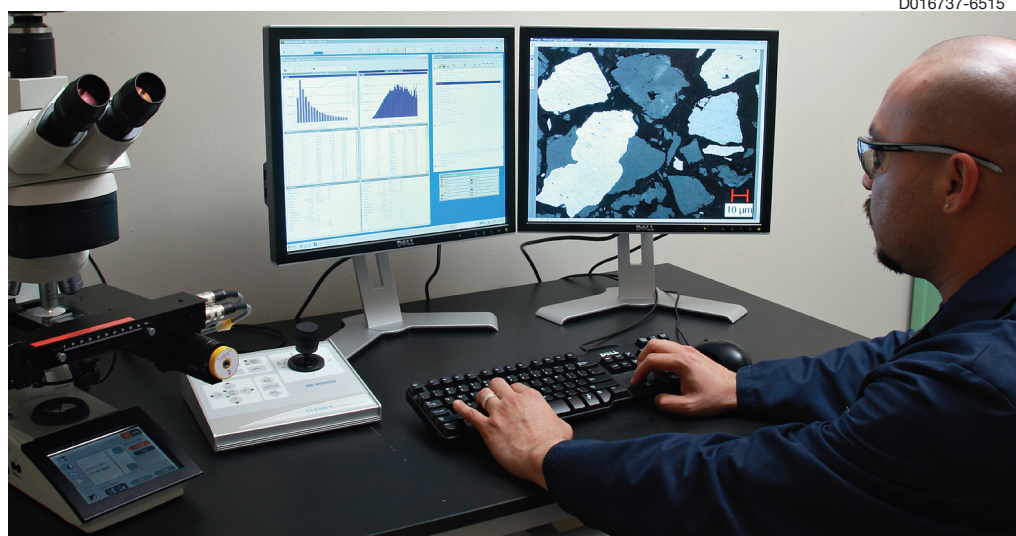
- Investigations of fuel/lubricant/engine interactions and exhaust emissions
- Fuel and fluid flammability hazard assessments
- Alternative fuels development and utilization
- Fuel injection system wear and performance
- Jet fuel use in diesel equipment
- Tribology, engine dynamometer evaluations
- Bench test development, fuel system materials compatibility
- Field evaluations
- Fuels/hardware interactions and test rig design
- API IP 1581 aviation coalescence
- EI 1583 aviation fuel water monitors

Fluids Testing and Qualification

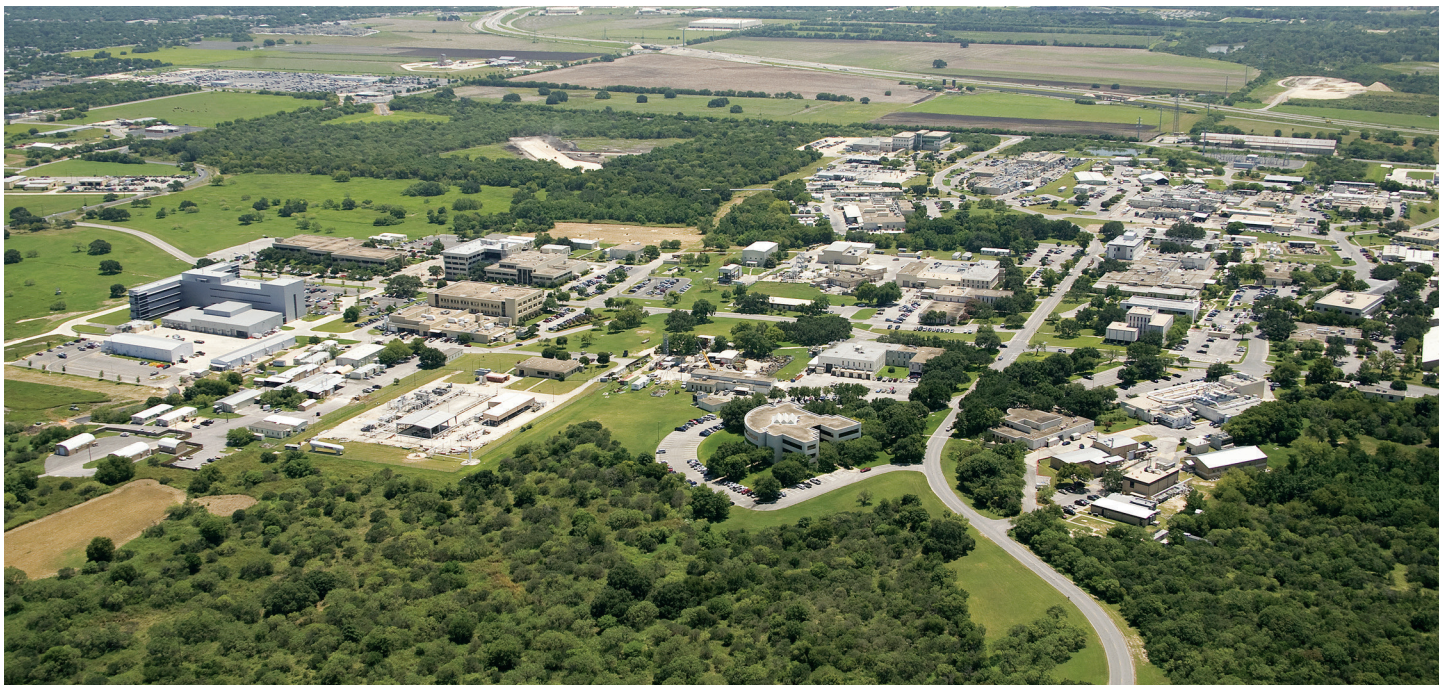
SwRI offers a wide range of specialty and standardized test capabilities, both on- and off-site, to support the fuel, lubricant and fluid requirements of the automotive industry. Extensive state-of-the-art laboratories and test cells permit evaluation, testing and qualification of a diverse number of fuels, lubricants and fluids. SwRI capabilities include:

- Specialized fuel and fluids production and evaluation
- Fuel property modification
- Fuel cleanliness, deterioration and property measurements
- Fluid/material compatibility testing
- Fuel pump testing
- Fuel kinetic studies

Staff members use optical imaging software to analyze information on the particle size distribution of fuel contaminants.



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Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies more than 1,200 acres and provides more than 2 million square feet of laboratories, test facilities, workshops and offices for more than 3,300 employees who perform contract work for industry and government clients.

*Benefiting government, industry
and the public through innovative
science and technology*



*We welcome your inquiries.
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