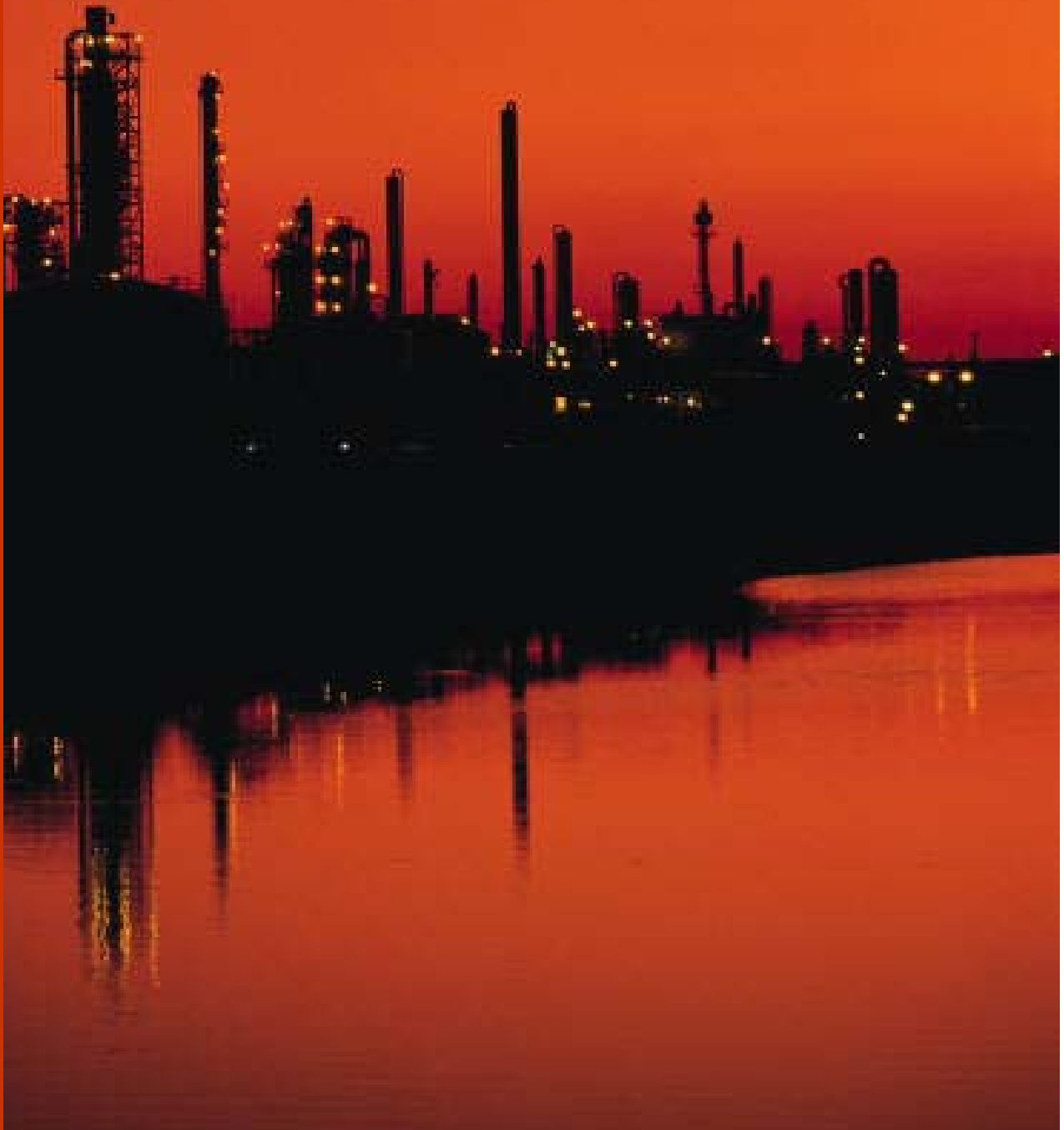


# Fuels Technology



**T**he continuing need for economical and reliable fuels has dramatically increased research, testing, and evaluation of alternative fuels technology. Southwest Research Institute® (SwRI®), with extensive experience in petroleum- and engine-related research, development, and technology, is a recognized technical leader offering numerous fuels technology capabilities, including:

- Staff of engineers, scientists, and technical support personnel to accomplish clients' goals in numerous fuels-related disciplines, including laboratory- and bench-scale process research
- Specialized equipment and facilities, including pilot-scale processing equipment, large-scale utilities, process expertise
- Independent evaluation of systems, technology, and fuel problems
- Novel and objective viewpoints on complex technical approaches and problem-solving techniques

The Institute's almost 60 years of experience have resulted in extensive contacts within the domestic and foreign fuels communities that deal with conventional and emerging fuel sources. SwRI's blend of field experience, engineering skills, and the design and fabrication capabilities provides an interdisciplinary approach to solving problems ranging from standard laboratory testing to innovative engineering methods. Challenges in fuels technology involve petroleum distribution, fuels specifications, fuel storage, engine and hardware interface, and fleet monitoring.

### **Alternative Fuels Center**

Operated under a US Department of Energy contract in support of the Alternative Fuels Utilization Program, the Alternative Fuels Center at SwRI provides R&D test quantities from 5 to 5,000 gallons of specially formulated fuels required for a variety of research programs. The center consists of a laboratory, drum storage area, and a tank farm with a total capacity of approximately 50,000 gallons. Gas-to-liquids studies are an active area of research.

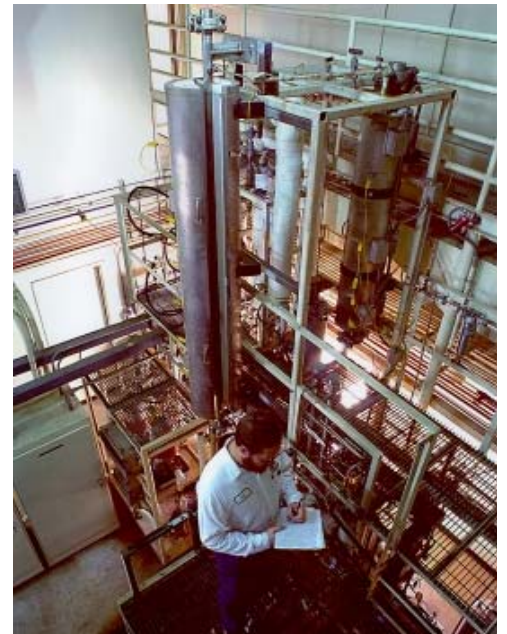


### **Test Fuel Formulation**

Special fuel formulations are produced in support of bench and engine testing programs. Operations include identification, procurement, analysis of blendstocks, and production of finished blend in quantities from 5 to 10,000 gallons. Some blends require preprocessing of the blending components by fractionation, adsorption, and chemical treating. Blending of test fuels is supported by sophisticated compositional analysis and testing for physical properties. This activity has functioned continuously since 1979 for programs sponsored by numerous government agencies, including the US Departments of Energy and Defense, National Aeronautical and Space Administration, Environmental Protection Agency, and many industrial clients and trade associations.

### **Coal Cleaning and Conversion**

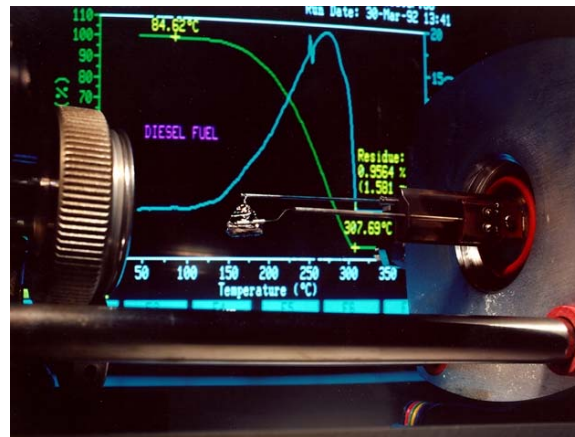
SwRI conducts investigations to evaluate the effectiveness of sulfur and ash removal on the quality of coals ranging from lignite to anthracite. Yield and coal product quality are rated for feeds. Studies and tests of coal/carbonaceous slurries and high energy density fuels for diesel and gas turbine engines are also provided.



## Fuel Properties

SwRI has devoted significant effort to anticipating and projecting not only quantities of future fuels, but also their qualities, in areas including a variety of oxygenates, military jet fuels, hybrid diesel fuels, shale- and coal-derived distillate fuels, and gasolines. The SwRI research program also includes emergency fuels, biodiesels, and blends of alcohols in gasoline.

Approaches range from gravimetric blending of the expected test fuels for bench and engine testing to more sophisticated efforts involving linear programming determinations of composition. Through extrapolations, trends in composition and economics have been forecast.



## Screening Test Development

Key properties of future fuels not covered by current commercial and military specifications are projected at SwRI. Property and pass/fail criteria have been developed, as well as special tests for valid measurement of new properties. The Institute has been instrumental in adapting and developing apparatus for the measurement of such properties as thermal stability, lubricity, and materials compatibility ranging from elastomers to metals corrosion. Sophisticated statistical analysis techniques are used to evaluate the degree of correlation between new laboratory and bench testing methods and existing performance data developed by engine dynamometer and full-scale fleet testing. Measurement of aromatics concentration is an area of particular accomplishment.



## Refining Process Analysis

Process analysis functions range from optimization of contemporary petroleum refining product slates to determining the impact of alternate feedstocks and components. Effects of ethanol, methanol, and other oxygenates on the cost and efficiency of product slates were examined for a wide variety of requirements. Building and execution of mathematical process models frequently is a cost-saving capability offered to industry.

## 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:

- Nuclear magnetic resonance spectroscopy
- Inductively coupled argon plasma spectrometer
- High temperature gas chromatograph
- Scanning electron microscope
- Fourier transform infrared spectroscopy
- Infrared spectroscopy
- High performance liquid chromatograph
- Analytical pyrolysis/cryofocusing concentrator system
- X-ray fluorescence spectrometer
- Gas chromatograph/mass spectrometer



## Field Testing and Evaluation

Effective fuel and fluid development requires the ability, technology, and resources to measure, evaluate, and determine optimal performance under field conditions. More than 240 engine dynamometers are in continuous operation at SwRI, testing engines ranging from small two-stroke, spark-ignition to large locomotive powerplants. Engines routinely undergo evaluation for performance, emissions, noise, and durability characteristics. State-of-the-art capabilities are applied to the acquisition and analysis of the complete spectrum of engine data. Engineers use high-speed computers to analyze basic engine performance to interpret and project engine and fuel requirements. Standard ASTM testing is routinely performed on a large-volume basis, and specialized fuels and lubricants evaluation programs are tailored to individual client requirements.



## Special Consulting Services

Numerous detailed studies are conducted for a variety of clients. Projects involve troubleshooting activities in fuels or petrochemicals production, specific process efficient analysis, and special testing services for multiple feedstreams. Results have provided recommendations for process modifications to improve feedstream properties.

***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 1,200 acres in San Antonio, Texas, and provides nearly two million square feet of laboratories, test facilities, workshops, and offices for more than 2,800 employees who perform contract work for industry and government clients.***



**We welcome  
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