

Capabilities in

Gaseous-Fueled Engine Development





DE139122



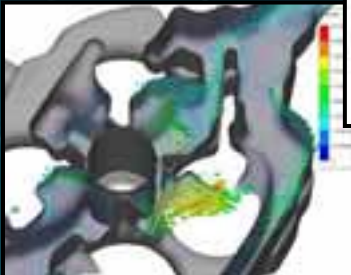
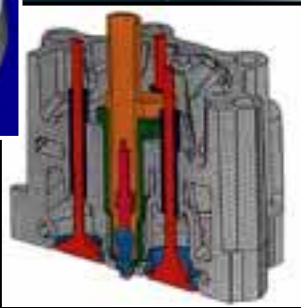
DE137243_7



Gas Engine Applications



D005502



Gas Engine Design and Analysis



D11W015168_0081



Gas Engine Control Systems

Natural gas is an abundant fuel with properties that promote both excellent performance and low exhaust emissions. Southwest Research Institute® (SwRI®) is a global leader in natural gas engine development and optimization with more than 40 years of experience. SwRI's expertise covers engines ranging from 5kW to 5MW in size, and applications including automotive, heavy truck, industrial, power generation, agriculture, rail, and gas compression. Along with compressed natural gas, SwRI has extensive experience with other alternative fuels, including:

- methane
- LPG
- propane
- butane
- hydrogen
- digester gas
- LNG
- landfill gas
- syn-gas

Gas Engine Design

SwRI combines years of experience with state-of-the-art analysis tools to provide robust designs to meet current and future requirements. SwRI conducts clean-sheet gas engine design programs and diesel-to-gas conversions. Clients can receive ownership of design and training on processes used, without the burden of licensing agreements or royalties. SwRI can also assist with prototype component procurement and parts sourcing.

Gas Engine Combustion System Development

SwRI has developed and applied a variety of gas combustion system technologies to meet specific client requirements. Technologies include dual fuel, prechamber, and open chamber combustion using spark ignition, pilot fuel ignition, and laser ignition. Selecting the proper combustion system and optimizing this system is key to meeting the client's expectations and minimizing production engine costs.

Gas Engine Control Systems

The control system on a gas engine influences:

- rated power output
- ability to adapt to varying fuel composition and ambient condition
- transient response
- reliability
- knock detection and mitigation
- misfire detection
- emissions generated from a gas engine

The control system can also greatly impact the engine production costs. SwRI has experience with a variety of control system hardware and software and can match the most cost-effective solution to our clients' individual requirements. SwRI's experience ranges from control algorithm development and validation to complete engine control systems.

Gas Facilities

SwRI has invested in all the facilities required to conduct gas engine development using natural gas (CNG or LNG), propane/butane (LPG), hydrogen or other blends of fuel. We have conducted numerous studies on the effect of gas composition on engine operation and exhaust emissions. SwRI uses gas chromatography to monitor composition of natural gas on a real-time basis, and has developed techniques to generate a wide range of gas fuel qualities.

Diesel-to-Gas Conversions – Truck Engines

SwRI has contributed to the successful improvement of more than 50 engine models that burn gaseous fuel, with many of these being diesel-to-gas conversions. SwRI has demonstrated the ability to meet proposed Euro VI and US 2010 emissions regulations with advanced gas engine technology. As an independent organization, SwRI is well positioned to recommend the most appropriate technology based on a particular client's needs. We guide our clients to the most cost-effective solution, using either in-house or commercially available technology.

Large Gas Engine Development

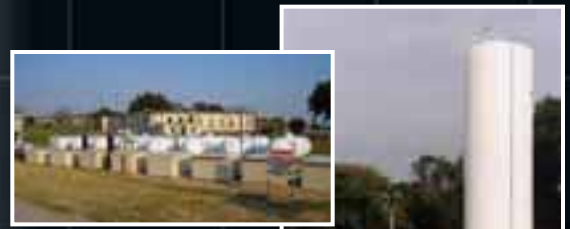
The use of gaseous fuels in power generation continues to grow. Gas engines offer excellent fuel economy, while meeting very stringent emissions requirements. SwRI has vast experience in the development of large, high-power output gas engines for power generation or combined heat and power generation, as well as gas pipeline applications.

Development Experience and Expertise

SwRI assists clients with product development well beyond the initial prototyping. Additional services include:

- ratings development
- emissions certification
- accelerated durability testing
- exhaust aftertreatment selection and integration
- vehicle or generator set integration

SwRI also assists manufacturers and end users with field testing, development and design support after production, training, and field services.



LNG, CNG, LPG and H₂ Facilities



*Truck/Bus/
Off-Road
Engines*



*Locomotive/
Power
Generation
Pipeline
Engines*



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 nearly two million square feet of laboratories, test facilities, workshops, and offices for more than 3,000 employees who perform contract work for industry and government clients.

We welcome your inquiries.

For additional information, please contact:



Thomas Boberg, Manager
Gas and Large Engine Development
Engine, Emissions and Vehicle Research Division
Southwest Research Institute
6220 Culebra Road • P.O. Drawer 28510
San Antonio, Texas 78228-0510
(210) 522-6267 • Fax (210) 522-2019
E-mail: thomas.boberg@swri.org
Web Site: www.swri.org