

Analytical Expertise

GTI has the knowledge and experience to do the job right

Gas Technology Institute (GTI) is an independent not-for-profit organization serving the research, development, and training needs of the natural gas industry and energy markets since the 1940s. Our main campus is located on an 18-acre site in the Chicago suburb of Des Plaines, Illinois. Our staff of over 300 is dedicated to meeting the nation's energy and environmental challenges by developing technology-based solutions for consumers, industry, and government.



For 75 years, GTI and **GTI Testing Laboratories** have given GTI and the energy-related industry a depth of customized support unavailable in commercial laboratories. Now, our multi-disciplinary staff of experienced scientists, engineers, and technicians can provide you with the same full spectrum of comprehensive

testing services using many of the latest developments in analytical instrumentation. From compositional determinations to root cause failure analysis, we have the know-how and experience to do your job right. Our comprehensive approach to analytical needs delivers accurate and insightful analysis, providing you with the information to make the right and best decisions.



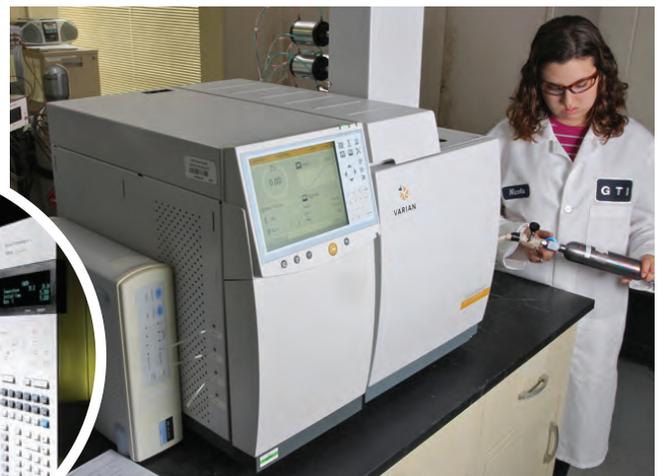
Accredited Lab

In 2004, GTI Testing Laboratories first passed an ISO 17025 audit conducted by A2LA, an accreditation organization that provides formal recognition of the competence of a laboratory to manage and perform specific tests listed in their scope of accreditation. The ISO 17025 accreditation process is based on regular audits of the facility, the Quality Management System, and the accredited test methods. Our accreditation has been renewed through 2017, and the current scope can be found on certificates 2139-01 (materials) and 2139-04 (chemical). With this world renowned accreditation you can be sure you are dealing with an experienced, reputable testing laboratory.



Fuel Gas Analysis

GTI's Analytical Chemistry Laboratory provides complete laboratory services for natural gas, biogenically derived gas, coal, liquid fuels, and other materials for the natural gas and power generation industries as well as for numerous municipalities and utilities. We offer analyses from major component analysis plus British Thermal Units (BTU) calculation



down to trace level constituent detection, including a suite of natural gas odorant compounds. Power generating companies requiring stationary source emission reporting use GTI Testing Laboratories to accurately monitor carbon, nitrogen, and sulfur levels in their feed gas.

Our capabilities incorporate modern instrumental techniques and traditional referee methods, providing you with highly accurate determinations. The chromatography lab contains an extensive collection of gas chromatographs and a large selection of specific detectors. Advanced analytical capabilities include gas chromatography coupled with atomic emission and mass spectral detectors. These specialized techniques and advanced equipment permit characterization of volatile organic compounds (VOCs) containing chlorine and silicon (siloxanes) in gases used to fuel internal combustion engines.

Liquid Fuels Analysis

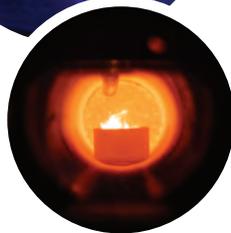


The fuels lab specializes in solid fuel and liquid petroleum analysis, providing you with highly accurate proximate and ultimate determinations.

In addition, physical

testing such as viscosity, specific gravity, and bulk density are all easily performed on your fuel samples. GTI recently received accreditation for three new tests for liquid hydrocarbon analysis. These tests for elemental analysis and total acid number are designed to support the work being done at GTI to advance the patented IH2[®] technology—a catalytic thermochemical process that provides a cost-effective route to producing liquid transportation fuels from renewable sources, one of GTI's hot areas of research right now.

The Analytical Chemistry Laboratory's range of analytical services covers the spectrum of chemical, molecular, and atomic analysis techniques. Our experts have contributed to and written many ASTM standard methods that are used today. They are knowledgeable in developing validated test methods for unique and client specific applications.



Microbially Influenced Corrosion Testing

GTI's Environmental and Microbiology Laboratory offers solutions to many energy industry problems through state-of-the-art microbiological research and testing services by integrating molecular genetics techniques to areas such as pipeline microbial corrosion prevention and treatment, microbial characterization, molecular biology, and anaerobic digestion studies. Our microbial influenced corrosion (MIC) testing service uses quantitative polymerase chain reaction (qPCR) testing to directly detect and quantify (without prior growth) corrosion-causing microorganisms typically found in pipes, production wells, and other equipment used by the natural gas, petroleum, chemical, water, produced water and wastewater industries. This qPCR testing is the first MIC analytical service accredited by A2LA. GTI was a pioneer in applying molecular technology to MIC detection, and the first one to use qPCR techniques, starting back in 2002.

GTI Testing Laboratories employs numerous other environmental forensic tools to address contamination and corrosion issues for industry customers. These can include analyses such as volatile fatty acids, oil extraction and simulated distillation, and anionic and cationic elemental distribution. Through a methodology called "Chemical Fingerprinting," GTI is able to identify source contamination of trace-level organic compounds by using gas chromatographic techniques to identify chemical compounds of interest. Included in this is Gas Chromatography/Mass Spectrometry (GC/MS), which can sensitively quantify the concentrations of organic contaminants present within a sample, and Gas Chromatography/Isotopic Ratio Mass Spectrometry (GC/IRMS), which measures stable isotope ratios of carbon to discriminate between different sources of carbon-containing contaminants.



Materials Analysis



GTI's Materials Analysis and Characterization Laboratory (MACL) has built its success by focusing on the fundamental properties and characteristics of materials. Forensic analysis of polymers, metals, and composites gives our clients the ability to better understand materials and their potential failure mechanisms before

they become much larger problems. Standard and customized tests are conducted to determine density, thermal properties, tensile

strength, compression, mechanical properties, and other characteristics. Advanced equipment such as a Scanning Electron Microscope (SEM) is used for microstructural examinations and chemical composition determination.



Coatings

Pipeline coating testing is critically important to the gas industry. Our scientists and engineers can run an array of tests to ensure you have the best coating for your particular application. Abrasion/chip resistance, adhesion, cathodic disbondment, coating thickness/hardness, chemical attack, impact/penetration resistance, QUV, water absorption/penetration, and other properties are thoroughly tested.



Chemical Corrosion

Corrosion is also a major concern in many industries: natural gas and petroleum products transmission and distribution, water and electrical utilities, building construction, railroads, steel manufacturers, and the automotive industry, to name just a few. Corrosion testing and prevention is essential to the future of the natural gas industry. A variety of chemical and electrochemical techniques can provide you with the necessary information about a substance's resistance to corrosion. Acid tests, voltammetry, Tafel plots, electrochemical impedance, and potentiostatic/dynamic polarization are just a few of the methods we employ to give you the most information possible. We can simulate various conditions to test corrosion inhibitors, a material's pitting and corrosion resistance, and calculate a material's metal-loss rate.



Plastics Testing

GTI Testing Laboratories also has a world-class plastic and metal pipe testing facility. A series of environmentally controlled large-bay (25' high) labs with 5-ton overhead cranes provide the capability to fully evaluate metallic, polymer, and composite piping systems. This includes full-scale burst, hydrostatic, cyclic, and accelerated testing. The same testing can be applied to evaluate all applicable joining systems and appurtenances.

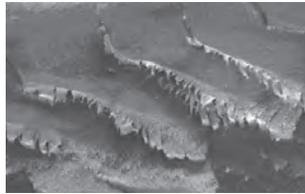


Failure Analysis

Failure analysis is the process of collecting and analyzing data to determine the cause of a failure. No matter what the industry, failures in the field can be costly and dangerous. The risks of explosion, property damage, and human injury mean that when components fail, you need to know why, and you need to know quickly. GTI Testing Laboratories' scientists and engineers can help you determine the how and why of field failures. Our goal is to provide you with a clear understanding of the circumstances leading to the failure and the steps necessary to prevent it from happening again.

The following list catalogs the most common causes of failure:

- > Design deficiencies
- > Material selection errors
- > Material defects
- > Processing defects
- > Service-driven failures



Failure investigations typically focus on operating parameters, system, and component design, as well as considering condition and maintenance history. With these processes in mind GTI Testing Laboratories uses a multi-layered analysis process to get to the heart of the problem. Samples of failed components

are subjected to rigorous scrutiny, starting with visual inspection, photography, and then moving on to a variety of analyses, depending on the progressive act of discovery, until the final



failure mode can be determined. Once we discover the root cause, we relay your results so that you thoroughly understand how and why the failure occurred. We will also recommend both corrective and preventive actions to reduce future risk of failure and optimize performance.



GTI Testing Laboratories Follows Good Laboratory Practices

It is the consistent policy of GTI Testing Laboratories that good laboratory practice (GLP) and quality assurance/quality control (QA/QC) procedures are implemented to comply with client and contractual obligations. Our management policies, objectives, principles, organizational responsibilities and standard operating procedures were developed with the goal of providing quality control from receipt of samples at the laboratory to generation of final reports. Our highly qualified staff uses state-of-the-art and well-maintained equipment and follows recognized standard tests such as NACE, ASTM, EPA and GPA methods whenever possible. Standards traceable to NIST are used for instrument calibration if they are available. A networked laboratory information management system (LIMS) is employed to enable rapid and precise sample status tracking, accurate accounting and data reporting, and vital controls of quality and cost.

If the test you need is not listed, or if you are not sure what kind of tests you need, please do not hesitate to contact us for more information. Put our scientific and engineering expertise to work for you.

For More Information

Karen Crippen, R&D Manager
847-768-0604

Tony Kosari, Industrial Testing Manager
847-768-0998

gtilabs@gastechnology.org
www.gastechnology.org/gtilabs