



the Energy to Lead

GTI Lab Tour

> November 17, 2009

gti[®]

GTI Lab Tour: Schedule and Contact Info

> RSVP Contact:

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Or ron.edelstein@gastechnology.org

> Please RSVP by November 3, 2009

> Tour:

- Leave hotel at 2:30

- Tour

- Refreshments

- Return to hotel by 5:30

> Casual dress, flat shoes

Lab Tour Summary

GTI website: www.gastechnology.org

Tour Stop 1: Residential/Commercial Appliances Laboratory

Tour Stop 2: Industrial Combustion Laboratory

Tour Stop 3: Advanced Transportation Systems

Tour Stop 4: Plastic Pipe and Distribution Labs

Tour Stop 5: Flex-Fuel Test Facility

Stop 1: Residential/Commercial Appliances Laboratory

GTI's Residential/Commercial Appliances Laboratory is designed to foster the development and advancement of gas appliances in terms of efficiency, safety and performance.

Capabilities

- > Some of the applications for both residential and commercial markets that have been developed within this laboratory include:
 - Deep fat fryers, griddles, charbroilers
 - Conveyor pizza ovens, bakery ovens, range tops
 - Steam cookers, combi ovens
 - Water heaters, combination water and air heaters
 - Steam generators, building humidifiers
 - Desiccant space conditioning systems
 - Appliance venting systems

Stop 1: Residential/Commercial Appliances Laboratory—cont.



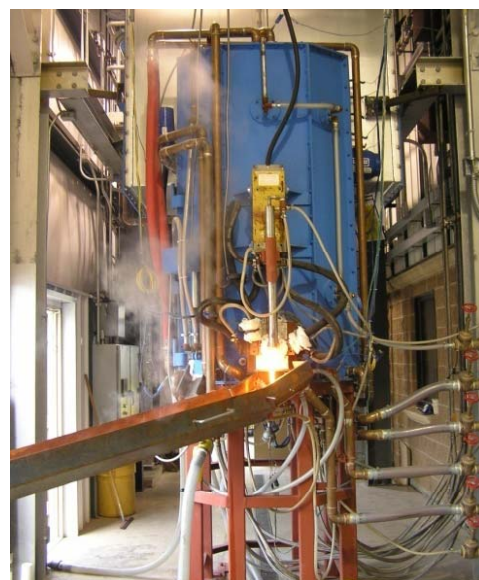
Stop 2: Industrial Combustion Laboratory

Through its Combustion Laboratory, GTI is addressing the growing demand for clean (low-emission), efficient and reliable combustion technologies. Within the 10,000 square-foot facility, researchers develop and evaluate advanced steam, power, heat transfer and combustion technologies for use in commercial and industrial systems. The facility is used for industry-government collaborative projects as well as for proprietary product development and evaluations.

Some of the applications that have been developed within this laboratory include:

- > **Submerged Combustion Melting (SCM)**—This is a process for producing mineral melts by bubbling combustion gases through the bath of material being melted, resulting in a 10–5% reduction in fuel use, 80% reduction in capital cost, 85% reduction in floor space, and a substantial reduction in emissions.
- > **Flexible Combined Heat and Power (Flex CHP)**—GTI has packaged a standard, electricity-producing microturbine with a patented reburner and heat recovery boiler which boosts overall efficiency from 22% to 84% while reducing emissions proportionally.
- > **Transport Membrane Condenser (TMC)**—This advanced compact heat exchanger recovers both latent and sensible heat from gases. It has been proven to increase boiler efficiency by 10–15% and is now being applied to residential furnaces, power plants and many other applications.

Stop 2: Industrial Combustion Laboratory—cont.



Stop 3: Advanced Transportation Systems

This area focuses on technology research, development, and demonstrations for vehicles, fueling stations, fuel production and portable power systems.

Capabilities

- > Compressed Hydrogen Fueling Station
 - First publicly accessible station in the Midwest
- > Compressed Natural Gas (CNG) Fueling Station
 - Has serviced local fleets and O'Hare remote parking lot buses since 2001
- > Liquefied Natural Gas Production Plant
 - Small scale plant demonstration unit. Technology licensed to Linde-BOC for on-site LNG for fleets
- > Mobile Hydrogen Unit (MHU)
 - Can support pilot programs for 1–4 hydrogen fuel cell vehicles
- > Environmental Test Chamber
 - Used in the development of dispenser technologies and high-pressure gas system component testing
- > Hydrogen Production Test Cell
 - Development and testing to reform natural gas, ethanol and other sources to produce hydrogen

Stop 3: Advanced Transportation Systems—cont.



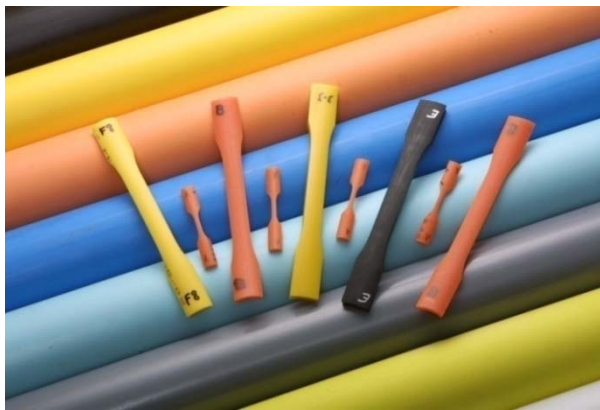
Stop 4: Plastic Pipe and Distribution Labs

Maintaining the integrity of plastic piping systems is critical in the operation of many industries. Annually, more than one billion pounds of various types of plastic pipes are shipped for use in gas distribution; water treatment and distribution; oil, gas, and chemical production; and as conduit for telecommunications and other applications.

For more than 50 years, GTI has been a leader in providing expert research, development, and testing services for plastic pipe and piping products.

Capabilities and Facilities

- > Long-Term Accelerated Temperature and Pressure Testing
 - To evaluate plastic pipe and fittings service lifetimes
- > Short-Term Pressure Testing
 - To evaluate pipe and fittings overall short-term bursting strength
- > Wide variety of plastic pipe materials testing and joining abilities



Stop 4: Plastic Pipe and Distribution Labs—cont.

Capabilities and Facilities

- > Fabrication Lab
 - Large-Scale CAD CAM CNC Machining Capabilities
 - Complex metal and plastic cutting for prototypes and sample preparation
- > MIG TIG Stick Welding and Plasma Cutting
 - Full range of pipe joining, beveling and cutting
- > Machining Capability
 - Rotary 3D tool paths for sampling and tools manufacturing
- > Dent/Gouge Loading Machine
 - To evaluate mechanical damage on steel pipes
- > Plastic pipe stress tests (S4 tests) and evaluation of liquid gas on pipe couplings
- > Various temperature-controlled chambers for environmental conditioning of pipes



Stop 5: Flex-Fuel Test Facility

Dedicated in 2003, GTI's state-of-the-art Henry R. Linden Flex-Fuel Test Facility (FFTF) for Thermo-Chemical Conversion of Fuels evaluates advanced and innovative gasification processes and facilitates the commercialization of advanced gasification and downstream end-use technologies.

With the support of the gas industry, the State of Illinois (ILDCEO), Carbona, and Rocketdyne, GTI has recently constructed a multi-million dollar advanced gasification test facility (AGTF) addendum to the FFTF to address the need for more thorough evaluation of gasification technology as well as other processes for the thermal and chemical conversion of feedstocks to fuel.



Stop 5: Flex-Fuel Test Facility—cont.

Capabilities

- > The FFTF employs GTI's fluidized-bed gasifier as a primary platform for testing coal and a variety of other solid fuels, including biomass. The facility's flexible design allows for the testing of a variety of cleanup systems. The gasifier and feed system are configured to allow simultaneous cofiring of coal with biomass or other opportunity fuels in the future.
- > The facility is available for use by organizations and companies conducting research on enabling technologies that have shown promise after laboratory and bench testing and that need to be proven at the next scale for long-duration tests. These systems can be tested on either slip-streams from the gasifier or on the full gas stream.

