HITech Aero Braze Division
Experts and Pioneers in the Field of Stainless Steel Brazing

Since 1943, HI TecMetal Group, Inc. has specialized in various braze processes **including** vacuum brazing**,** hydrogen brazing**,** induction brazing **and** diffusion bonding. We also offer critical heat treating and welding processes of refractory and specialty metals under the requirements of the Nadcap and **ISO 9001:2000** quality assurance systems.

Our Engineering Staff has years of experience with research and development work, production quantities or complete turnkey manufacture complete to print fabrication. We have years of experience in material science, problem analysis, production methodology and fabrication design. Our Production Staff has a proven track record of high quality output and on-time delivery. Whether your project is for one piece or thousands we are ready to help you succeed.

Hydrogen furnace brazing is one of the processes used at HTG to fabricate assemblies for production aerospace assemblies, food equipment, controls, devices, security, instrumentation, automotive and a host of other prototype and production brazements.

- Our well established experience with hydrogen brazed assemblies assures the highest integrity assemblies for critical service. Helium
- Parts emerge from the furnace with clean and bright surfaces free of oxidation and contaminants. Hydrogen brazed assemblies' exit the furnaces immediately ready for further assembly or processing steps without additional operations or processing.
- With exceptional equipment maintained to the highest standard processing HTG is able to selectively braze or heat-treat products for specialized applications.

HTG Additional Capabilities Include:

- Vacuum, hydrogen retort brazing and heat treating.
- Component part press assembly
- CDW, RW and GTAW welding
- Temperatures to 2650° F
- Induction brazing in hydrogen environments
- Leak testing

General Product & Process Information

EXAMPLES OF FURNACE BRAZED PARTS:

Market/Category	Product Description	Process	Temperature (°F)	Equipment
Food/Equipment	Fig. 1 Commercial Cookie Tray	Nickel Braze NSF Approved	2050°F	Vacuum
Automotive/Heat -Cool	Fig. 2 Stainless Steel Fittings	Copper Braze	2050°F	Hydrogen Belt Furnace
Aircraft/Engine – Rolls Royce	Fig 3 [On Left] Hydraulic Sump Assembly	Copper Brazed	2050°F	Hydrogen Belt Furnace
	Fig 4 Plate	Gold Brazed	2150°F	Vacuum Furnace
Hydraulics/Valves & Fittings	Figure 5 Fluid Valve	Nickel Brazed	1950°F	Hydrogen Belt Furnace
Automotive/Fuel System	Figure 6 Fuel Filter Housing	Copper Brazed	2050°F	Hydrogen Belt Furnace
Aerospace/Engine	Figure 7Fuel Nozzle	Nickel Brazed	2000°F	Vacuum Furnace

Aerospace/Engine/Blades & Vanes	Figure 8 Vane & Inserts [Baffles]	Nickel Brazed	2200°F	Vacuum Furnace
Aerospace/Engine/Rotating Parts	Figure 9 Honeycomb Seal	Nickel Brazed	2200°F	Vacuum Furnace
Stationary Power/Stirling Engine	Figure 10 Sterling Engine Head	Nickel Brazed	2050°F	Vacuum Furnace
Automotive/Fuel Cell	Figure 11 Fuel Cell Regenerator	Nickel Brazed	2050°F	Hydrogen Belt Furnace
Stationary Power/Stirling Engine	Figure 12 Sterling Engine Head	Nickel Brazed	2050°F	Vacuum Furnace

PHOTOGRAPHS AND ILLUSTRATION

Figure 1 Nickel Brazed Commercial Cookie Tray

Figure 2 Stainless. Steel Automotive Fitting – Copper Brazed

Figure 3 Hydraulic Sump Ass'y Copper Brazed

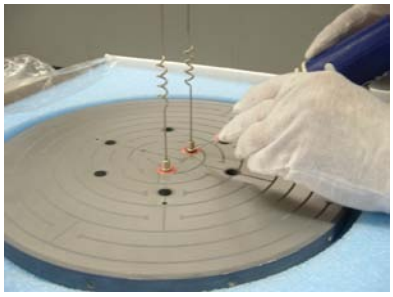


Figure 5 Fluid Valve

Figure 6 Fuel Filter Housing

Figure 7Fuel Nozzle

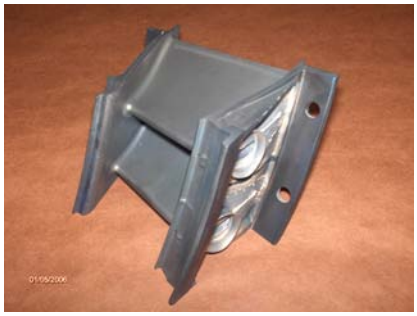


Figure 8 Vane & Inserts

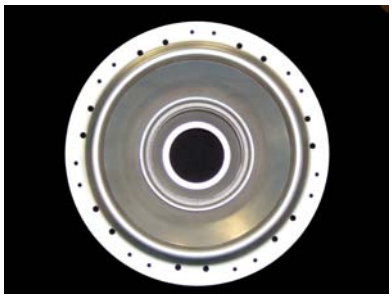


Figure 9 Honeycomb Seal

Figure 10 Sterling Engine Head

Figure 11 Fuel Cell Regenerator

Figure 12 Sterling Engine Head

HTG also provides these additional services:

- ✓ Parts Cleaning [continuous washing equipment]
- ✓ Braze Joint assessment and redesign for cost and quality improvement
- ✓ Braze Engineering Consultation – HTG is a braze Expert
- ✓ Design and Development of Assembly & Weld Tooling [Illustration 1, 2 & 3]
- ✓ Design & Fabrication of Product Assembly Cell [Illustration 4, 5]
- ✓ Design and Development of Braze High Temperature Fixturing [Illustration 6 & 7]
- ✓ Parts Assembly for braze
- ✓ Tack welding CTW, GTAW, RW
- ✓ Testing – Visual, Leak Decay, Water Submerge, Dimensional [Illustration 8,9 & 10]
- ✓ Packaging and Shipping [Illustration 11]

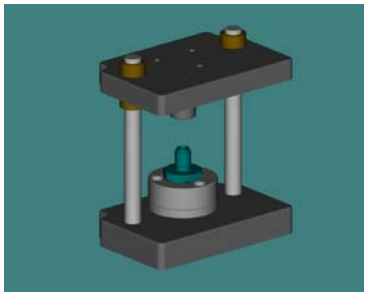


Illustration 1 Press Assembly Tool

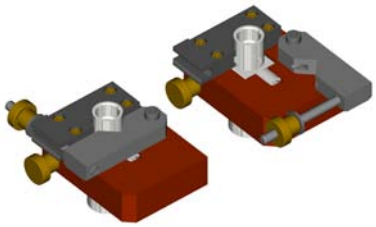


Illustration 2 Tack Weld Tooling

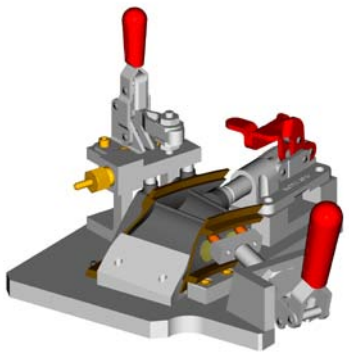


Illustration 3 Tack Weld Fixture

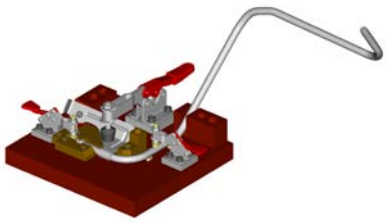


Illustration 4 Tack Weld Fixture

Illustration 5 Design & Fabrication of Product Assembly Cell

Braze Assembly & Weld Tooling and Fixtures

Illustration 6 Braze Fixtures to Hold parts in Location During Brazing

Illustration 7 Braze Fixtures to Hold parts in Location During Brazing

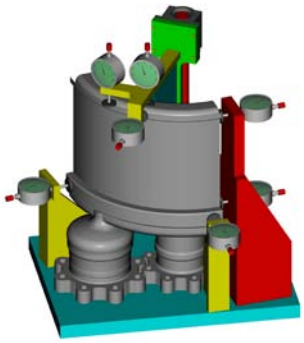


Illustration 8 Dimensional Inspection Fixture

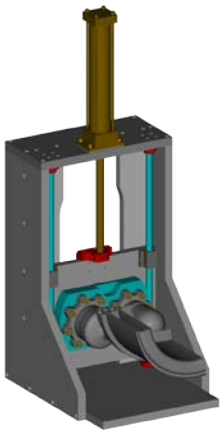


Illustration 9 Leak Test Fixture Submerge Water

Illustration 10 Leak Decay Test Fixture

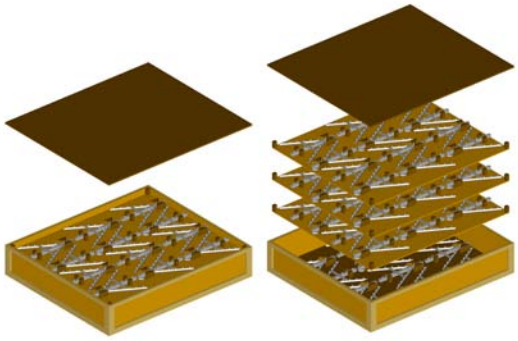
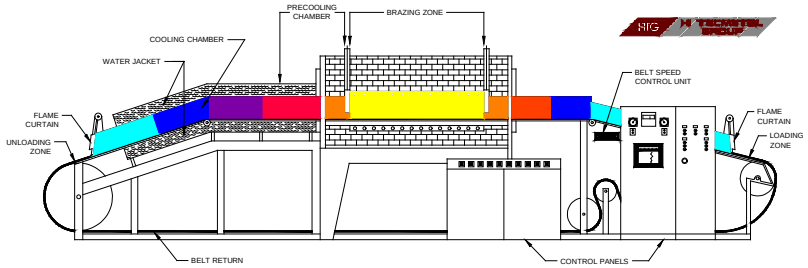


Illustration 11 HTG Designed and Built Packaging

Equipment

HTG utilizes continuous humpback belt, retort, box and vacuum furnaces in order to produce high quality brazements. Good Brazing-joint-design is essential to successful process application. One should not attempt to braze joints that were conceived for different processes like welding or soldering, unless they are redesigned with brazing requirements in mind. Brazing can be the perfect and most economic process for joining suitable applications, if all factors are duly accounted for in design and planning.

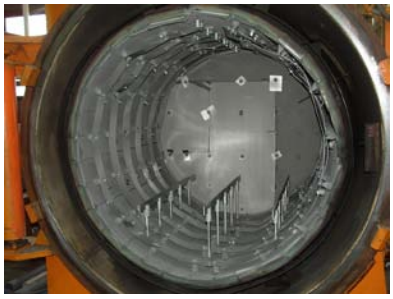


Impeccable equipment maintenance enable HTG produces high atmosphere integrity and control which are key to the successful brazing of stainless steel components. The presence of oxygen or moisture in the furnace will oxidize the surfaces to be brazed and result in defective braze product. Stainless steel has a high affinity for oxygen at high temperatures and the presence of oxygen or water vapor in the furnace must not be present. Both vacuum furnaces and humpback furnaces have been the traditional systems used to braze stainless steel because of their ability to ensure a very low oxygen partial pressure in the atmosphere.

HTG specializes in precision vacuum brazing. The process is routinely used to join critical assemblies that may employ delicate or intricate features. Titanium, copper, stainless steel, ceramics, aluminum, steel, tungsten carbide, and tungsten are some of the materials joined.

HTG Braze engineers have a wide range of experience in materials joining which enables us to use the best practices combined with exacting process conditions for the product application.

- When beneficial, a partial pressure braze technique is used to limit sublimation or evaporation of braze filler metal.
- Products that are manufactured include sensors, detectors, cathodes, cold plates, heat exchangers, and biomedical assemblies



HTG Vacuum Capabilities Include:

- Assembly weights to 5,000 pounds
- Size greater than 48 inches in diameter and 60 inches in length
- Temperatures range to 2350° F
- Design for manufacturability review, assembly, testing and technology transfer programs are all within the scope of what we do.
- A wide range of experience in materials joining enables us to use the best process conditions for the assembly application
- Products that are manufactured include fuel nozzles, fuel lines, bleed-air fabrications, sensors, radiation detectors components, cathodes, cold plates, heat exchangers, and biomedical assemblies

HTG Capabilities Include:

- Assembly weights to 10,000 pounds
- Size greater than 52 inches in diameter and 100 inches in length
- Temperatures range to 1800° C
- Design, testing, and technology transfer programs

Quality

Usual quality requirements are applied, depending on the application. Once the Brazing Procedure Specification has been approved, process control is applied in all stages of production from preparation to final delivery.

HTG's Quality Policy is the total satisfaction of both internal and external customers.

Our employees are committed to understanding and meeting customers' evolving needs. HTG's continuous improvement, operational excellence, and commitment to ISO 9001 facilitate innovative product and quality solutions.

ISO 9001: 2000 Certificate of Registration

Figure HTG/HITech Aero Braze Division

Also specializes in the Bright Heat Treatment of Stainless and Alloy Steels