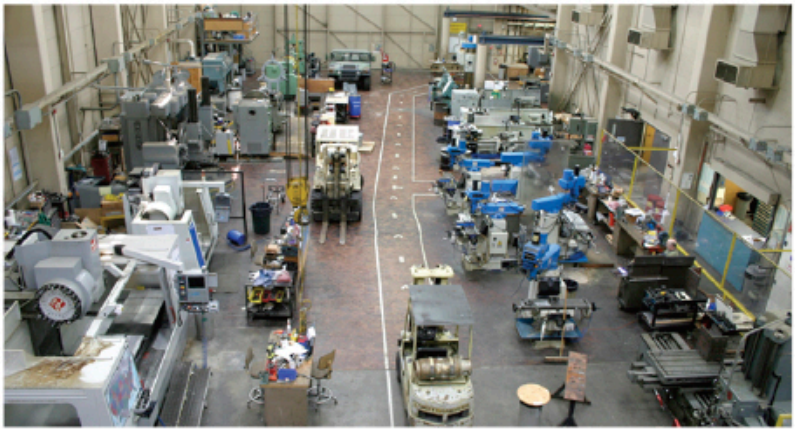
Prototype Fabrication Capabilities



CEM provides a number of unique capabilities to the UT Cockrell School of Engineering and our research partners. CEM researchers and technical staff have decades of experience in the design, fabrication, and test of novel machines. The high bay area houses extensive fabrication, assembly, and testing facilities in a 140,000 sq ft air-conditioned space. The 70 ft tall high bay features two 25-ton cranes with an additional 25-ton crane servicing a machine shop area.

CEM uses a distributed manufacturing approach for fabrication of novel machine prototypes. When components can be fabricated by conventional industrial practices, they are outsourced to experienced suppliers. However, when materials or other factors beyond current industrial capability are required, CEM researchers develop new fabrication processes in-house. If the new processes become routine practice, they are transferred to industry so the results of the earlier work are available through a competent base of industrial suppliers. In this way, CEM research remains focused on novel systems and research.

Milling Machines

- Haas Model VF7 Machining Center
- Hurco CNC Model DM1
- Giddings & Lewis 3" Horizontal Boring Mill
- Summit 350 3 hp 10" x 50" Table (2x)
- Summit 550 5 hp 11" x 52" Table (3x)

Lathes

- Victor 20" x 80"
- Sheldon 6" x 24"
- Ryazan 52" x 16"
- King Verticle Turret 62"Table 48" Height
- Victor 17" x 60"
- Sebastian 13"x 32"
- Hercules 32"x 80"

Welding Shop

- 1200 sq ft external shop used for prototype welding
- Equipped with an ESAB 2-axis oxy-acetylene table, along with both metal/inert gas (MIG) and tungsten/inert gas (TIG) welding machines

Drill Presses

- Summit Radial Arm 18" Column 6' Arm
- 2 Miscellaneous Drill Presses

Grinders

- K.O Lee Surface Grinder
- 2hp Tool Post Grinders (2x)
- Hammond 8" Pedestal Grinder
- Rockwell Disc / Belt Sander

Saws

- Tannewitz Band Saw 36" Throat
- Kalamazoo Horizontal Band Saw 6"x 12"

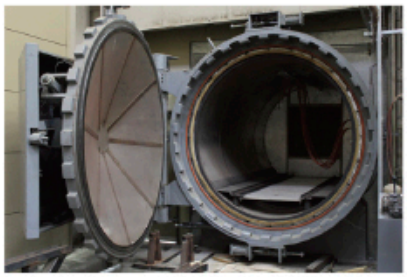
Composite Fabrication

CEM has significant in-house expertise in the design, analysis, and manufacturing of composite structures used in high performance rotating machines. To aid in rapidly prototyping complex composite structures with known mechanical properties, CEM developed a Composite Analysis tool called CEMWIND that generates detailed material property data that can be exported to finite element analysis codes, along with programs that control fiber placement and orientation in the filament winding machine.

Filament Winding

This dedicated low lab space equipped with environmental controls houses a McClean Anderson 5-axis CNC filament winding machine. The system is capable of processing parts up to 66 in. in diameter and 40 ft long using both wet winding and pre-impregnated fiber tows. The winding machine has been modified with a specially designed fiber payout system to enable processing of high modulus graphite fibers with minimal fiber damage.

Autoclave



A dedicated autoclave, manufactured by American Autoclave, is used to cure composite structures. The fully programmable autoclave is rated for 650° F, 250 psig, and can process composite parts up to 7 ft in diameter and 11 ft long. The autoclave can process a range of materials including epoxies, cyanate esters, BMIs, some lower temperature polyimides, and thermoplastics.

Material Characterization

CEM developed a burst test method for characterizing the tensile strength and modulus of filament wound composite rings. The hydroburst test fixture enables a reliable and cost-effective method for assessing material properties of advanced composites (fibers, resins, and fillers including nanoparticles). The fixture can be operated at room or elevated temperature and enables statistically significant generation of critical thermo-mechanical properties, which can be used to establish material design allowables.

Other Assembly & Test Capabilities

Overhead Cranes

Two 25 ton overhead cranes for main high bay area, additional 25-ton overhead crane for machine shop, smaller 3-ton crane in auxiliary machine shop.

Available Power

In addition to various bench top instrumentation power supplies, CEM also has a 250 Volt 6,000 Amp dc power supply located in the main high bay. 4160 V available in the second story transformer vault, with 480 V available throughout the high bay.

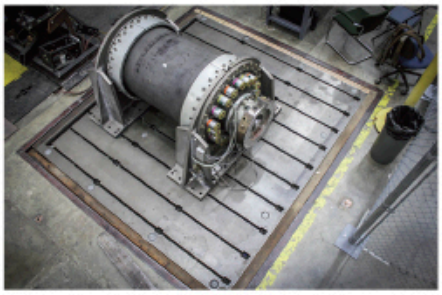
Granite Slab

Available for precision assembly.

Additional Materials

Large capacity of chilled water onsite hydrogen production. Two 400 hp motoring supplies.

Tie Down Pads



Five machine tie-downs throughout the high bay.

Assembly Press

The primary hydraulic composite assembly press in the high bay is 40 ft tall and is capable of generating forces in excess of 500 tons with room for 20 – 25' parts and a 60 in. stroke, one smaller 200-ton H-press with 13 in. stroke, one smaller 200 -ton hydraulic four-column assembly press.

For more information, please contact:
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