Steel Casting Facilities

The Robert V. Wolf Foundry and Metal Joining Laboratory is a 5300 square foot laboratory that contains state of the art melting and casting equipment including 3 coreless induction melting furnaces (1 non-ferrous and 2 ferrous) that allow for melting, alloying and treatment of any type of steel. The lab also has available a variety of mold and pattern technologies including green sand, lost foam, Palmer system for chemical bonding, investment shell, centrifugal casting, and gravity die casting. Adjacent labs have rolling facilities for hot and cold rolling of ingots produced in the foundry and a 25 lb vacuum induction melting furnace. The lab also has a full chemistry lab for Celox dissolved oxygen, Leco total oxygen and nitrogen, a Leco C & S analyzer and a arc spectrometer for full chemical analysis.

The lab also contains metal joining equipment (oxy-acetylene welding, shielded metal arc welding, and gas metal arc welding/MIG) available for welding and fabrication. The lab also has equipment for casting sample preparation (cut-off saws, band saws, grinding and shot-blasting equipment). A machine shop is available for all types of machining associated with research.

Other laboratories containing specialized research equipment to support the melting and casting laboratories, include an ASPEX-PICA 1020 inclusion analysis system, various small furnaces for melting, simulating solidification, and treating liquid metal.
Mechanical Testing

The Edward and Helen Lasko Materials Testing Laboratory is 1400 ft² dedicated to studying the static and dynamic properties of metals, ceramics, polymers and various composites. The facility is now home to three, fatigue-rated MTS servohydraulic test frames, two Instron screw-driven test frames for high temperature testing of ceramics, Charpy V-notch impact testing, instrumented impact testing for the determination of dynamic fracture toughness, high strain rate testing using a split Hopkinson pressure bar, and hardness testing equipment. The MSE materials test laboratory currently supports MSE, Nuclear, Civil and Mechanical engineering users. This facility utilizes modern digital control and acquisition.

The MTS model 810 test frame is equipped with the “voice coil” servo-valve that enable the hydraulics to be operated under load control at 1000 Hz. The maximum frequency is dependent upon specimen stiffness. Lower specimen stiffness lowers the maximum attainable frequency. For steel specimens, the 1000 Hz test frequency is attainable and fatigue lives of $10^9$ cycles are produced in 11.5 days under continuous operation. The downside to operating this equipment is that at 1000 Hz, the machine generates 100-110 dB at the same frequency. As a result a sound enclosure was built to house the new test machine.

The newest test frame acquisition is an MTS Landmark 370 servohydraulic test frame; the 250 kN actuator is integral to a 500 kN rated test frame and is equipped with MTS 647 hydraulic wedge grips that are fatigue rated at 250 kN in fully reversed loading.

S&T Materials Testing Laboratory
Research Facilities & Equipment

Additional facilities include a thermal processing laboratory, (2,500 ft² dedicated to heat treating and thermal treatments) and additional laboratories associated with the Graduate Center for Materials Research (MRC)

The Graduate Center for Materials Research (MRC)

Started in 1964, 28,000 ft² houses Materials Related Analytical Equipment Advanced Materials Characterization Lab

2009 Helios Nano Lab 600 Focused Dual Ion Beam microscope

2010 FEI Tecnai G2 F20 Nano-Analysis System

Multi-Purpose Diffractometer 2000 ° C Capability

FEI HELIOS NANOLAB SEM/FIB

<table>
<thead>
<tr>
<th>Gun</th>
<th>Schottky FEG emitter</th>
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<tr>
<td>Ion Column</td>
<td>500V-30KV, up to 22nA</td>
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<tr>
<td>Electron Column</td>
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<td>Detectors</td>
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<td>Attachments</td>
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Model and Simulation Research Software

The steel manufacturing research center utilizes a variety of modeling and simulation software applicable to fluid flow, thermodynamics, kinetics, process modeling, casting and solidification, thermomechanical processing and microstructural simulation utilizing several commercial as well-as in-house software packages.

Factsage
Fluent
METSIM
Excel VBA
COMSOL
MICRESS
ANSYS
ABAQUS
MATLAB
DFT Atomistic Modeling
LAMMPS
LS-DYNA

The STEEL MANUFACTURING RESEARCH CENTER at Missouri S&T has even more to offer!

We have much more extensive labs and facilities than we can show you here. Please feel free to contact us and request a tour.