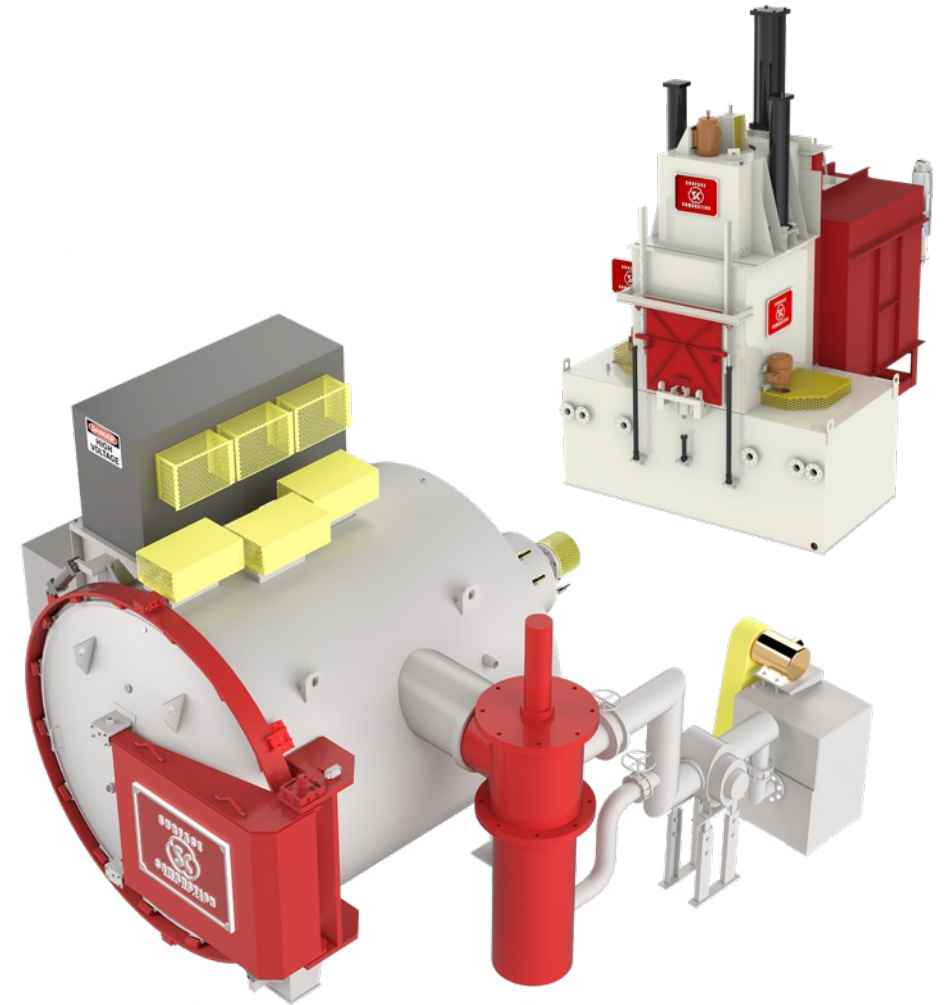




Vacuum vs. Atmosphere Furnace Guide

This presentation talks about the difference between vacuum and atmosphere vacuum furnaces. Follow by an outline of some of the vacuum furnaces we manufacture.





Vacuum Furnaces

How They Work

Vacuum furnaces operate by removing the air and any potential contaminants from the chamber, creating a vacuum environment.

Atmosphere Furnaces

How They Work

Atmosphere furnaces control the furnace atmosphere through the introduction of specific gases (e.g., nitrogen, hydrogen, or a mixture) to prevent unwanted chemical reactions between the materials being processed and the surrounding environment.



Vacuum Furnaces

How They Work

Vacuum furnaces operate by removing the air and any potential contaminants from the chamber, creating a vacuum environment. An industrial vacuum pump is used to evacuate the furnace. This process prevents oxidation, decarburization, and other surface reactions that might occur in the presence of air or other gases.

Advantages

- **High Quality of Finished Products:** Due to the lack of oxygen and water vapor, the processed work is free from scaling, oxidation, and other surface imperfections.
- **Control Over Atmosphere:** The vacuum environment allows for precise control over the furnace atmosphere if a specific gas is introduced, enabling specialized processes like sintering, brazing, and annealing.
- **Energy Efficiency:** Vacuum furnaces often heat materials more efficiently and can operate at higher temperatures, resulting in faster processing times.

Applications

- Ideal for heat treating metals and alloys that are sensitive to oxidation or require precise atmosphere control.
- Used in the aerospace, automotive, and tool & die industries for producing parts with superior mechanical properties and surface finishes.



Atmosphere Furnaces

How They Work

Atmosphere furnaces control the furnace atmosphere through the introduction of RX ® or Endothermic gases (e.g., nitrogen, hydrogen, or a mixture) to prevent unwanted chemical reactions between the materials being processed and the surrounding environment.

Advantages

- **Versatility:** Can handle a wide range of heat treatment processes by adjusting the gas mixture, such as carburizing, nitriding, and annealing.
- **Cost-Effectiveness:** Generally less expensive to purchase and operate than vacuum furnaces, making them suitable for larger production volumes.
- **Material Compatibility:** Can process a variety of materials, including metals, ceramics, and glasses, with relatively low risk of distortion or warping.

Applications

- Frequently used in the manufacturing of automotive components, machinery parts, and tools that require specific surface properties or case hardening.
- Suitable for industries where high throughput and cost efficiency are priorities.



Choosing Between Vacuum and Atmosphere Furnaces

Vacuum Furnace

- When processing materials that are highly reactive or sensitive to oxidation.
- For applications requiring high precision and superior surface finishes.
- On site greenhouse gas reduction
- Flameless work environment

Atmosphere Furnace

- For a broad range of heat treatment processes requiring specific gas atmospheres.
- When cost-effectiveness and versatility are more important than the absolute highest quality of surface finish.
- For higher volume production where the initial cost and operating expenses need to be minimized.

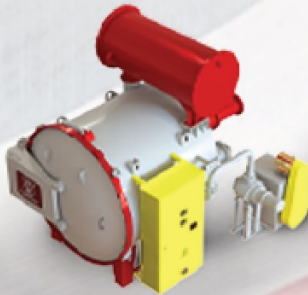


PRESENTING SURFACE COMBUSTION'S

VACUUM

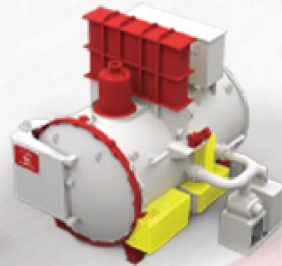
A M E R I C A N L E A G U E

ALL★STAR TEAM



RELIEF PITCHER

VacuDraw Tempering



LEADOFF HITTER

Multi-Chamber



POWER HITTER

Power Convection



STARTING PITCHER

Pit Vacuum



UTILITY PLAYER

Cloverleaf Vacuum



POWER HITTER

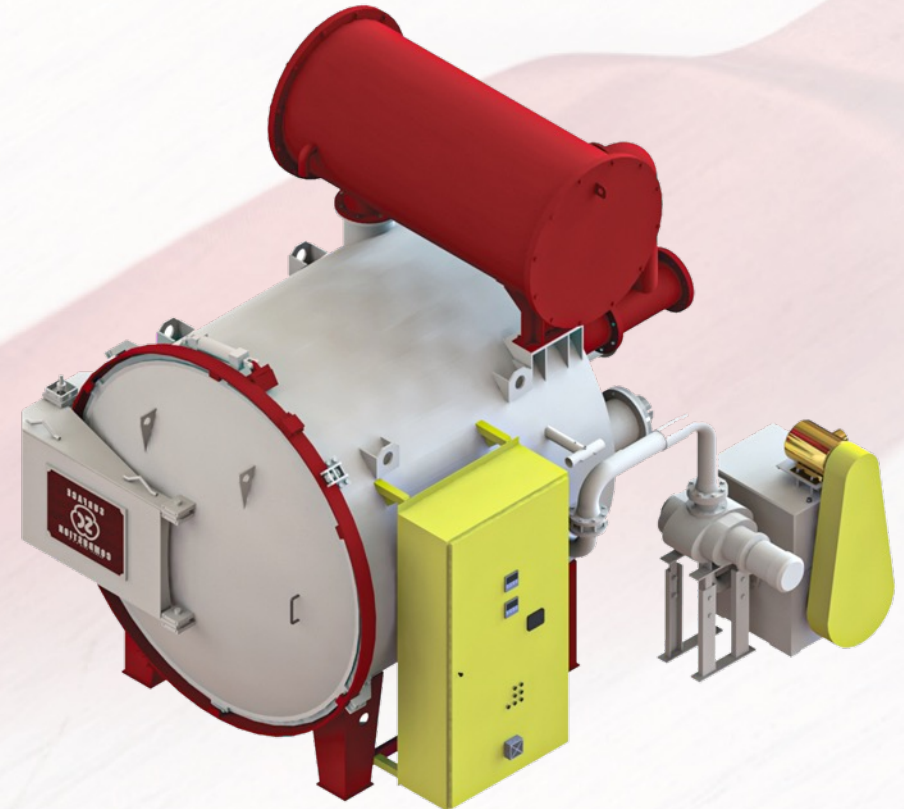
- **Robust Construction & Safety:** Engineered for durability and reduced loading risks.
- **Efficient Heat Transfer:** Rapid, uniform heat transfer and efficient convection cooling for small and large workpieces.
- **Versatile & Customizable:** Available in 2-6-bar and up to 10-bar designs, with rugged all graphite hot zones.
- **Vacuum Level:** 2, 6, 10 bar
- **Temperature Range:** 1000°F to 2400°F
- **Ideal Industries:** Automotive, Tooling, Molds and Dies, Medical





STRESS RELIEF PITCHER

- **Cost Savings:** More profitable cycles with significant cost advantages.
- **Improved Efficiency:** Convection heating slashes floor-to-floor time, optimizing production.
- **Enhanced Flexibility:** Supports various atmospheres, processes bright loads without a diffusion pump.
- **Vacuum Level:** 20 microns. Heating and cooling up to 2 Bar
- **Temperature Range:** 350°F to 1400°F
- **Ideal Industries:** Automotive, Commercial, Tool & Die, Agriculture, Off Road, Aerospace, Electrical Components





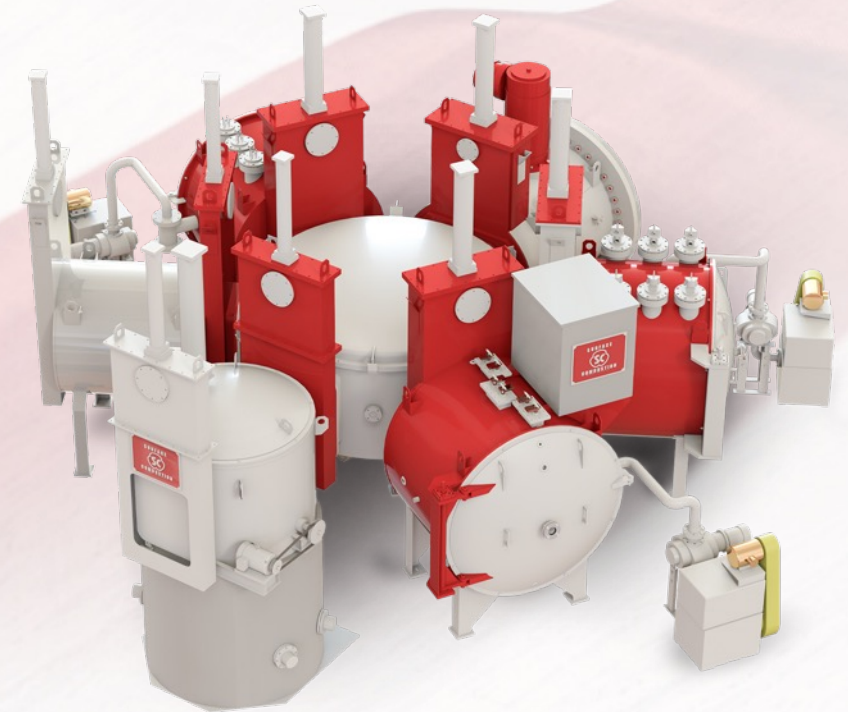
VACUUM
AMERICAN LEAGUE
ALL★STAR

UTILITY PLAYER

CLOVERLEAF VACUUM

Flexibility Meets Advanced Technology

- **Versatile Heating Options:** Gas-fired or electrically heated chambers cater to cost effective heating sources.
- **Advanced Automation:** Precision control with central turret for streamlined material handling.
- **Reliable & Maintainable:** Isolated maintenance capability ensures uninterrupted operation. Chambers can be opened to atmosphere for inspections or servicing while the system is still in operation.
- **Vacuum Level:** 20 Microns, Gas Quench Pressure up to 20 Bar or Oil Quench
- **Temperature Range:** 1000°F to 1800°F for Carb Chamber.
1000°F to 2400°F for High Purity High Temperature Chamber





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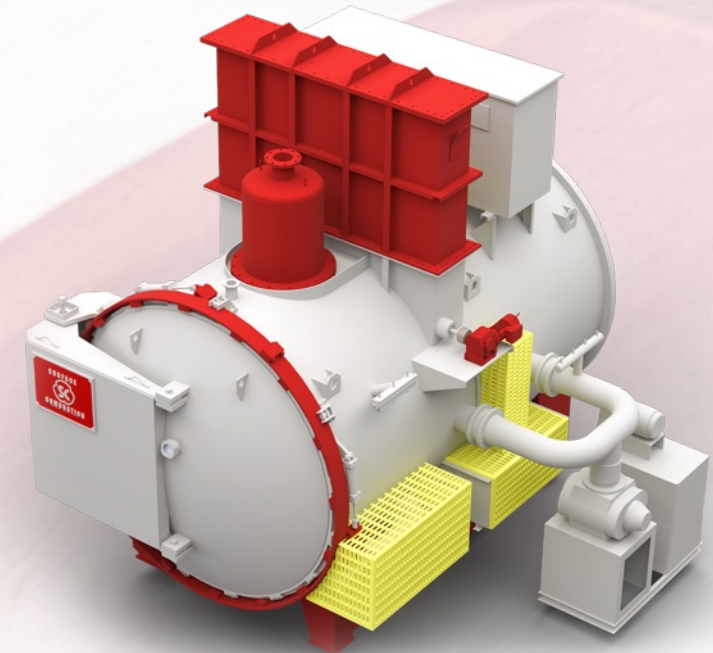


LEADOFF HITTER

MULTI-CHAMBER

Engineered for Reliability and Efficiency

- **Hot Zone Integrity:** Maximum hot zone integrity because the heating chamber stays under vacuum and at temperature at all times. Outside humidity and contamination never enters the hot zone while processing.
- **Flexible Quenching:** Gas or oil quenching capabilities meet diverse vacuum processing requirements.
- **Enhanced Cooling:** Superior cooling performance for increased productivity, higher part hardness, and faster turnaround.
- **Versatility in Application:** Engineering for heavy loads and high production lots.
- **Direct-Fired Solutions:** High velocity burners for fast, uniform heating.





**Surface[®]
Combustion**

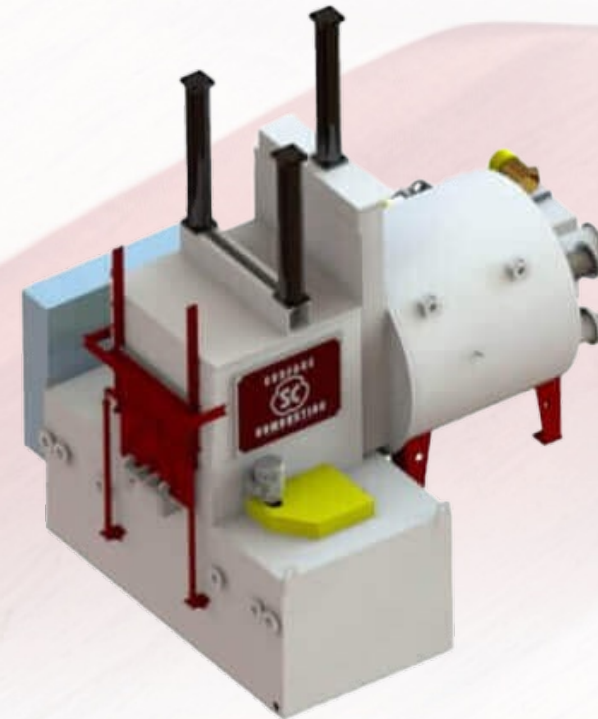
- **Customizable Designs:** Offers both standard and engineered pit furnaces tailored to specific industrial requirements.
- **Capacity and Size:** Standard models handle up to 30,000 lbs., with dimensions ranging from 24 to 120 inches in diameter and 36 to 144 inches deep.
- **Versatile Applications:** Suitable for large workpieces and small parts in baskets.
- **Advanced Features:** Equipped with proprietary high-temperature fans for efficient heat distribution.
- **Robust and Reliable:** Built with heavy plate casings and steel plate lids to enhance durability and operational efficiency.



CLEAN-UP HITTER

Industry's Leading Batch Integral Quench Furnace

- **Versatile Processing:** Handles multiple heat treating processes in one furnace.
- **Advanced Quenching:** Automatic transfers to various quenching media under protective atmospheres to prevent oxidation.
- **Enhanced Features:** Larger capacities, improved insulation, and advanced control systems.
- **Automation and Compatibility:** Equipped for automated processing with adaptable batch systems for diverse workpieces.
- **Vacuum Level:** 20 Microns, Oil Quench Oil (No Pressure or Bar)
- **Temperature Range:** 1000°F to 1950°F
- **Ideal Industries:** Automotive





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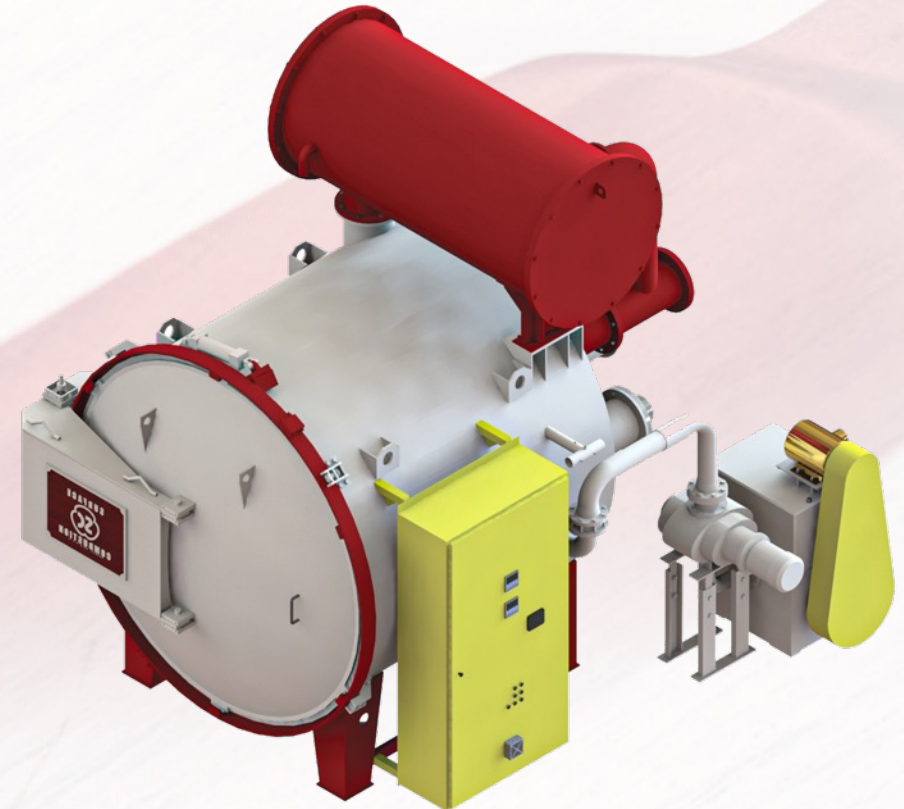


LONG RELIEVER

SOFTVAC VACUUM FURNACE

Pioneering Hot Wall Vacuum Technology

- **Enhanced Efficiency:** Features hot wall technology to reduce thermal loss and improve temperature and case depth uniformity.
- **High-Temperature Capability:** Reaches up to 1975°F, supporting high-temperature applications with advanced temperature control.
- **Flexible Atmospheres:** Operates with Vacuum, Nitrogen, Nitrogen/Hydrogen, or Air, catering to various industrial needs.
- **Multi-Chamber Options:** Available in single, 2, 3, and 4 chamber configurations to fit multiple-stage processing requirements.
- **Vacuum Level:** 20 Microns, Gas Quench 1.5 Bar





V A C U U M
A M E R I C A N L E A G U E
ALL★STAR



CONTROL PITCHER

CARBOTTOM FURNACE

Specialized in Precise Atmospheric Control and Efficiency

- **Advanced Loading Mechanism:** Facilitates easy and seamless loading and unloading, perfect for heavy and large batch operations.
- **High-Temperature Capability:** Operates across a broad temperature range from 1000°F to 2400°F, accommodating various materials and processes.
- **Atmosphere Control:** Specializes in precise atmosphere conditions using options like RX® and DX® gases and various nitrogen mixtures for optimal material properties.
- **Energy Efficiency:** Incorporates recuperative technology, improving efficiency by up to 29%, reducing both operational costs and environmental impact.
- **Durability and Longevity:** Built with robust materials for durability, with many units proven to operate effectively for over fifty years.



Thank you!