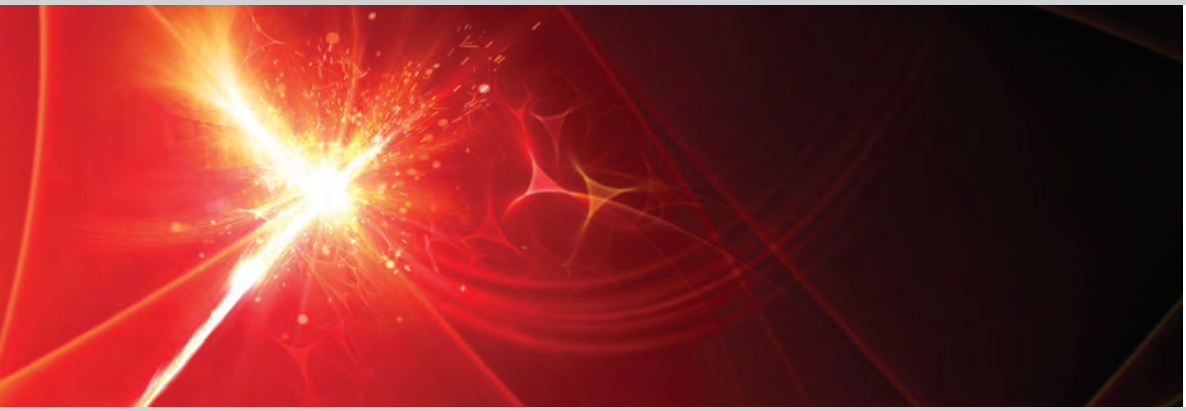
Rotary Furnaces

Innovative designs for advanced materials processing.



Harper International

Spark the future.™

Rotary Furnaces

Every Harper rotary tube furnace is designed for the customer's unique specifications. We bring innovative solutions to designs for continuous processing of advanced materials such as granular, powder, or particulate aggregates in high purity and specialty atmosphere environments at temperatures up to 2400°C.

Our rotaries offer exceptional versatility, reliability and energy efficiency. Our designs include multiple patented features that enable better mixing, resulting in improved heat transfer and mass transfer. The absence of moving parts in the tube support system provides a simple, reliable, robust design that enhances scalability. Additionally, the tumbling action of the product within the tube results in high degrees of temperature uniformity and gas-solid contact, producing a more homogenous product, reducing processing times and increasing production rates.

Harper offers the unique ability to accommodate a variety of process atmospheres that others simply cannot. Our excellent seal designs, advanced gas monitoring and handling systems, and indirect heating method allow the use of flammables and toxic gases. Harper approaches the design of a rotary furnace and calciner as a complete system, with the ability to incorporate process control systems, gas treatment and handling, turnkey installation and complete field commissioning. Field service can incorporate control instrumentation integration and programming as well as process engineering optimization and support.

Our experience in designing unique systems spans a range of advanced materials for use in a Rotary Furnace, including Metal Oxides, Powders, Rare Earths, Technical Ceramics, Graphene, Energy Storage Materials, Energy Generation Materials and more.

A. Harper has extensive experience in multi-zone rotary designs.
B. We offer a variety of customized material feed solutions.
C. Harper furnaces are ideal for processing various advanced materials.
D. Our advanced end seal design ensures atmospheric control.
E. Our expertise spans bench scale designs to full production lines.
F. Harper's designs include innovative patented features such as Helical flights.
G. Our Rotary sealing system is designed to ensure atmosphere integrity with minimal gas consumption.


A.


B.

After more than 85 years at the forefront of thermal processing solutions for cutting-edge materials, we're just getting warmed up.


C.

Rotary Furnace Design Enhancements

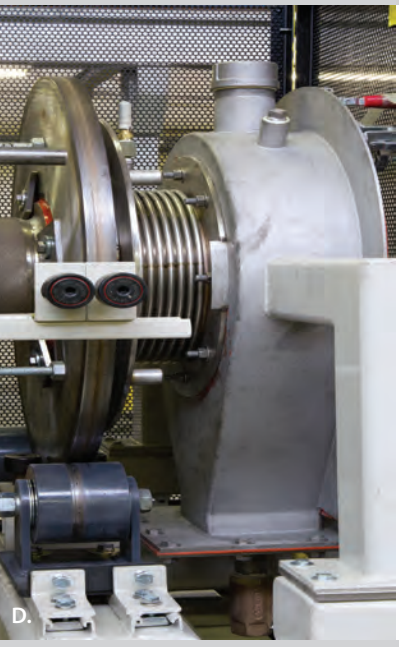
- Riffle flights – provide axial mixing for processing at a fixed average composition and are excellent for moderating exothermic reactions or continuous in-line mixing. Riffle flights enable similar benefits as standard continuous stirred tank reactors (CSTR), but in a continuous rotary tube format.
- Helical flights – convey material without back-mixing. Utilized for processes that require narrow residence time distributions.
- Cross Flow System – coarse, free-flowing material can be heated and reacted with through-flowing gas. Gas flows locally to the solid material path while globally flowing counter-current to material flow, providing superior gas-solid contact.
- Advanced Sealing System – patented rotary reactor sealing system provides optimal rotary tube furnace atmosphere integrity with minimal gas consumption

Capabilities & Features

- Temperatures to 2400°C
- Tube diameters to 60 inches (1.5 meters)
- Electrically heated or gas-, oil- or dual-fuel fired
- Controlled atmospheres including flammables and toxic gases – hydrogen, nitrogen, air, oxygen, ethylene, methane, CO2, CO, chlorine gas
- Variety of tube material designs – alloys, mullite, alumina, silicon carbide, quartz, graphite
- Process gas circulating and conditioning systems
- Automatic material handling and return systems
- Defined residence times
- Advanced seal design
- Automatic lubrication
- Feed level detection

Typical Applications

- Pyrolysis
- Drying
- Calcination
- Reduction
- Controlled oxidation
- Carburization
- Solid-solid reaction
- Purification
- Waste remediation


D.


E.


F.


G.

Thermo. Dynamic.

Harper International is a global leader in complete thermal processing solutions and technical services essential for the production of advanced materials. From concept to commercialization, from research scale to full production line operations, Harper is perpetually on the cutting edge. Since our founding in 1924, we have pioneered some of the world's most innovative, customized systems, with a focus on processing materials at high temperatures and in non-ambient atmospheres.

Our value proposition is unequaled — decades of industry experience, a highly specialized, multi-talented group of employees, and a passion for partnership. We don't shoehorn a standard line of products to fit our customers' requirements. Harper's culture is one of genuine ingenuity and creativity, which ensures we are constantly challenging ourselves to craft the best-engineered technology solution for our customers' unique needs.

Harper's philosophy is not only to deliver comprehensive systems with the latest technologies, resulting in distinctive solutions, but also to design features that ensure the most efficient and effective operations. Whether it's optimized waste gas treatment, control systems with predictive maintenance, or energy efficiency techniques, Harper always has the complete solution in mind.

"On a moment's notice, we have people going out to all parts of the world, solving problems and addressing concerns."

– Ron Vacek
Director of Project Management

"Taking core technology designs and catering them to our customer's special and unique thermal processes. That's where we really shine."

– Peter Witting Ph.D.
Chief Engineer

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