



**RETECH SYSTEMS LLC**

**Advanced Thermal Processing Technologies**



# High Performance Vacuum Metallurgical Furnaces

*Solving Industry's toughest problems through the  
science of advanced thermal processing technology.*



# RETECH SYSTEMS LLC

## Advanced Thermal Processing Technologies

### The Retech Advantage

In an industry demanding design precision for an ever-changing market, Retech understands the need for vacuum metallurgical equipment and processes that are both proven and state-of-the-art. Since 1963, Retech has supplied equipment to Europe, Asia and North America, with over half of our products built to service the international market. A solid identification with the needs of our customers, as well as understanding the importance of producing cost-effective technologies, is the foundation upon which Retech is built.

As one of the industry's leading innovators, Retech has contributed important advancements in precision pouring, plasma arc melting, consumable casting and metal powder production. Retech is the most fully integrated manufacturer of metallurgical processing equipment in the world, giving customers access to a wide range of in-house resources to achieve the individual requirements of each project. Experience and innovation, coupled with a complete engineering and manufacturing operation are key to our success. Our team of engineering, manufacturing and research specialists work with each customer to tailor relevant, reliable, cost-effective solutions for the production of high performance metals.



Besides being the world's leading supplier of Cold Hearth Melting Furnaces, Retech is also the most integrated manufacturer of a broad range of vacuum and controlled atmosphere furnaces. Advanced process technologies offered by Retech for melting, refining and casting titanium, titanium alloys, and other reactive and refractory metals, super alloys and rare earths include: Electron Beam Cold Hearth Melting, Electron Beam Direct Melting, Electron Beam Welding, Plasma Cold Hearth Melting, Consumable Casting, Cold Wall Induction, Vacuum Arc Remelt, Plasma Consolidation, Plasma Welding, Rototrode® (non-consumable casting), powder systems, laboratory systems and custom engineered systems.

Each technology produces products with unique metallurgical and geometric properties that vary with application. Retech's background and experience allow us to match customers' specific process requirements with the most appropriate technology.

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### Project Coordination

From the beginning of a project through its on-site start-up, Retech assigns a member of its Program Management team to oversee execution of the project. This point of contact utilizes Retech's real-time information management tools to track production and schedule data, and provide this feedback to the customer on a regular basis. In building systems that consist of literally thousands of parts, this important component of each Retech program ensures coordination of a production matrix designed to deliver an on-time, in-spec product.

### Engineering Capabilities

Retech's Engineering department consists of specialized personnel experienced in equipment design, stress analysis, welding technology and sophisticated electronic controls. Whether designing from scratch the world's largest Electron Beam furnace or working with a customer to refine conventional VAR technology, our Engineering staff utilizes state-of-the-art CAD systems to blueprint each customer's individual requirements.

### Manufacturing

When the design and engineering of each Retech system is complete, our fully integrated manufacturing facility brings the project to life. Retech maintains the world's only dedicated vacuum metallurgical manufacturing operation, capable of efficiently producing precision components from the largest furnace weldment to the most detailed of parts. Throughout each project, Retech's Quality Assurance program ensures that the highest standards are met.

### Complete Test and Assembly

To support the implementation of emerging technologies, Retech offers its customers the ability to fully assemble and test equipment, assuring that each system is entirely operational upon shipment. This unrivaled capability allows customers to validate the system and inspect its performance prior to the equipment's acceptance, minimizing the installation and start-up phases. Ultimately, customers are provided with the quickest path toward full-rate operation of their Retech equipment.

### Research and Development

Innovation is imperative to success in the metals industry, and Retech's Research and Development capabilities allow customers to explore ideas and objectives with our experienced R&D staff. Arguably the world's foremost producer of plasma arc melting systems, Retech continues to explore this state-of-the-art technology, as well as advanced processes for the latest in electronic control systems, turbine blade production and sensor developments. Pilot production and research services can also be performed at our facility.

### Customer Service

As a complement to the fast-paced, competitive operations of our customers, Retech offers a full range of responsive technical services and after sales support. A variety of arrangements are available, including service contracts, maintenance contracts, spare parts, product improvements, phone support and upgrades. Whether traditional repairs, availability of commonly stocked spare parts, a quick reaction modification or a planned plant maintenance effort, our trained professionals can augment your staff to insure the fastest possible recovery and return to full production. Retech's field service professionals can also support customers' surge capacity requirements or address non-standard operations, with minimum impact to production work, as well as recommended approaches to improve productivity and equipment availability.

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### Electron Beam Melting Systems

Electron Beam Furnaces range from single-gun research furnaces to multiple-gun, several megawatt, high volume production furnaces. Electron Beam Furnaces offer a range of material feeder options, such as a rotary feeder for loose chips, sheet clippings, compacts, turnings, etc., and a bar feeder for large diameter, square, rectangular or irregular shaped bar stock. Several sizes and configurations of hearths and crucibles are available to meet process requirements. Single or dual ingot withdrawal chambers, isolation valves and indexing carts are included. Computerized beam guidance and motion profiling enables optimum control of the melt pool and temperature, as well as other critical process variables.



VON ARDENNE 

Retech Electron Beam Melting Systems utilize Electron Beam Guns, Power Supplies and Gun Guidance Systems developed and manufactured by VON ARDENNE, the world's leader in Electron Beam Technology. High-powered electron beam guns from the House of VON ARDENNE have been well known to the specialists in all allied fields for more than 30 years. Together with the appropriate supply and control units, these high-tech products are consistently improved in a continuous dialogue between user and manufacturer. They provide a highly developed product that meets the needs of the international special metals industry.

### Plasma Technology

Retech's Plasma Melting Systems are designed to produce high-quality products from raw and/or recycled materials. Hearth melting in general can offer significant cost saving by eliminating electrode welding and consumable arc melting.

Retech Plasma furnaces range from small-single torch research furnaces to multiple-torch, several mega-watt, high volume production furnaces. Our Plasma furnaces can also incorporate a combination of feeders, including rotary feed or recycled turnings, sheet clippings, briquettes and bar feeding. Several sizes and configurations of cold copper hearths and crucibles are available to meet process requirements.

Retech Plasma melting systems yield very clean, fine-grained, as cast ingots by combining superheat and cold hearth melting to remove high and low density inclusions. A key benefit to plasma melting is its ability to maintain alloy composition over a wide band of complex alloys. Processing in an inert gas environment prevents the loss of volatile alloying elements during melting, thus reducing the need to adjust the alloy empirically. Retech Plasma melting systems are the right choice for producing high-performance, complex alloys with zero defects.



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### Plasma Arc Centrifugal Treatment (PACT™)

The Plasma Arc Centrifugal Treatment (PACT™) process can utilize a wide variety of lightly characterized, heterogeneous wastes to produce volume reduced, durable slag that needs no further treatment.

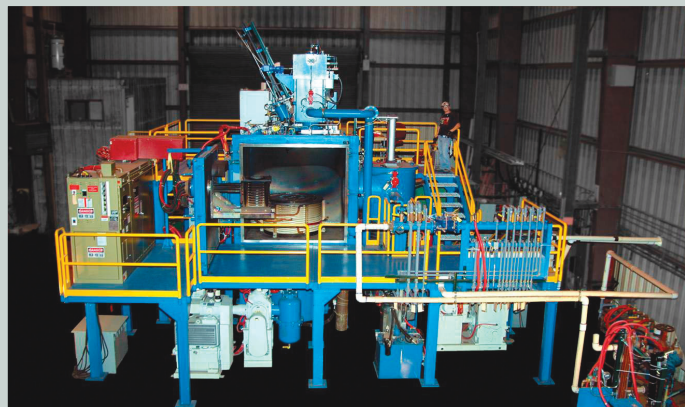
With full-scale production systems installed on three continents, Retech has emerged as a world-class supplier of plasma processing systems. Following its inception in 1963, extensive research and development of plasma technology for our reactive metal melting equipment led the company to apply that expertise to the treatment of waste. Our patented rotating hearth treatment system – or PACT™ – promotes rapid melting and homogenization of the waste feed, and converts hazardous and radioactive waste into an extremely leach-resistant and mechanically strong slag product.



More types of waste can be simultaneously treated in our patented plasma arc melter than in any other process or technology; Retech's plasma systems can accept multiple streams of a wide range of solids, slurries, liquids and gases.

### Vacuum Induction Melting and Casting

With more than 30 years of experience as a worldwide supplier of precision casting and melting equipment, our experience with this successful technology has resulted in proven performance in process control and maintenance. Retech produces equipment known for its high yields and low operating costs, and has responded to demands of the industrial gas turbine market by offering systems capable of producing larger and larger components.



At the core of our market dominance is a maintenance friendly system with precision pouring, accurate and repeatable temperature control, a smooth but responsive withdrawal system and comprehensive data acquisition. Each of these features is controlled by a state-of-the-art PLC/computer package that can offer automatic, semi-automatic and manual operations. Retech's recipe-driven control system offers our customers the repeatability features necessary to maximize throughput and yields, thus supplying them with a competitive advantage.

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### Vacuum Arc Remelting (VAR)

Retech utilizes its extensive experience in the melting of reactive metals and offers advanced Vacuum Arc Remelt furnaces designed to meet a wide range of customer requirements. For over 40 years, we have been the leader in design and manufacture of Vacuum Arc Remelting (VAR) furnaces, a technology developed for the production of titanium, nickel alloys and steel ingots.

Retech VAR furnaces provide the very latest in high production, maintenance-friendly systems with fully integrated process control architecture and built-in features for safe, efficient operation. These features allow precise and repeatable weight monitoring coupled to a smooth and responsive electrode drive mechanism. Each of these features is controlled by an advanced state-of-the-art PLC/computer based logic system. Retech offers VAR furnaces ranging in capacity from laboratory to production units.



### Consumable Electrode Casting

Retech supplies Consumable Casting furnaces for both aerospace and commercial applications. We offer our customers a variety of equipment packages to optimize the overall productivity and efficiency of each system.

To meet the customer's individual requirements, Retech offers both single-chamber and multiple chamber consumable casting furnaces, both of which can be equipped with centrifugal casting capabilities. Our single-chamber systems combine melting and casting in a single vessel. Multiple-chamber systems permit casting removal and electrode replacement while maintaining melting chamber atmosphere.



### Plasma Welder

Retech provides Plasma Welding Systems designed to longitudinally and girth weld titanium compacted sponge electrodes and girth weld end-to-end first melt titanium ingots. Retech Plasma Welders are 3-torch systems designed to easily convert to either argon or helium operation by conveniently changing process control parameters. Retech's Welders include automated welding sequences and weld strip patterns and are designed to weld a variety of compact geometries. The welders offered include the most state-of-the-art design features available.



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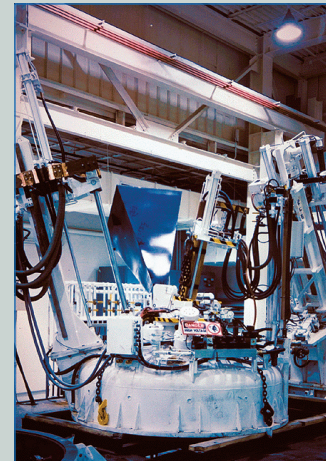
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### Rototrode

The Rototrode® is a patented, non-consumable melting system developed by Retech for the melting and recycling of reactive and specialty metals and is used in both aerospace and commercial applications. In recent years, this innovative technology has also been applied to casting VAR bar stock and powder, as well as near net shape products.

Rototrode® utilizes a rotating, water-cooled copper, non-consumable electrode that has one big advantage. It allows direct feeding of a wide variety of raw materials. Retech designed the Rototrode® system to melt previously thermal processed metals in a single operation.

Rototrode® technology can be applied to tilt-pour crucibles for parts casting, static crucibles for producing metal ingots and bottom-pour crucibles for powder production. Our unique system enhances complete alloying and melting of materials by producing and holding hotter pool temperatures for precision controlled periods of time. This also allows most forms of scrap to be readily upgraded to ingot quality, increasing the customer's bottom line.



### Powder Production Equipment

Retech supplies systems that utilize a variety of melting techniques in conjunction with three powder production technologies: gas atomization, spin cup atomization and spin wheel casting. The spin wheel casters produce a very fine flake, which is usually further reduced in size. Metal can be melted by plasma, Rototrode®, consumable arc and hot or cold wall induction.



### Lab Furnace

Retech supplies the metal working industry with laboratory size melting furnace as a means to develop new alloys and processes. Our lab furnaces utilize alloy and/or chemistry analysis and/or development with the following technologies: electron beam melting, plasma melting, vacuum arc remelting, vacuum induction melting, and PACT™ melting.



**Fully Integrated Facility  
Engineering, Manufacturing, Assembly**

**Proven Technologies • Turn-Key Installations**

**ISO 9001:2000 Certified**

**Over 380 Systems in 16 Countries**

**Utilizing Our Global Experience Since 1963**

- Plasma Arc Furnaces
- Electron Beam Furnaces
- Vacuum Arc Remelt Furnaces
- Precision Investment Casting (VIM) Furnaces
- Consumable Casting Furnaces
- Plasma Welding Equipment
- Cold Wall Induction Melting Furnaces
- Powder Production Equipment
- Laboratory Equipment
- Environmental Remediation Equipment
- Advanced Control Technology
- Equipment Upgrades
- Custom Heat Treat Equipment
- Research and Development



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