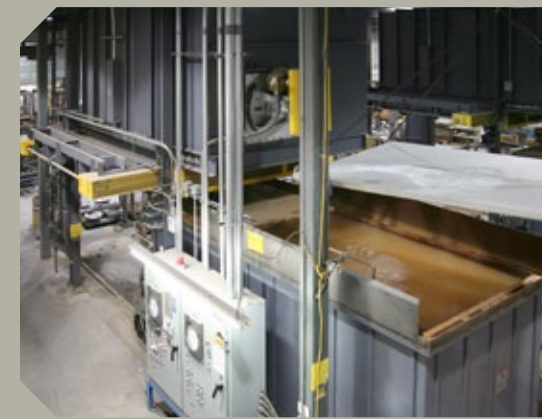
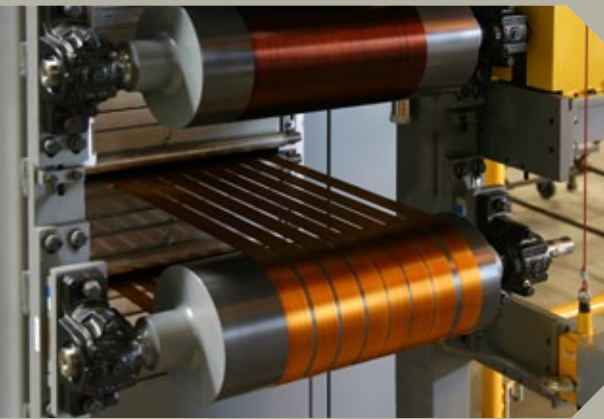


INSPIRED INNOVATION

Despatch
INDUSTRIES

THERMAL PROCESSING OF ADVANCED MATERIALS

CARBON FIBER OXIDATION, COMPOSITE CURING, SOLUTION HEAT TREATING





INSPIRED INNOVATION

Thermal processing of materials is a critical step in manufacturing quality products. Despatch has a long history of working with the world's top companies in the advanced materials market to provide custom thermal processing solutions. Our innovative technology and equipment enable our customers to produce the strongest and most lightweight advanced materials for the industries they serve.

Throughout our over 100 years of company history, Despatch has been committed to partnering with our customers to provide high-performance, custom solutions to advanced materials processing challenges. We have been involved in many areas related to carbon fiber composites, from the oxidation of fiber to curing composites and we have provided equipment for other advanced materials processes such as aluminum solution heat treating and fiberglass composite curing. Our breadth of knowledge in this market is extensive and we have a thorough understanding of the strict temperature, uniformity and airflow requirements necessary to produce high performance, advanced materials.

ADVANCED MATERIALS APPLICATIONS:

Aluminum • Solution heat treating and aging for airplane body and engine parts and automotive parts including wheels, aluminum suspension and engine components

Polymers • Curing and annealing of thermoset plastics and adhesives

Composites • Drying, debinding, curing, and heat treating a wide range of fibers, woven and non-woven materials, pre-preg and composite materials

Carbon Fiber • Oxidizing of carbon fiber pre-cursor • Drying and curing carbon fiber composite subassemblies

Industrial Applications • Castings, sand cores, industrial material processing and heat treatment



ALUMINUM AGING AND SOLUTION HEAT TREATING

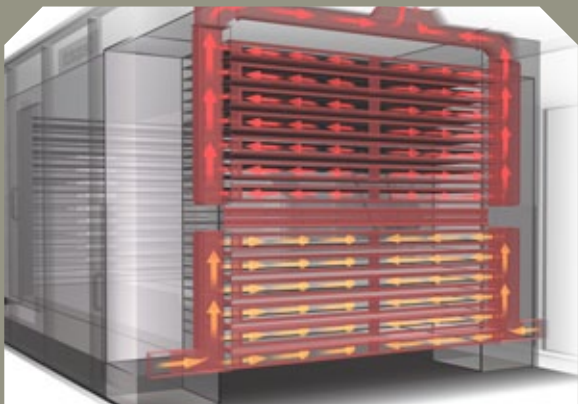
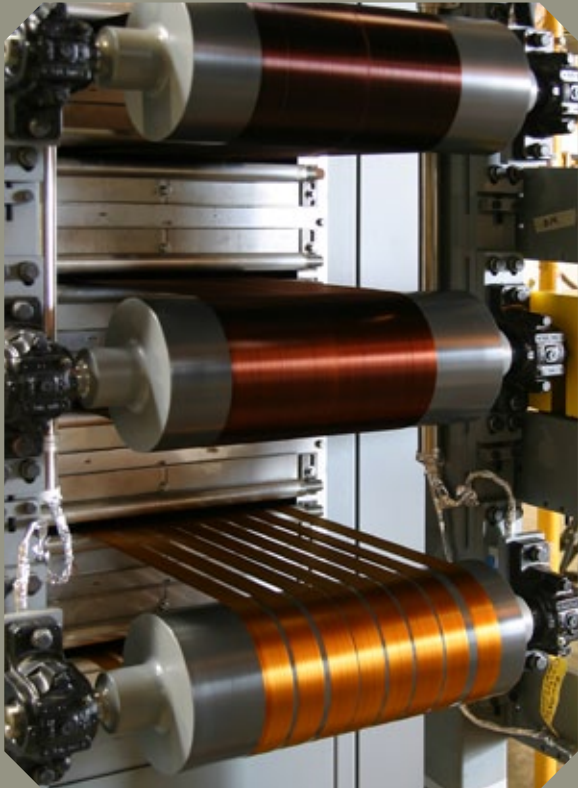
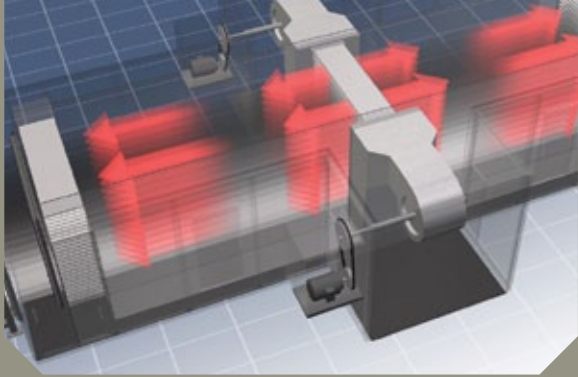
Despatch is a proven supplier of Drop Bottom Solution Heat Treat Furnace Systems with over 180 systems designed, installed and certified worldwide over the past 75 years. The aerospace, military and automotive industries rely on Despatch as a low risk supplier of this type of equipment.

Designed for heat treating large and small batches of aluminum parts, from castings to thin wall aerospace components, the systems usually include a bottom-load furnace with glycol and/or water only quench tanks, water rinse tanks, load cars to hold the work rack, and work racks. Despatch offers chiller systems to cool the quenchant solution for customers processing thin walled aerospace components, as well as heated quenchant systems for processing thicker walled items such as castings.

FEATURES AT A GLANCE

- ◆ Meets all applicable aerospace and automotive specifications including AMS-2750 and AMS-2770
- ◆ PLC based control system with touch-screen operator interface for simple operation
- ◆ Chartless recording controller for process monitoring
- ◆ Temperature uniformity $\pm 3^{\circ}\text{C}$ ($\pm 5^{\circ}\text{F}$) meets or exceeds process requirements (Furnace Class 1)
- ◆ Fast response electric heating system for quick temperature recovery
- ◆ Water or Glycol quench tank designed to meet maximum quenchant temperature rise
- ◆ Water rinse tanks with agitation
- ◆ Powered load car with quench and rinse tanks attached for automated operation
- ◆ Heat exchangers for quench and rinse tank cooling necessary for high-volume production
- ◆ High velocity vertical down airflow minimizes temperature drop as doors open
- ◆ Pneumatically powered bi-parting doors with clamping air cylinders to tightly seal the doors to the furnace body
- ◆ 18 cm (7 in.) thick multi-layer insulation with alloy mesh screen
- ◆ 315°C to 649°C (600°F to 1200°F)





THE WORLD'S LEADING OXIDATION TECHNOLOGY

Oxidation is considered to be one of the most important process steps in carbon fiber production, yet is also considered the step that still has the greatest improvement potential.

As oxidation is primarily an exothermic reaction, consistent and uniform airflow is essential to successfully remove energy from each filament across the web. The Despatch Oxidation Oven with center-to-ends airflow delivers uniform densification across the entire tow-band that exceeds carbon fiber manufacturer's expectations. Airflow turbulence is minimized to prevent cosmetic damage to fiber tows. Consistency of process results in no skinning (uncured core) and more uniform densification across the entire tow-band. Center-to-ends airflow provides up to 30% faster rates of oxidation than conventional cross flow or vertical down flow oven designs.

FEATURES AT A GLANCE

- ◆ Center-to-ends airflow
- ◆ Industry's finest airflow and temperature uniformity resulting in uniform oxidized density across the entire tow-band.
- ◆ Maximized heated zone size provides for increased fiber production.
- ◆ Air velocities up to 4 meters per second
- ◆ Insulated vestibules for capture of process and potential fugitive emissions.
- ◆ Fire mitigation systems
- ◆ Scalable designs
- ◆ Vertical stacking (up to 3 high)
- ◆ Easy access for periodic cleaning.
- ◆ Filter removal while in operation
- ◆ End louvers to reduce the inward migration of cold air and egress of the heated process chamber.
- ◆ Optional automated end louvers
- ◆ Energy efficient design
- ◆ Latest PLC and DCS control platforms
- ◆ Patent-pending ACER Technology-reduces energy cost, enhances process atmosphere control and improves fiber quality

INTEGRATED CARBON FIBER PRODUCTION LINES

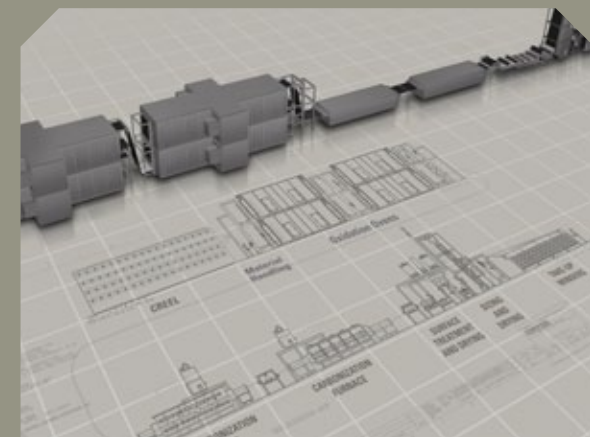
Through experience and expertise in the carbon fiber industry, Despatch has built connections and relationships to facilitate the installation, set-up and optimization of a complete carbon fiber manufacturing line through one point of contact. Despatch provides integrated solutions for 1k to 320k tow manufacturing lines. We provide the equipment and optimize your processes for the highest quality fiber and lowest cost per kilogram of fiber produced.

Along with the world's leading oxidation technology, Despatch offers energy efficient LT and HT furnaces designed for ease of operation with quick access to the muffle interior for easy cleaning. The Despatch surface treatment process provides uniform electro-chemical etching across the fiber web. A sizing system provides uniform and constant distribution of size on the fiber. A non-contact dryer delivers uniform, low velocity airflow with a filtration system to capture fibrous debris.

An integrated control system allows for accurate, centralized control of temperature and transport drive speeds. The control system includes full data-logging and trending and enables the line to run at peak performance with maximum production output.

EQUIPMENT

- ◆ Oxidation ovens
- ◆ Abatement systems
- ◆ Input creel
- ◆ Rolls, stands and drives
- ◆ Pre-carbonization furnace
- ◆ Carbonization furnace
- ◆ Surface treatment
- ◆ Contact drying system
- ◆ Sizing equipment
- ◆ Non-contact drying system
- ◆ Take-up winders
- ◆ 1K to 320K tow
- ◆ 20 to 2700 metric tonne capacity
- ◆ Integrated control system with SCADA interface
- ◆ Installation, commissioning and optimization of the entire line





COMPOSITE CURING

The Despatch S-Series walk-in oven is designed for industrial process versatility, dependability and economical utilization of facility space. These walk-in ovens are typically used for aging, curing, bonding, annealing, drying, baking and heat treating. Despatch's design integrity, manufacturing experience and overall emphasis on quality and innovation ensure your exact requirements will be met. S-Ovens offer customers a variety of beneficial features, including vacuum ports, lift doors, and tight temperature uniformities.

Despatch ovens provide uniflow airflow which delivers heated air from both sides of the chamber for uniform operating temperatures. This air moves horizontally and vertically through the work chamber to be reheated and recirculated through the system. For parts and molds with unique heat transfer requirements, Despatch can work with you to design an airflow that is best suited to provide the fastest, most uniform heat-up time.

FEATURES AT A GLANCE

- ◆ Flexible and customizable based on the proven Despatch S-Oven design
- ◆ Full installation and startup services
- ◆ Tight uniformity, standard at $\pm 5^{\circ}\text{C}$ with capabilities up to $\pm 2.5^{\circ}\text{C}$
- ◆ Electrically heated or gas fired (direct or indirect)
- ◆ Custom airflow to optimize heat transfer and cure uniformity for unique product molds



VACUUM BAGGING

Despatch offers complete vacuum bagging systems with unlimited vacuum ports. These ports can be added in sets of 8. Jack panels allow you to connect as many thermocouples as needed for monitoring the curing process. Mold preparation, including preheating, drying and cleaning processes can also be provided.

PROCESS CONTROL SYSTEM

Despatch composite curing ovens are now available with Focal Point™, a PC-based process control system. Focal Point™ fully controls the curing process and documents all process information, providing traceability and validation of part quality. Focal Point™ offers precise process control with lead-lag temperature control and an advanced recipe editor for programming temperature and vacuum profiles, and for controlling fans and dampers. Focal Point™ software logs all process data in a spreadsheet or database, which can be accessed by a plant computer system.

VACUUM BAGGING SYSTEMS

- ◆ Jack panels allow 8, 16, 32 or more thermocouples to fully monitor product by connecting through the oven
- ◆ Unlimited vacuum ports can be added in sets of 8 for easy connection to the vacuum bag within the oven
- ◆ Vacuum port monitoring tools can be added to record pressures if required
- ◆ Vacuum pump and all required components for complete system

PROCESS CONTROL SYSTEM

- ◆ PC-based system
- ◆ Recipe editor to control temperature and vacuum profiles
- ◆ Process data logged on system PC
- ◆ Standard or customized reporting



Custom solutions

No company has more proven success in partnering with customers to deliver complex thermal processing solutions for research and development, product testing and manufacturing. Our equipment and technology is involved with some of the most critical and cutting-edge applications in the advanced materials market. Our innovative designs are backed by seasoned engineering, manufacturing and project management teams with decades of experience.

PREPREG TOWER TREATER

The Despatch Tower Treater is designed for web coating and curing of fiber lines with Epoxy and polyimide prepreg. The system uses a combination radiant/convective style oven that utilizes air for energy transfer. Separate return and supply air systems provide uniform temperatures throughout the oven for even product treatment. All chamber process air is fully exhausted to the incinerator.

HONEYCOMB PROCESSING SYSTEM

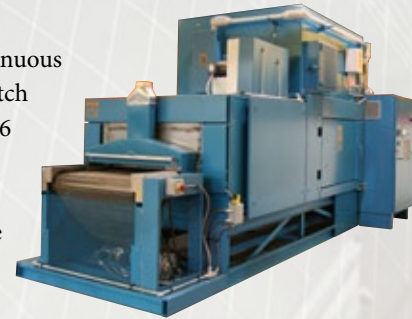
Despatch offers a custom S Oven processing system for curing the coating on honeycomb material. The custom system offers high velocity, vertical down airflow and an expandable duct to help evenly distribute air through the product. In addition to uniform air distribution, the oven also features Class A atmosphere, tight temperature uniformity and a control system for process monitoring. Exhausted air is reclaimed for significant energy savings. Despatch honeycomb processing systems produce honeycomb material that is extremely strong with very little added weight.

SPLICING OVEN

Carbon fiber manufacturers use Despatch's custom splicing oven to fuse fiber strands together to keep fiber running continuously through the production line. The splicing oven is a modified LAC model oven with increased heater capacity; slots with silicon curtains added to the back panel and angled ledges with shelves on the interior.

CONTINUOUS OVENS

For high-volume, repeatable applications, continuous operation may be the optimal approach. Despatch continuous ovens offer conveyor widths from 46 to 91 centimeters with electric or gas heat. Despatch continuous ovens achieve superior temperature uniformity in all interior parts due to high-volume, vertical down air flow.



STANDARD OVENS

Despatch benchtop ovens and lab ovens offer a small footprint where space is limited and processes that deal with small batch loads. Despatch cabinet ovens and reach-in ovens are designed for easy loading and unloading. Cabinet and reach-in ovens provide an efficient footprint and are available in a wide range of chamber sizes. Despatch walk-in and truck-in ovens can accommodate a variety of specific product and process needs. These ovens are suitable for loading manually or by fork truck.



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7-10 MATERIALS