

Microlines for Continuous Filamentary Carbon Fiber Conversion

Start with the expert.

Harper pioneered the Microline concept based on the flexibility to change and modify for the needs of customers in research and development of advanced fiber processing techniques. Our system accommodates line speeds ranging from 0.1 m/min to over 1 m/min and tows from 10 filaments to 48000 filaments.

To date, Harper is the only thermal systems provider in the world to have installed a complete R&D line. Our recent contracts prove our leadership position, including several Microlines for research institutions in the USA and South America, as well as our advanced piloting line at Oak Ridge National Laboratory, designed with flexibility to handle multiple precursor types with a unique material handling solution.

Our fully integrated and extensively outfitted Microline systems are configured for customization with advanced performance equal to our production scale lines, but in a modest scale for research and development customers. Most lab-scale testing is performed in discontinuous batch processing steps; the Harper International system provides continuous conversion of filamentary material. The system is equally suited for both potential industry clients as well as national and academic research institutes.

Harper systems allow for maximum manipulation of key process parameters, including controlling tension after each unit operation and multiple zones of temperature control in oxidation, pre-carbonization, and carbonization. Our driven rolls allow flexibility in tow count and for customization of the operation of the oxidation oven, zone by zone, pass by pass.



Spark the future.™



About Harper International

Harper is a global leader in complete thermal processing solutions and technical services essential for the production of advanced materials.

Harper initially pioneered the development of high temperature furnaces for the carbon fiber market at its start, and now owns a worldwide reputation as a leader in delivering thermal processing solutions that meet the increasing challenges of this growing market.

For additional information, visit harperintl.com or email info@harperintl.com

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System Operations

Our Microline system includes all of these highly customizable operations:

- Creel: Up to (8) positions
- Oxidation Oven: Up to 300°C, with multiple Zones of Control
- Drive Stands: Multiple locations throughout the system,
- Low minimum loading point to enable research on minimal filament count
- LT & HT Furnace Pre-carbonization and Carbonization: Up to 1000°C and 1600°C respectively, with multiple Zones of Control, atmospherically controlled
- Optional Pretreatment System
- Optional Surface Treatment System
- Optional Sizing System
- Optional UHT Furnace for Carbonization: Up to 2800° C, atmospherically controlled
- Overall Plant Footprint approximately 40m L x 10m W x 4m H

For investment and technical configuration considerations, the system can be designed with:

- single or multiple dip systems for surface treatment
- advanced HT furnace designs for up to 1800°C
- configuration of control system for preferences regarding remote access and data historian
- material handling for emerging precursors including those requiring belt transport

Additionally, Harper offers testing facilities for its customers if needed prior to equipment investment to assist with scale up and process development.

Start-up for Harper equipment from ambient conditions takes 8 – 12 hours. Shut down can occur in a shorter time frame. To optimize the life of the equipment and minimize thermal cycling, we recommend that the LT and HT furnaces be at idled at temperature for short downtime durations (i.e. over a weekend). This also optimizes power, when considering the requirements for heat-up.

As always, Harper offers customized training, service and maintenance options based on the needs of the client. Beyond training, Harper's commitment to ongoing and rapid response to keep the client and their operations running smoothly and meet evolving / emerging system requirements is well known in the industry.



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