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CASE STUDY: Renewable Resource R&D

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Harper International has designed a furnace system with dual functionality for carbon-related R&D.

Harper International Corp. recently developed a furnace system with dual functionality for a national laboratory that is engaged in the research, development and commercialization of new advanced materials. The laboratory is researching the development of a wide range of carbon materials from renewable resources. Advanced carbon materials derived from renewable sources would replace products currently derived from petroleum. The objective is to provide products with similar functional quality at a lower cost, thereby increasing the applications for these advanced carbon materials.

Project Requirements

To simulate the commercial production of carbon materials, a continuous thermal processing system was selected by the lab's research team. Precursor materials planned for this development project vary widely in both particle sizes and shapes. These variations in precursor materials would require two distinctive types of furnace systems: a rotary furnace for one type of material and a mesh belt furnace system for other materials.

The laboratory, which had limited floor space available, contacted Harper International for assistance in designing a single, continuous thermal processing system that could satisfy both requirements. The Harper team designed a multi-functional thermal processing system that can be transformed from a rotary tube furnace to a mesh belt furnace while using a single thermal platform.

"The design of this custom furnace system demonstrates the commitment Harper makes to provide solutions, investments and new concepts to achieve the needs of our valued customers," says Rick Rehrig, vice president of Sales for Harper. "The world of advanced materials continues to change at an accelerated pace. The engineers and scientists here at Harper International provide custom solutions and technical assistance for economical commercialization in the advanced materials industry."

System Features

The single thermal processing system features a clam-shell design that allows the top half of the furnace to open, exposing the furnace's internal section. The rotary tube furnace features a completely sealed rotary tube system and enclosed discharge collection to maintain atmospheric integrity. Four zones of control allow for adjustments to heat-up rate, soak period and cooling rate. Process capacity is controlled by adjusting the angle of the system's inclination, along with the rotational speed of the tube and the feeder system screw.

The rotary tube may be removed from the system, allowing for the installation of a mesh belt within the same thermal section of the furnace. The mesh belt thermal system is also atmospherically controlled, with purge chambers located at both the entrance and exit end of the furnace system. Four zones of control allow for adjustments to the thermal profile. The internal alloy muffle was designed with several exhaust ports at key locations for the removal of corrosive off-gases. A water jacket installed around the muffle assists with the cooling of material prior to its exit from the furnace.

Both furnace systems have been designed to be gas tight and operate with a variety of atmospheric gases, including reactive and corrosive gases. The systems can operate in the 1000°C range with thermal processing cycle variations from 30 minutes up to 10 hours. The laboratory will have the flexibility to test and develop new carbon materials from a variety of sources, including renewables.

For additional information, contact Harper International Corp. at 100 W. Drullard Ave., Lancaster, NY 14086-1698; call (716) 684-7400; fax (716) 684-7405; e-mail info@harperintl.com; or visit www.harperintl.com.

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