



## From Spark to Finish.

Ideas don't just jump from the lab to the global marketplace. Let Harper help you get to market faster and more efficiently with our Ignite™ process.

### Altogether brilliant.

We're inspired by our customers' bright ideas, and know that together we can make them brilliant. The relationships that we form based on confidence, collaboration and mutual success, have made us one of the world's foremost providers of thermal processing. But don't just take our word for it – read what customers have to say about Harper...

*"It is critical that in our mission to develop breakthrough energy technologies, we have partners who are equally as dedicated to supporting us with innovative production equipment. We have been working with Harper since 2009 as we refined and optimized our thermal processing regime, and now that work culminates in this key piece of equipment that will enable our production scale operation."*

**Phil Souza**  
Vice President of Manufacturing  
EnerG2

*"As we looked to significantly increase production capacity to meet the growing global demand for our unique and extremely wear-resistant Tough Coated Hard Powders (TCHP), we recognized that careful consideration and understanding of our thermal processing steps was required. Harper provided exceptional technical proficiency in this area, and then followed through with a tailored furnace that optimizes our process and delivers efficiencies in multiple areas."*

**John Keane**  
President  
Allomet Corporation



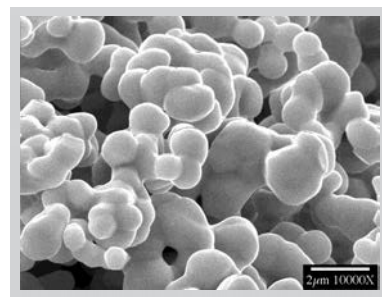
Spark the future.™

Harper enables companies in the development of advanced materials, from the lab to full commercialization, helping make their innovations a reality. Utilizing our depth and breadth of experience in thermal processing, we partner with our customer to ensure success as they scale up their process operations.

Harper's support to emerging industries begins in early stages of research and development, whether at corporate R&D centers, universities, government institutions, or start-ups. Our mission is to assist these customers in turning the next generation of material innovations into profitable new markets. Just like our experience in the Carbon Fiber market, we help customers develop unique thermal processes and efficiently and effectively progress them into complete production lines. Learn more about our thoughtful process that helps ensure the customer's idea gets out of the lab and into the world.

### Feasibility and Testing

Optimization of process parameters is critical prior to investment in thermal processing equipment to ensure capacity and quality requirements are achieved. At our Technology Research Center, customers utilize Harper's systems and expertise in their process development and process optimization for use in commercial scale up and for those systems with unique specifications. Harper also provides a variety of additional analytical services such as gas analysis (critical to ensuring compliance with environmental regulations) electron microscopy, XRD, BET, and other thermal and elemental analysis.



### Engineering Studies

Count on our extraordinarily experienced engineering staff to conduct in-depth studies to determine equipment requirements and help define process parameters for optimal plant design to assist with technical and business strategy and financial planning. Our vast capabilities in thermal processing engineering studies include, but are not limited to:

- process cost models
- economics of increased production with current & future state technologies
- analysis of best-suited thermal process technology for new material innovation
- identification of opportunities for improved product quality and cost reduction
- investigation of solutions for transition from batch to continuous processing
- engineering of material handling solutions for unique processing systems



## Scientific, R&D and Pilot Scale Systems

As customers ramp up their operations, Harper offers a range of solutions including furnace technologies and oxidation ovens in scientific lab scale, advanced R&D scale and pilot scale sizes. Most testing is performed in discontinuous batch processing steps. Harper provides continuous systems designed with flexibility, precision and advanced data management features configured to best mimic future state production conditions and facilitate future scale up. Suited for potential industry clients as well as national and academic research institutes, all systems are designed to help the client research their unique research and business goals and support the transition to large scale full capacity production.



## Complete Production Lines

Harper offers a complete solution for your advanced material process plant. From material handling and pre-treatment to final product collection and everything in between, Harper is focused on helping customers link the process steps to achieve greater efficiencies in reduced operating costs, increased quality and productivity, and strategic risk mitigation. From first point of engagement, Harper rigorously designs thoughtful operations sequences that ensures a comprehensive perspective is maintained.

Harper approaches gas treatment and handling with several objectives. Not only do our designs focus on managing emissions and treatment of off-gas in an environmentally conscience manner, but we also carefully consider opportunities for energy recovery for use within the process. Additionally, our controls group develops sequence of operations (SOPs) that drive simultaneously toward efficiency and enhanced product quality. Our fully integrated systems connect all process equipment to one centralized control system, ensuring operation is that of a cooperative plant all functioning on the same control platform rather than individual and isolated control platforms.

## Customer Support

Harper's dedication to our customers doesn't end at the shipment of a system. Our Pulse™ team of experienced, technical and professional staff is capable of providing parts, support and service worldwide. We offer a number of programs and services which can be tailored to your specific needs throughout the entire lifecycle of the system.

- Installation & Installation Management
- Start-Ups
- Replacement Parts
- Rebuilds
- Retrofits
- Repairs & Troubleshooting
- Control, Atmosphere and Material Handling System Upgrades
- Maintenance Management Programs
- Equipment & System Decommissioning
- Equipment & System Relocation Management

Additionally, Harper's team can provide operational and engineering services to support core business plans and strategies. Through custom designed programs, we can help you achieve a higher level of planned and predictive operational activities that ensure a more efficient use of resources. As your partner, we provide responsive service and become proactively involved in identifying, evaluating, recommending, and implementing innovative, cost effective and technological solutions.

To start sparking your future today, contact Harper at 001.716.276.9900 or email us at [info@harperintl.com](mailto:info@harperintl.com).