

# MICROWAVES BRING CURING HOMOGENEITY

Efficient microwave technology offers short process times, low energy consumption and process automation of plastics and foams

The VHM Hephaistos microwave unit is an internationally patented system. The units are characterized by their extremely high field homogeneity. It is possible to cure high-quality fiber materials such as carbon fiber reinforced plastics in the Hephaistos. Carbon fiber reinforced plastics are often used in lightweight constructions and are therefore frequently employed in the aerospace, marine and the automotive industries.

In the Hephaistos system, microwaves selectively penetrate the material and heat the product, but the oven chamber and air inside it remains cold during this process. Energy consumption is reduced by up to 70%. The production cost of parts is thereby reduced through the shorter warm-up, processing and cooling times offered by the unit compared with conventional methods used in autoclaves.

The system is continuously being improved in terms of both its process and its system technology. Engineers are working toward functionality that enables the Hephaistos to be integrated into automated systems. A semi-automated slide door version is available. This allows the automated placement of large and heavy parts inside the microwave using a robot or transport mechanism.

The Hephaistos system can be designed either for a one-piece flow or according to a manufacturing cell layout that optimizes the process and available space.

The current system is distinguished by the hexagonal design of the heating chamber. The implementation of this structure was a first very successful step to obtain a high-quality uniform temperature distribution. The development of the structure is going on. The Vötsch and Weiss central Department of R&D Electronics/Software are now presenting promising results of an innovative control system. A Model Predictive Controller (MPC)

was designed based on a thermodynamic model of heat generation within the volume of the material and heat losses at the surface of the material in combination with a Kalman filter. Detailed results will be published at the Sampe Conference in Southampton in the UK, on September 2018. The MPC will be available as an option for industrial applications soon.

The MPC independently controls 12 microwave antennas using the temperature feedback from fiber-optic temperature sensors and infrared cameras. Comprehensive measurements with two infrared cameras show the improvements made possible by the MPC.

The innovative VHM Hephaistos microwave system is produced by Voetsch Industrietechnik in Reiskirchen, Germany. It was developed as part of a technology transfer and an ongoing collaboration with researchers at the Karlsruhe Institute of Technology (KIT) in Germany.

The modular Hephaistos system is safety tested with CE certification and is available immediately. The system is available in three capacities with an operating temperature up to 400°C (752°F). Laboratory scale units with a usable volume 750 liters to large-scale industrial systems with usable volumes of 4,200 liters and 7,000 liters are available.

Voetsch Industrietechnik offers a wide product portfolio in the field of heating technology. The company has an experienced team of engineers and designers that develops, plans and produces heating technology. Products include heating/drying ovens, clean room drying ovens, hot-air sterilizers, microwave systems and industrial ovens. The portfolio reaches from the technologically sophisticated standard versions to customized solutions for individual production operations.

As part of the Weiss Technik Companies, Voetsch Industrietechnik contributes to the



// The Vötsch VHM Hephaistos microwave oven is characterized by high field homogeneity



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solutions developed under the slogan "Test it. Heat it. Cool it" and are deployed around the world in research and development as well as in the production and quality assurance of numerous products. With more than 21 companies at 15 locations, the company can provide support and high operational safety for systems. The products under the Weiss Technik brand include environmental simulation and air-conditioning as well as containment solutions. The Weiss Technik Companies are part of the Schunk Group based in Heuchelheim, Germany. //

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