AUSTRIAN INSTITUTE OF TECHNOLOGY

Press Release

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HIGH ENERGY SAVINGS THROUGH PROCESS OPTIMIZATION

The AIT Austrian Institute of Technology and the Plansee company are working together to reduce energy consumption in production

The refractory metals molybdenum, tungsten, tantalum and niobium are extremely important in technology: they are very resistant and have a high melting point. Products made from these materials are used, for example, in computer tomographs, smartphones and photovoltaics. One of the world's specialists for these materials has been the Tyrolean company Plansee High Performance Materials (HPM) for more than 100 years.

To achieve their full performance, these materials must undergo an energy- and time-intensive heat treatment. In many cases, components undergo an annealing process. This takes place in electrically heated high-temperature furnaces, among others, in which the products are layered and which are equipped with zone temperature control. For each heating zone, there is a specification as to what temperature must be reached. "Since the annealing process requires a comparatively high energy input, this process must be optimized in terms of resource conservation and saving expensive energy," explains Gerfried Weiss, production manager at Plansee. To this end, a research project was set up together with the AIT Austrian Institute of Technology.

Minimum annealing time must be maintained

In an annealing process, the furnace interior is heated until the specified zone temperature is reached. This temperature is then held at this level for a certain holding time - this is to guarantee that the products are heated to the specified temperature and annealed at this temperature for a certain minimum annealing time. The products are then cooled down again.

In practice, exact compliance with this minimum annealing time is not trivial, since the temperature profile of the products depends very much on the loading of the furnace, and the temperature profile does not follow the zone temperature exactly due to the thermal inertia of the materials. Moreover, the temperature (up to 1,800 degrees Celsius) of the heat-treated items can hardly be measured directly - on the one hand, corresponding load thermocouples are expensive, sensitive and difficult to install, and on the other hand, software models for temperature estimation are very complex. Therefore, in practice, one tends to play it safe and choose a longer duration for the annealing process. If it is too short, the annealing material is not annealed homogeneously long enough, which has a negative effect on the material properties. But if it is too long, time and energy are wasted.

In order to optimize the annealing process, Plansee has started the ThermoTec project together with researchers from the AIT Austrian Institute of Technology. "In this project, we have combined Plansee's expertise in materials and processes with our knowledge of how to control difficult and complex processes," explains AIT project manager Martin Niederer. He and his colleagues work at the AIT Center for Vision, Automation & Control in the Complex Dynamical Systems research group on the optimization and automation of production processes.

High energy and time savings with consistent quality

Through extensive measurements, analyses and modeling, an algorithm has now been developed that can be used to reliably set the desired minimum annealing time for any given load.

Experimental validation of the algorithm in more than 230 annealing runs on one furnace spread over one year showed that the holding time of the process could be reduced by 20 percent on average. The reduction in energy demand and CO2 emissions is equivalent to the consumption of 15 single-family households.

Accompanying material tests showed that product quality remained unchanged at a high level. The optimization also reduced the overall duration of the process by almost 12 percent, allowing better utilization of the furnace. "The process ensures exact compliance with the minimum annealing time, resulting in energy savings and thus heating costs as well as improved throughput with consistently high quality," summarizes Tobias Glück, head of the Complex Dynamical Systems competence unit.

Using the new process in practice

The process is now being used in productive operation at Plansee, helping to reduce energy requirements in production. "The new algorithm can be integrated into the existing kiln control system and can therefore be easily transferred to other kilns. We will continue to implement this in the coming months," reports Bernhard Mayr-Schmölzer, development engineer at Plansee.

About the Center for Vision, Automation & Control

The Center for Vision, Automation & Control (VAC) at the AIT Austrian Institute of Technology is a research unit that uses the possibilities of automation and digitalization to initiate and drive innovations for industry.
With the Institute of Automation and Control Engineering (ACIN) at the Vienna University of Technology, the center has an internationally leading scientific cooperation partner in the field of systems and automation engineering. Therefore, it can accompany the entire innovation process from basic research to industrial implementation. This involves the acquisition of information by (imaging) sensor systems via sensor fusion, the combination of physically based models with concepts of machine learning and data analysis, the use of this information in fault detection and isolation, optimization and control up to cognitive decisions for autonomous systems.

Within the Center, the Complex Dynamical Systems (CDS) Competence Unit conducts research in the area of systems and automation engineering with a focus on digitization, automation and optimization of components, processes and products. By applying advanced systems theory concepts to real-world problems, a bridge is built between academic research and industrial practice. www.ait.ac.at/vac

About AIT

The AIT Austrian Institute of Technology is Austria's largest Research and Technology Organization (RTO) and plays in the top league worldwide in many infrastructure topics. With its seven centers, the AIT deals with the central infrastructure topics of the future and sees itself as a highly specialized research and development partner for industry. AIT's research and technological developments realize fundamental innovations for the next generation of infrastructure technologies in the fields of Energy, Low-Emission Transport, Health & Bioresources, Digital Safety & Security, Vision, Automation & Control and Technology Experience. These scientific research

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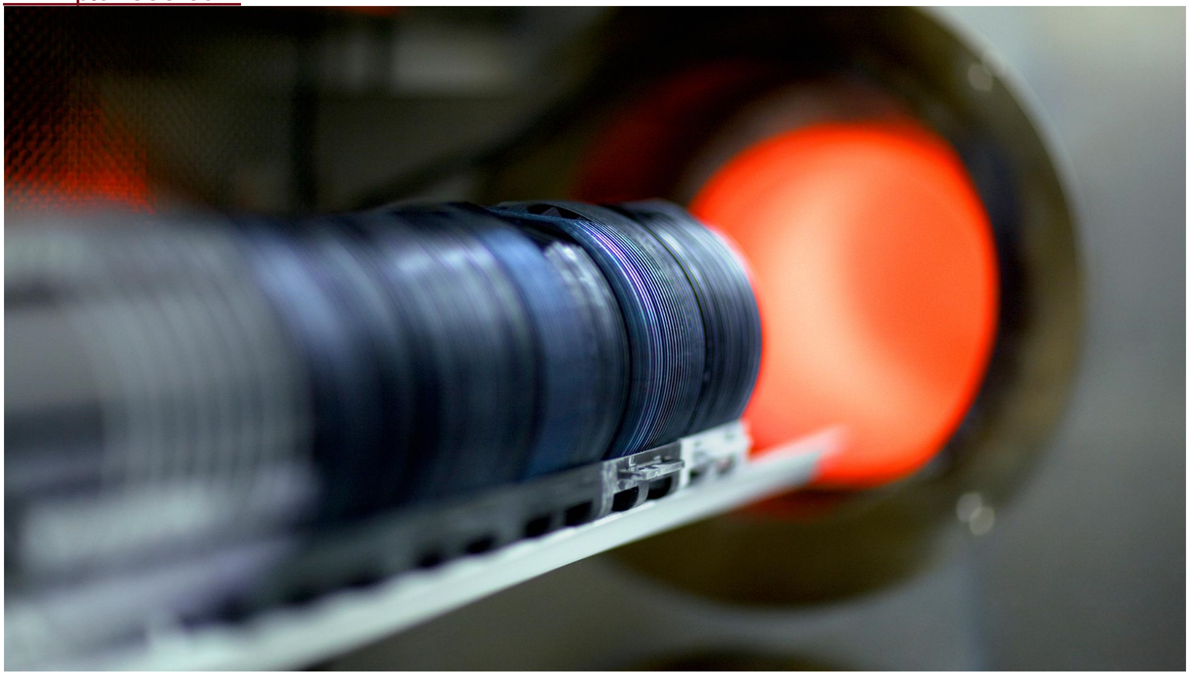
About Plansee HPM

Plansee HPM is an expert in the production of components made of molybdenum, tungsten and tantalum. Whether in electronics, coating technology or high-temperature furnaces - where conventional metals reach their limits, Plansee's refractory metals, alloys and composite materials come into play. Founded in 1921 in Reutte, Austria, Plansee is now an international company with 32 sites in 24 countries. This includes 13 production sites in the USA, Europe and Asia.
www.plansee.com



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