Current trends in heat treatment and metallurgy

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Abstract

Statement of the Problem: Heat treatment, together with metallurgy and its applications, is one of the most conservative industrial fields. The implementation of new solutions, devices or entire technologies often takes decades. Gradually developed for centuries, they accelerated at the end of the 20th century, following the trends of industrial and civilization changes.

One of the breakthrough events was the use of negative pressure (colloquially vacuum) as a protective and technological atmosphere in industry in the 1960s and 1970s. In the following decades, the share of vacuum technologies in relation to traditional, atmospheric technologies increased more and more dynamically, to currently reach the level of approximately 20-25% depending on the industry, and in the case of new investments it often exceeds 50%.

Another important phenomenon was the gradual implementation of European sustainable development programs and goals, covering 17 areas including environmental protection, stopping climate change, clean energy, and recycling, which significantly affect industrial production, including heat treatment and metallurgy. The effects of the above are visible in the directions of changes regarding emission reduction, including exhaust gases and CO2, electrification of road transport, renewable energy, and hydrogen energy transformation.

The presentation will present examples of modern technologies and equipment for heat treatment and metallurgy, consistent with current standards and development directions. Including vacuum replacements for traditional equipment, single-piece flow heat treatment, powder production and sintering for additive manufacturing, hydrogen production and hydrogen metallurgy, renewable and nuclear energy, and global strategic projects.

Image

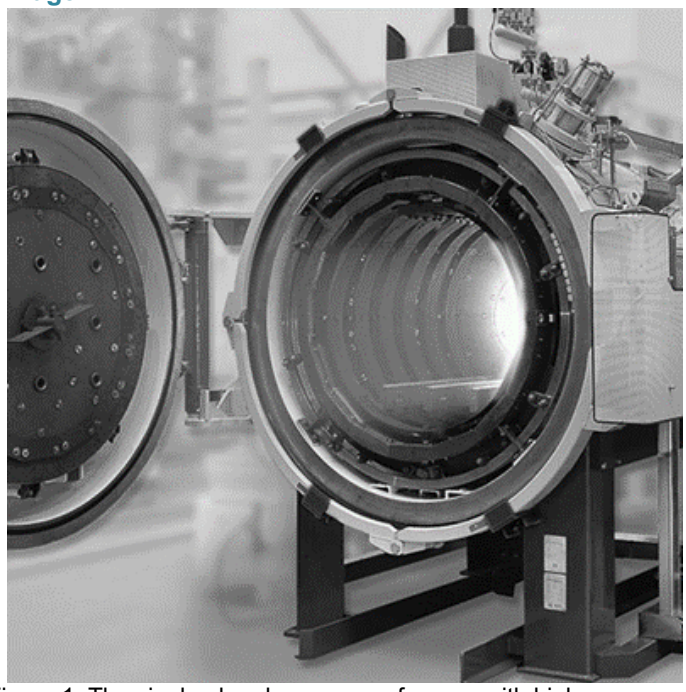

Figure 1: The single-chamber vacuum furnace with high pressure gas quenching.

Recent Publications

1. Wołowiec-Korecka E, Korecki M, Klimek L (2022) Influence of flow and pressure of carburising mixture on low-pressure carburising process efficiency. Coatings 12:337-344. DOI:10.3390/coatings12030337
2. Korecki M, Brewka-Stanulewicz A, Wołowiec-Korecka E (2019) Devices for modern vacuum heat treatment. Archives of Materials Science and Engineering 2/95:77-85. DOI:10.5604/01.3001.0013.1732
3. Korecki M, Wołowiec-Korecka E, Brewka-Stanulewicz A, Kula P, Klimek L, Sawicki J (2017) Single-piece flow case hardening can be worked into in-line manufacturing. Thermal Processing for Gear Solutions 9-10:42-4

Photograph

Biography

Dr Macije Korecki graduated from the University of Zielona Góra, wherein 1988 obtained a Master's Degree in Electrical Engineering. He completed his Ph.D. at the Łódź University of Technology in 2008 with his thesis on the theoretical and experimental methods of design for vacuum furnaces. He has authored numerous international patents on behalf of SECO/WARWICK, and regularly presents technical papers at international conferences on a variety of topics, specializing in vacuum heat treatment technology. He began his career at Elterma in 1988 as a service engineer for vacuum furnaces. He then joined SECO/WARWICK in 1991 as a service engineer and then service manager on the Vacuum Team. In 2005-2009, he served as an R&D Director, leading the team that developed new equipment and processes, such as low pressure carburizing and high-pressure gas quenching. He served as Director of the Vacuum Team in Europe from 2009-2012. Then he has become the Vice President of the global Vacuum Product Group. Currently Vice President, Business Segment Vacuum Heat Treatment Furnaces SECO/WARWICK S.A.
Doctor engineer Maciej Korecki is involved in research and development of vacuum heat treatment equipment and technology and their implementation into a new area of industrial applications. He is an inventor and promoter of the "single-piece flow" vacuum heat treatment method.

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