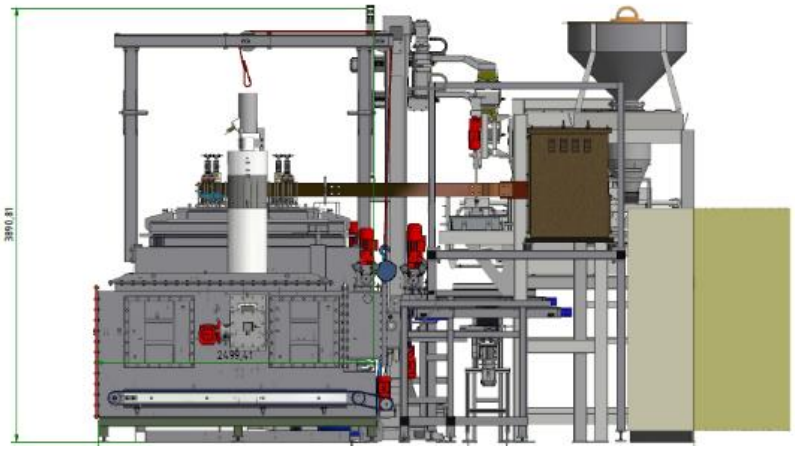
CARBIDE 2500: A Pusher-Type Furnace for the Carburizing of Tungsten-Carbide at 2500 °C

Title of the Project

"The first 2500°C industrial furnace, for higher efficiency and up to 5 times higher strength materials"



Project Duration

24 months, started on 1st Mai 2018

Tungsten Carbide (WC)

Tungsten Carbide (WC) is a high performance material composed of Tungsten (W) and Carbon (C). This inorganic non-natural compound, exhibits a hexagonal structure made of a grid of Tungsten and Carbon, that confers it unique properties. Not only does it have a hardness second only to that of diamond, it also has a high density, melting point, strength and a high electric and thermal conductivity. Furthermore, the compound tungsten carbide is easily molded into many shapes, can be sharpened with precision, and can be melded with or grafted to other metals.

High quality tungsten carbide powder is needed to produce cemented carbide, an extremely successful composite engineering material made up of between 70-97 percent by weight of WC-powder. WC powder is mixed with the binder metal, compacted in a die and then sintered in a furnace to produce a cemented carbide. Parts made using cemented carbide are resistant to heat, wear and pitting. Therefore industrial tools made using cemented carbide components are primarily used for applications where they are subjected to great stress, for example drilling, mining, milling and grinding. Due to their characteristics, such tools are relevant for the production of products in many industrial sectors, for example those producing aerospace, automotive, pump and seal, oil and gas, metal forming, metalworking, and hygiene products.

Another important application of tungsten carbide powder is the production of specialized alloys and composite materials containing other metals. Tungsten carbide can be combined with nickel, iron, silver, and copper to create specialized materials that are used in commercial construction applications, electronics, industrial gear making, radiation shielding materials, and the aeronautical industry.

" This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 811248 "

One of the sectors, in which tungsten carbide also plays a significant role, is the development of new materials for the manufacturing of high density parts by additive manufacturing techniques, such as binder jetting and powder bed fusion (e.g. Selective Laser Sintering, Electron Beam Melting).

Production of tungsten carbide powder

Tungsten carbide is formed by a chemical reaction between tungsten and carbon at very high temperatures of between 1450 °C-2500 °C. This process is called Carburizing or Carbonization. Reliably achieving these high temperatures in the high temperature process zone of thermal process equipment is a great challenge for plant manufacturers. They can be achieved in high-temperature pusher furnace systems with a graphite interior with a reducing atmosphere.

We at CREMER are specialized in high temperature processes under an inert or reducing atmosphere. We successfully design and construct pusher type furnaces for reducing, sintering, carburization, and calcination (please refer to: Pusher Type Sintering Furnace PTS, www.cremer-polyfour.de).

Influence of the carburization temperature (2200 °C vs. 2500 °C)

CARBIDE2500 is the only atmospheric pressure industrial furnace that can operate at 2500°C, 300°C above state-of-the-art high-temperature industrial furnaces. This opens new and relevant possibilities to the powder metallurgy (PM) industry, as it is now possible to produce materials with significantly enhanced properties.

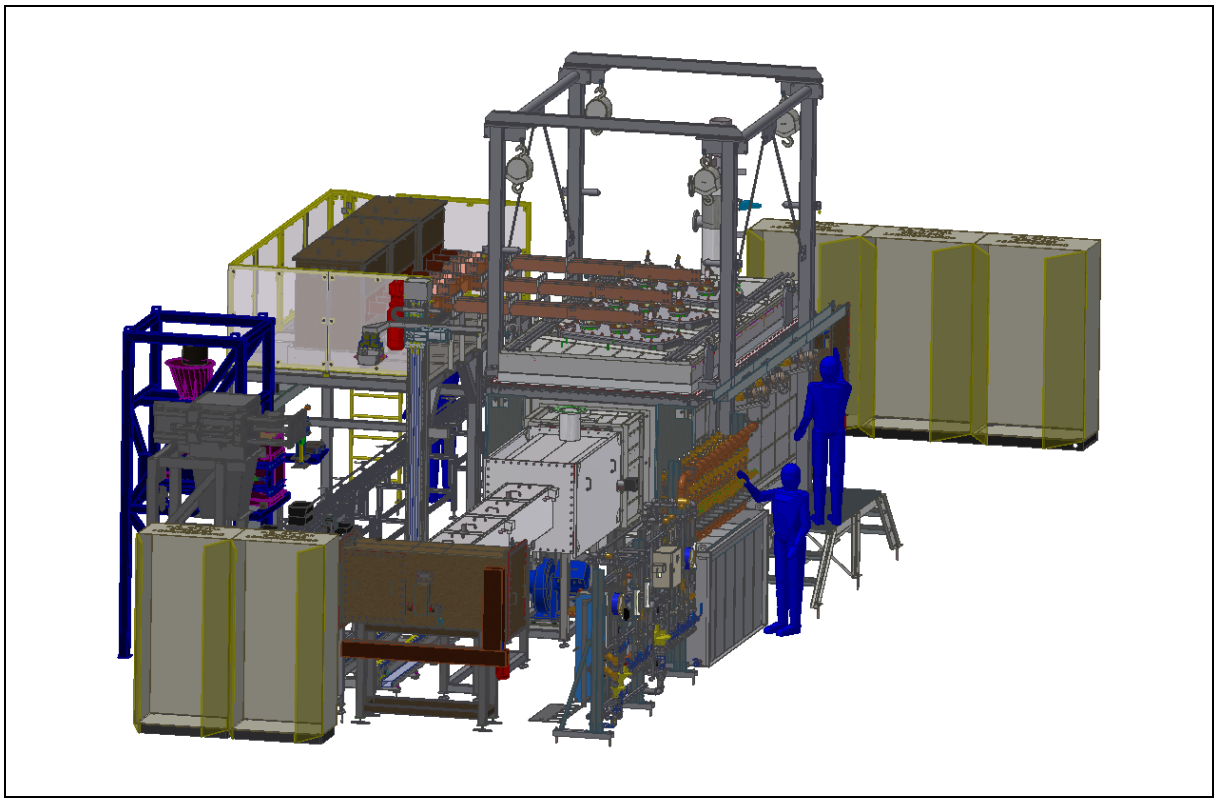
Material tests were made to compare properties of tungsten carbide (WC) obtained at 2200°C (state-of-the-art industrial furnaces) and tungsten carbide obtained at 2500°C (CARBIDE2500 technology). Tungsten carbide particles size was the same in both tests, only varying the carburizing process temperature. The result: Tungsten Carbide (WC) produced at 2500°C has a 3 to 5 times higher strength and increased hardness in comparison to the same composition material produced at 2200°C.

Conclusion

CARBIDE2500 is the first atmospheric pressure industrial furnace able to operate at 2500°C. This allows the production of Tungsten Carbide (WC) with a 3-5 times higher strength, opening new possibilities for the whole PM supply chain towards the high precision manufacturing goal.

" This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 811248 "

Photo Gallery



Contact:

CREMER Thermoprozessanlagen GmbH

Auf dem Flabig
D-52355 Düren
Germany

Tel.: +49 – 2421 – 968 30 0
Fax.: +49 – 2421 – 6 37 35

info@cremer-ofenbau.de
www.cremer-polyfour.de

“ This project has received funding from the European Union‘s Horizon 2020 research and innovation programme under grant agreement No 811248 “