Germany

Front Line Technology for Laboratories and Industrial Plants

Linn is expanding its activities in the construction of industrial plants for microwave technology.

In the spring of last year *Riedhammer* and *Linn High Therm* announced their co-operation in the microwave heating technology sector. The aim is to achieve a substantial increase in the use of special constructive solutions from the house of Linn using their patents in large-scale plants for the ceramics industry. The international presence of Riedhammer within the ceramics industry will provide Linn with technical market support. The mutual aim is to concentrate know-how in the areas of engineering, production and the application technology resources. Moreover, development in the internal microwave sector for utilisation in hybrid-plants shall be promoted. Over the past few decades, Linn has shown great creativity in the development of high temperature furnaces and kilns for special applications and also provides a high level of customer orientated kiln design.

Fig. 1 Horst Linn

Company History

Linn High Therm was founded by *Horst Linn* in 1969 and specialises in electrically heated laboratory and high temperature furnaces and inductive smelting and casting plants for industry and laboratories.
In 1979 the product range at the enlarged factory in Eschenfelden was extended to include induction-heating equipment, microwaves and vacuum furnaces.
The special production capacity for the construction of medium sized industrial kilns was increased in 1991 with the acquisition of a company in Bad Frankenhausen, which then began to trade under the name of *Linn Elektro Therm*.
At the beginning of 2002, the 100% owned Linn Elektro Therm GmbH subsidiary was then renamed as *Linn High Therm GmbH*.
Today Linn High Therm has 110 employees and the export quota is at approximately 60 %, foreign operations being concentrated on Eastern Europe (Pilsen), Russia, Lithuania, Thailand, South Korea, Malaysia, Vietnam, China and the Middle East.

Product Philosophy

The strengths of Linn High Therm GmbH lies in constructing special systems according to customer's specifications. Naturally, the company relies on the utilisation of basic modules for the design of these plants, in order to be able to keep the construction costs to a minimum. The aims of each development and specially tailored construction project are:

- Special economicalness taking into account all environmental aspects.
- Low operating costs and long working life due to the utilisation of front line technologies.
- Energy savings made through the use of modern high temperature insulating materials produced at their own factory.
- Reliability and continuity based on many years of practical experience in the construction of high temperature systems.
- Well thought out construction solutions with multiple utilisation possibilities.
- Strict adherence to all existing safety regulations and certification to the ISO 9001 international standard.

Fig. 2 MDBT 70+24 oven for microwave drying of insulation materials

Fig. 3 MKT 30 plant for drying of grinding wheels

Microwave Technology for the Ceramics Industry

For industrial microwave drying, Linn High Therm offers two different kinds of equipment. For continuous processes with short to medium drying times, the continuous microwave belt dryers of *type MDBT* are best used. This type is constructed from standardized modules, but still can be adjusted in power and length to the individual process requirements. The MDBT type (Fig.2) is offered in a broad range of power, ranging from 8...150 kW and heated length, ranging from 0,3...30 m. Applications are the drying of ceramic cups and plates, ceramic honeycombs, insulation materials, building materials, ceramic raw materials, and many others.
For batch processes with medium to long drying times of also large pieces, chamber dryers of the MKT type (Fig. 3) can be used. This type is available with powers ranging from 2,4...50 kW and volumes ranging from 1...30 m^3. Microwave power and chamber volume can be adjusted to customer demand.
An easy to operate sliding door enables fast loading by hand or lift truck and saves production space or building height in comparison to a swivelling door. Applications are the drying of porcelain figures, gypsum moulds, grinding wheels, high voltage insulators, and among others.
Both types of equipment can be designed as hybrid systems, by preheating the inlet air of the drier by electric heaters, or oil- and gas-burners. This can reduce the required microwave power and improve the temperature homogeneity of the product.
The microwave frequency applied is usually 2,45 GHz. Beside this frequency Linn High Therm offers, at the moment exclusively, equipment with the new microwave frequency 5,8 GHz. Due to the special design, older units can be retrofitted with this new frequency. This microwave frequency is especially suitable for the drying of thin materials and low water contents or not-coupling materials.

Other Products Included in the Range

The product portfolio is versatile on the one hand yet is able to meet the highest technical requirements on the other. In addition to 1150... 1 800°C laboratory kilns for universal thermal treatment there are also protective gas muffle furnaces that operate ≤ 1 150°C, high temperate furnaces for vacuum and protective gas operation that operate ≤ 2 800°C, over-pressure furnaces that operate up to 250 bar/2 300°C, vacuum hardening furnaces with high pressure gas quenching up to 10 bar and 1 800°C, cold walled furnaces that operate ≤ 2 800°C for vacuum and protective gas operations, multi-zone tubular furnaces, tempering and hardening furnaces that operate ≤ 1 300°C and circulating air furnaces that operate ≤ 850°C. Furthermore chamber and shuttle kilns ≤ 5 m^3, rotary tube furnances ≤ 4m and roller kilns ≤ 8m. There are also inductive re-melting and treatment plants for preparing samples of oxidised and metallic materials for spectroscopy, high and middle frequency generators, induction centrifugal casting machines for precision casting, jewellery, dental, medicinal technology and magnesia industry, special furnaces for research and development, the nuclear industry and pot melting furnaces for aluminium, variegated and precious metals as well as glass and special systems for the treatment of precious stones and the growing of crystals are all integral items in the range of products.

Linn High Therm, www.linn.de