Energy-efficient glass melting technology emanates HORN® expertise

A global leader in glass melting technology, HORN® Glass Industries offers advanced furnace solutions and turn-key plants. With over 140 years of expertise, the company delivers innovative, energy-efficient systems tailored to diverse glass production needs – ensuring both high performance and sustainability for manufacturers worldwide.

As a glass melting technology specialist, HORN® Glass Industries AG supplies the float and container glass industry with a wide range of high-quality individual products and turn-key plants. Its high performance glass melting furnaces and turn-key plants are planned, built and delivered to glass manufacturers all over the world to produce beverage bottles, food containers, drinking glasses, window panes, automotive glass, glass tubes, glass fibres or specialty glass. With more than 140 years of experience in the construction of glass melting furnaces HORN® is well known as a specialist and expert

in the glass industry. Over the years, the company has extended its capabilities and expertise and has grown from being a glass melting furnace manufacturer into an industry leader in technological plants. The group has also grown considerably with subsidiary companies in China, Malaysia, India, Croatia, Ukraine, Brazil and the Czech Republic and Romania, adding value – such as proximity and short response time for global customers. Almost 90 percent of the products are exported from the HORN® headquarters in Plössberg (located in the Bavarian Upper Palatinate, Germany) to more than 75 countries worldwide. At all times, HORN® offers its customers full support and a helping hand. Due to a very high level of vertical integration of all products, HORN® offers tailor-made solutions and, at the same time, has ventured into new areas, e.g. in the construction of proprietary tin baths and related equipment. HORN® manufactures a wide range of products in its own workshops in Plössberg and is the service provider for the realisation of customer visions and projects in the field of glass production. HORN® supports its customers from the first draught through to the process of implementation to permanent on-site production support. HORN® builds a wide variety of glass furnace types for its customers, ranging from the usual end fired furnace to the all electric melting furnace. Furnace selection depends on individual customer requirements and demands. Depending on glass quality, furnace capacity, raw material specifications and glass type, each furnace is customised and optimally designed in compliance with the requirements of the customer. HORN®'s know-how and experience of many years concerning the optimisation of energy consumption and emissions are also reflected in the sophisticated design of all melting furnace components.

SCOPE OF SERVICE AND SUPPLY

- Melting technology and know-how
- Design of steel, refractory, piping, cabling, control systems and equipment
- Refractory supply
- Heat-up and Start-up
- Optimisation of melting process
- Troubleshooting

Although its technology is state-of-the-art, HORN® nevertheless continues to strive for the development of innovative technologies such as large scale all electric and hybrid furnaces, new measuring devices, new equipment and related control strategies.

TYPICAL CONCEPTUAL FACTORS FOR SELECTING A MELTING FURNACE

- Melting capacity, glass colour, product type, requirements concerning the glass quality, etc.
- Medium for firing of the furnace, such as natural gas, oil, LPG and the possibility of using oxygen
- Environmental requirements or other legal requirements
- New construction or replacement of a melting furnace already in place
- Space conditions in the melting furnace building

FURNACE TYPES

HORN®, with its extensive experience, expert knowledge and expertise, designs different types of furnaces best suited to the various glass melting processes. Furthermore HORN® consid-

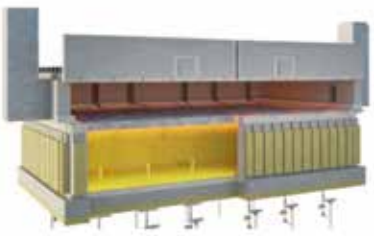
Regenerative End Fired Furnaces

Regenerative Cross Fired Furnaces

Oxyfuel Furnaces

Recuperative Furnaces

All Electric Furnaces



Float Glass Furnaces

Hybrid Furnaces

ers local circumstances like energy prices and environmental regulations. HORN® Glass Industries AG supplies the following furnace types:

ALL-ELECTRIC FURNACES (COLD-TOP)

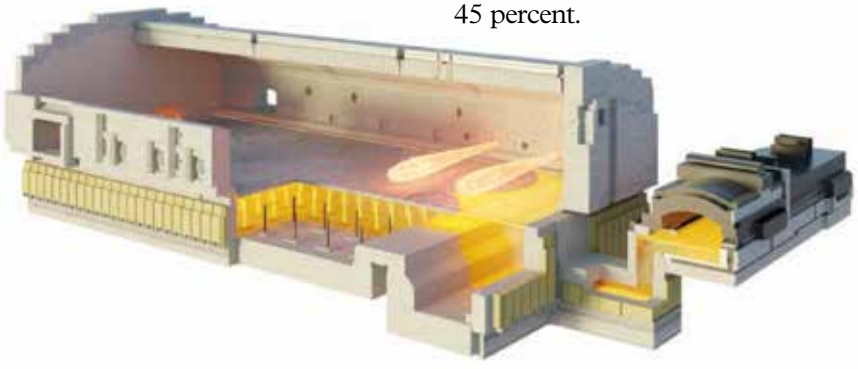
In general, all electric furnaces following the cold top technology are typically used for a production range of 5-80 t/d. It is possible to increase the melting capacity up to 200 t/d and more. For this furnace type energy is not supplied by means of fossil fuels, but exclusively by electric energy that's supplied by molybdenum electrodes.

DESCRIPTION

It is possible to use rod electrodes with specially developed, water-cooled electrode holders or block electrodes. The electrodes can be installed in the furnace bottom, in the lateral walls of the tank or inserted from the top, so-called top electrodes. Appropriate positioning and wiring of the electrodes lead to reduced corrosion of the refractories and thus increase the furnace life. The most efficient concept is usually the usage of top electrodes. In case of a cold top furnace the batch is supplied by an area batch charger at an open side wall of the superstructure. This layer insulates the glass bath from the environment, making additional insulation unnecessary. The melting, refining and homogenising processes in all electric furnaces are directionally vertical. All electric furnaces are not controlled by temperature but rather by electric power and batch thickness. There is a very delicate balance between these two measures making the furnace less flexible in respect to pull changes. The flexibility can be improved by means of furnace design. The specific pull is higher and not comparable with fossil fuel fired furnaces due to the vertical melting process. The glass quality can be drastically higher than in a fossil fuel fired furnace. For this reason, high quality specialty glass, e.g. for optical application, is molten with all electric furnaces. The energy consumption of all electric furnaces is lower than the one of fossil fuel fired furnaces. This is especially true for small furnaces, making small furnaces even more cost efficient. Increasing costs for CO2 allowances can be a deciding factor for all electric furnaces despite higher costs for electric energy in the near future.

REDUCED ENERGY CONSUMPTION

Hybrid furnaces combine the combustion of a fuel (mostly natural gas) with a highly increased proportion of electric power. For the combustion, an end-fired as well as a cross-fired setup can be used. This includes furnaces with regenerators, recuperator and oxyfuel combustion. If the overall electric share is aimed to be over 40 to 50 percent, the latter is the preferred solution. Compared to their classic pendant with little to no boosting, the overall energy consumption is reduced by approximately 5 to 10 percent, while CO2 emissions from combustion decreases from 20 to 45 percent.



HYBRID FURNACES

HORN® hybrid furnaces are specially designed to combine the classic heating method of combusting a fossil fuel with the usage of more electric power by using electrodes in the melting tank. The high electric share leads to a reduction of the fuel consumption and therefore to lower temperatures in the superstructure. In combination with a lower flue gas volume (even more for an oxyfuel furnace), this requires a modification of the superstructure design and possibly of the refractory materials to avoid cold spots and the subsequent damage. In the melting tank, a high number of electrodes are necessary. They can be installed as side or bottom electrodes depending on steelwork, position of burners, glass composition, etc. and preferably form "convection zones" in the tank. In these areas, the typical convection is preserved, despite the influence of all the electrodes, to support the melting process. To some degree, a hybrid setup offers flexibility regarding the energy contribution between fossil and electric and also for the pull rate. Currently hybrid concepts are used for furnaces with smaller pullout of 50 to 400 t/d and/or specialty glass, but in general the maximum furnace size is approximately the same as for the classic fossil furnaces (750 t/d and even larger). ■

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