

Fifty years of being switched on

FIFTY YEARS OF BEING SWITCHED ON

SORG

Furnaces with a bright past
and sustainable future



The use of electric furnaces for glassmaking was first brought to the market by SORG 50 years ago. Since then, the group has continued to innovate, providing tailor-made systems that not only ensure the high quality glass required nowadays, but also low energy consumption in response to the need to reach climate neutrality in a foreseeable period.

Since introducing the first all-electric VSM® furnace 50 years ago, the SORG Group has supplied over 100 cold-top Vertical Super Melters, as well as electric boosters for over 500 traditional fossil-fired furnaces worldwide. Still today, SORG continues to innovate with sustainable solutions to tackle climate change.

SORG mostly uses electric energy to increase the capacity of fossil-fired melters and also improve the glass quality. In fact, its first applications of electric melting can be traced back further to the 1960s. Now an independent supplier of more than 500 boosting systems in over 70 countries, these can be applied to any make of combustion furnace.

The Electric Melting team

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includes electrical engineers, mechanical engineers and industrial management assistants. Technical development and pre-engineering are included in the quotation phase, with all calculations and key equipment design carried out in-house.

Systems are tailor-made to individual customer needs and boundary conditions. Technical documentation is provided to help resolve day-to-day problems, while commissioning support and a free after-sales service include inspections to see when electrodes need replacing. The team also works alongside SKS/Sorg Feuerungsbau, who can provide expert maintenance assistance to customers facing any severe equipment issues.

TAKING TODAY'S TECHNOLOGY FORWARD

With the Paris Agreement asking for a 40 per cent reduction in carbon emissions by 2030 and net zero by 2050, the global glass industry faces a huge step change as manufacturers seek more renewable energy sources.

Modern glass melting furnaces are highly effective and energy consumption is on a relatively low level. High quality requirements, especially with regard to homogeneity and bubbles also have to be met. While of course, emissions such as NO_x, SO_x, dust and CO must be within the limit values.

Furnaces tend to have a high to very high flexibility, so that glass producers can react to the market demands. They need to be designed so that colour changes of the glass can be carried out quickly, together with changes in the raw materials due to availability, price and quality.

The one major disadvantage of modern glass melting furnaces is that they are fossil-fuelled. Many have installed electric heating, but only to increase the melting per-

formance and the glass quality.

As high-energy-intensive installations, furnaces continue to produce significant CO₂ through the combustion of fossil fuels. Efforts are underway to reduce CO₂ emissions and slow down global warming. The European Union goal for climate neutrality by 2050 means a complete eradication of fossil fuels, leaving electrical energy as the most logical alternative.

SORG has an entire department dedicated to this more sustainable energy source. Currently led by the fourth and fifth generations of the Sorg family, the Group offers a unique range of safe and sustainable solutions to provide the lowest cost of ownership over the life of the investment.

ALL THE BENEFITS OF ALL-ELECTRIC MELTING

The cold-top vertical melting principle of SORG's Vertical Super Melter has proved to be the best technology available for glass furnaces using only electricity as their energy source.

Patented in 1970, the VSM[®] produces all kinds of glass, especially high-quality glassware ranging from borosilicate glass to tableware. It can reduce energy consumption in a number of unique ways. With no combustion, no energy is lost in terms of a large quantity of waste gasses. The only gas stream generated is a relatively small amount from the decomposition of raw materials in the batch, as well as water vapour from raw material humidity. This waste gas stream can be removed from the furnace superstructure. Cleaned by means of a small baghouse filter, it prevents in-factory dusting and is released into the environment without any further treatment.

As the main process steps take place in the vertical direction of the furnace, the outside



surface area of the cylindrical melting tank is relatively small. Furthermore, heat insulation can be applied to large parts of the tank, making losses through the refractory exceptionally low. Other large components with high wall losses, such as a large superstructure or heat recovery system, are totally unnecessary.

SORG's rotating crown batch charging system achieves a perfectly even coverage of the melt with a layer of raw materials. This batch blanket acts as an insulating layer on top of the melt and an integrated batch preheater, resulting in superstructure temperatures of between only 150 and 300°C. The sealed superstructure also prevents dust within the factory.

Relatively easy to operate, all-electric melters also benefit from less maintenance and a shorter repair downtime. And with more than 100 VSM[®] furnaces installed since 1971, all kinds of special glasses have been successfully produced.

The first widely-used application of all-electric melters was in producing glasses with volatile components. Due to the cold raw material cover, these components can be reabsorbed in the batch blanket and not lost to the environment.

An increased demand for all-electric melters in localities with high environmental require-

ments has led to urban glass producers being allowed to extend production capacity only by switching to a furnace technology that avoids emissions of air pollutants like sulphur dioxide or nitric oxides. In areas with high hydro-power potential or limited supply of natural gas, electricity is the cheapest energy available.

One of the biggest advantages to having an all-electric melter is in the simplicity of operation. Without combustion and waste gas treating equipment, only a small number of auxiliary aggregates have to be installed, operated and maintained. Just two main control loops are required – the electric heating power and glass level. Day-to-day furnace operation is low and maintenance work is mostly limited to the batch charging system, inspecting and exchanging worn electrodes, whenever necessary.

GOING BEYOND THE LIMITATIONS

The cold-top vertical melting process does come with certain limitations, such as in the possible meter size and pull. Requiring an even layer of batch to be spread across the whole surface of the melt, all-electric melters have a size limit of around 200 metric tons per day.

Reducing and neutral glasses are difficult to produce with all-electric melters today, while glasses for continuous reinforcement fiber have a very high specific electrical resistance and would require melters of a reasonable size to operate at dangerously high voltages.

Besides electricity being more expensive than natural gas in most parts of the world and therefore uneconomical for standard glasses, a lower melting capacity means that a single

all-electric furnace might only supply one or two production machines. However, this will also lead to higher flexibility in production and less furnace repair downtime impacting the overall output of the plant. A shorter total lifetime of the all-electric melter is compensated by shorter glass-to-glass repair time and considerably lower refractory cost.

If energy prices are disregarded and the industry reconsiders everything in terms of the environment, then pure electric melting furnaces are an adequate replacement for fossil-fired melting furnaces.

The VSM® is solely electrically heated and produces no CO₂ emissions from combustion. However, this requires the acceptance of cutbacks that are controllable.

MOVING AND MELTING WITH THE TIMES

Our big challenge is to reach climate neutrality in a foreseeable period. The future of glassmaking requires sustainable melting technology. Legal guidelines such as emission trading and increasingly strict limits on air pollutants will force glass producers to change their furnace technology. Classical combustion technology, like the regenerative firing principle that has been used for more than 150 years now, will soon be gone.

The concept of hybrid melting and alternative combustion fuels, such as hydrogen have been debated and developed for a while, but with the high capital cost involved, they still have a long way to go. All-electric melters have proven technology and may see a renaissance in the production of special glasses. By implementing certain process changes, they make an ideal alternative for mass produced

glass such as containers.

Even though such a long-term commitment is extremely difficult due to undefined boundary conditions, it's possible to commission a first design stage melting furnace almost conventionally today. Simply by boosting shares of more than 10 per cent in the total energy and increasing the use of electricity over time in accordance with the changing regulations. This furnace concept has the advantage of greater flexibility, especially if there is the possibility of future fossil heating using green hydrogen.

The need to reduce emissions is more important than ever, and as long as there is a sufficient supply of carbon-neutrally generated electric energy, the solution for future glass production is electric melting.

With half a century in all-electric melting, SORG has been switched on to greater sustainability long before reducing our industrial carbon footprint became the all-important issue it is today. By always asking difficult questions and looking for the brightest solutions, SORG is leading the way forward in its own inquisitive and conscientious way.

To find out how SORG is staying switched on, visit the sustainable melting microsite at: <https://sustainablemelting.sorg.de>.

SORG

VALUE
BY
DESIGN

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