

FURNACES

High capacity, low carbon: BDF goes fully electric

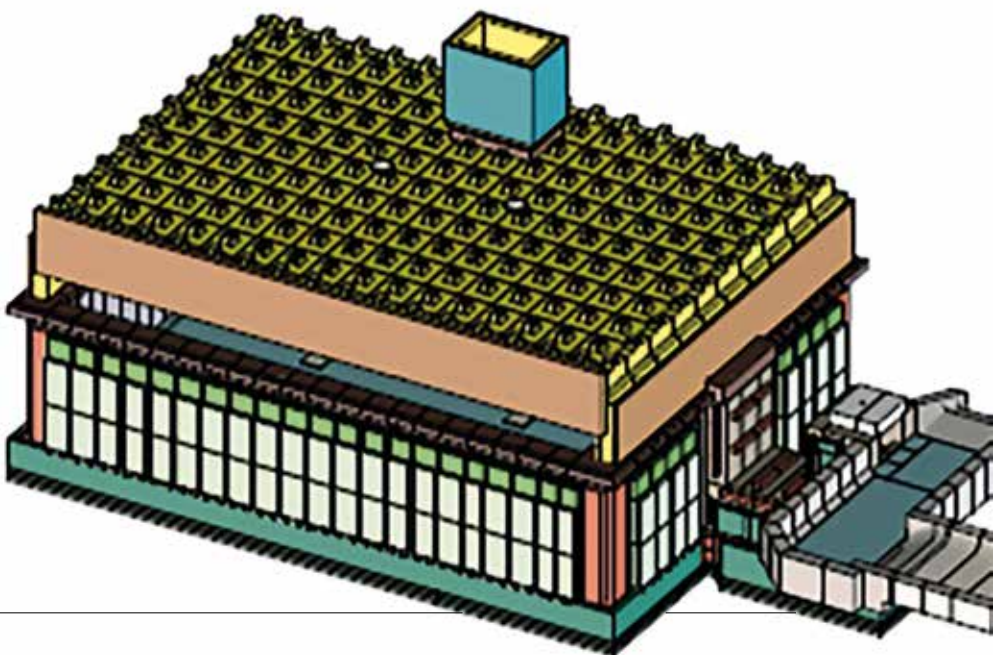
STORY OF FURNACES

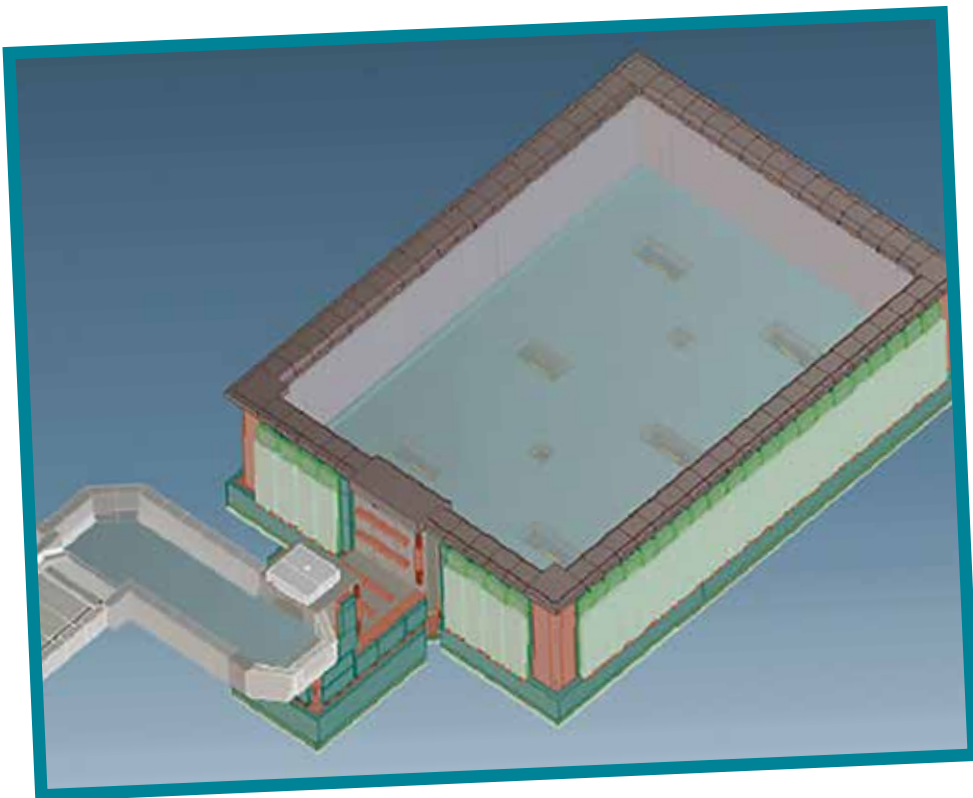
Since the early 20th century, end-port (end-fire) furnaces have been the standard in container glass melting for small to medium pull rates. From the 1970s onwards, regenerative and oxy-fuel furnaces became widespread - offering higher efficiency and lower emissions. In recent years, the push for decarbonization has led to the development of hybrid and fully-electric furnaces - combining conventional combustion with electric boosting to meet high-pull demands sustainably.

SO WHY ELECTRIFY NOW?

Global container-glass demand continues to rise -up 2.6 percent CAGR through 2030- yet carbon budgets are shrinking. European Union Emissions Trading Scheme allowances already add a fee per ton of hot-end CO₂, and the next review is expected to tighten free allocations further. Gas prices remain volatile; electricity sourced from wind and solar has fallen below in price per MWh in several markets. These dynamics make an electric melter not only greener but, in many regions, cheaper over a ten-year horizon. Conventional oxy-fuel designs capture some of that benefit but still emit combustion CO₂ and require expensive oxygen generation. Full electrification eliminates both while simplifying flue-gas treatment and stack-monitoring compliance.

As the glass sector races towards decarbonization, BDF Industries unveils its modular, fully-electric furnace - capable of melting over 250 TPD. Merging efficiency, scalability and sustainability, this next-generation solution empowers manufacturers to meet rising demand whilst dramatically reducing both emissions and energy costs.





ELECTRIFYING GLASS MELTING: BDF'S MODULAR ALL-ELECTRIC FURNACE FOR >250 TPD

As the glass industry accelerates its path toward decarbonization, full electrification of melting furnaces is emerging as a game-changing solution. Yet, scaling electric technology to support high production capacities -beyond 250 tons per day (TPD)- remains a technical and strategic challenge. BDF Industries, drawing from over a century of experience and over seventy years in glass plant engineering, introduces its new fully-electric, modular melting furnace concept. This solution is designed to meet the dual demand of industrial-scale output and radical emissions reduction, making it a key asset for glass manufacturers aiming to align productivity with sustainability.

A LEGACY OF INNOVATION IN GLASS TECHNOLOGY

Since 1906, BDF Industries has been a technology leader in the hollow glass sector. As

the first European company to manufacture IS machines, and with hundreds of melting plants commissioned globally, BDF has developed deep, vertically integrated expertise across Melting and Forming technologies. This new electric furnace reflects that heritage. Each project is tailored with precision engineering, combining robust process knowledge with field-proven components to ensure efficiency, reliability and high glass quality.

A MODULAR APPROACH TO HIGH-CAPACITY ELECTRIC MELTING

The BDF electric furnace is built around a modular architecture: the melting tank is divided into pre-engineered sections, on-site assembly, and long-term maintenance. This modularity enables flexible plant design, scalable production capacity and easier upgrades - making the system adaptable to future energy and production scenarios.

Key benefits:

- Scalable design: production capacity can be increased by

adding modules, minimizing downtime and maximizing return on investment;

- Improved energy efficiency: each module features independent electrical circuits and high-performance thermal insulation, limiting heat loss;
- Faster deployment: standardized fabrication reduces engineering complexity and speeds up on-site installation.

SEAMLESS INTEGRATION WITH ELECTRIC FOREHEARTHS AND SMART CONTROL SYSTEMS

The electric melting furnace is designed to work in synergy with BDF's well-established electric forehearth, which use silicon carbide heaters to deliver precise, homogeneous glass temperatures. These systems are fully enclosed, minimizing air infiltration and energy loss during the glass' journey to the forming lines. To enhance performance and process transparency, BDF also offers its digital control platform Panorama 4.0™ - a real-time supervision system that integrates data from the furnace, forehearth, and forming lines into a unified dashboard. From energy monitoring to electrode power tracking, operators can make informed decisions faster, improving uptime and efficiency.

FULL-ELECTRIC MELTING: A KEY ENABLER FOR DECARBONIZATION

Replacing fossil fuels with electricity in the melting process eliminates direct emissions of CO₂, NO_x, and SO_x. Additionally, electric heating enables direct energy transfer to the glass bath via electrodes, achieving thermal efficiencies above 85 percent—significantly higher than conventional gas furnaces, which typically operate around 45-60 percent. Recent analyses show that fully elec-

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tric furnaces can reduce total energy consumption by up to 35 percent compared to gas-fired systems. These performance gains align with broader industry trends: today's glass packaging is about 30 percent lighter than it was 50 years ago, manufactured using 70 percent less energy and emitting half the CO₂ per unit produced. While the full environmental benefit of electric melting depends on the source of electricity, the energy grid is rapidly shifting toward renewables. In many regions, electric solutions are already becoming cleaner and more cost-effective than localized combustion - and that trend is expected to accelerate.

COMPARING TECHNOLOGIES: ELECTRIC VS. HYBRID AND FOSSIL-FUELED FURNACES

In high-capacity applications, traditional regenerative or recuperative gas furnaces still dominate. Hybrid furnaces -mixing electric and fossil energy- have been deployed as a transitional step, cutting CO₂ emissions by 20-45 percent by shifting up to 50 percent of energy input to electrodes.

Full-Electric furnaces, like the new BDF solution, take decarbonization further:

- Zero combustion emissions: eliminating burners and combustion chambers reduces



- direct environmental impact;
- Superior thermal control: modular heating zones and real-time monitoring deliver process stability and energy savings;
- Future-ready infrastructure: designed to operate with renewable energy sources, full-electric furnaces align with long-term sustainability goals.

THE BDF ADVANTAGE: INDUSTRIAL SCALABILITY MEETS CLEAN ENERGY

By combining modular engineering, advanced process controls and a legacy of glass melting expertise, BDF's electric furnace is more than a new product. It's a strategic tool for transformation. With capacities above 250 TPD, it proves that high-volume, all-electric melting is not only possible, but also practical and profitable. When inte-

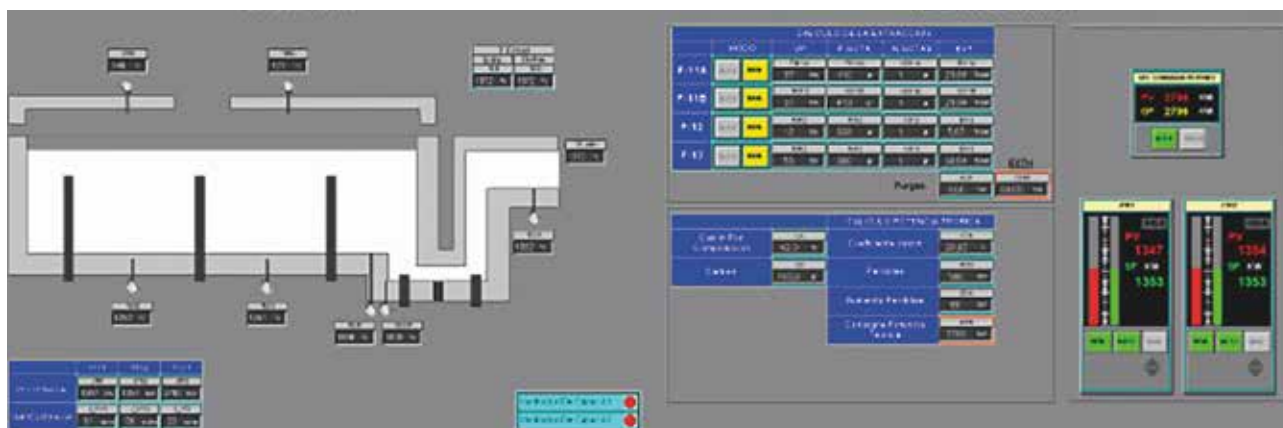
grated with BDF's electric forehearths, forming lines and smart control platforms, this solution delivers unmatched operational performance and environmental impact reduction. For glassmakers navigating the energy transition, BDF Industries offers a clear path forward - combining innovation with proven industrial strength. ■



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