■ Innovation and energy efficiency in the glass industry

Well Equipped for the Future

Innovations are key in today's glass industry. At Glasstec 2010, the industry's premier companies are showcasing new technologies and processes in the glass manufacturing sector. The main focus is on efficiency and enhancing performance, especially in terms of how well the environment is protected.

Glass as a material has become a permanent fixture in our everyday lives. Whether container glass such as for bottles or jars; or high quality float glass for automotive use, construction, interior architecture, and photovoltaic plants; or in specialized applications such as fiberglass, glass has conquered all areas of our lives. Although the basic material has been the same for some 5,000 years, in recent years the demands made of production processes have undergone dramatic changes. By

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refining production recipes and special production methods, researchers and engineers have managed to turn glass into a high-performance product. Coatings play an important role in this regard. Coatings give glass dirt-repellent and even self-cleaning characteristics, giving glass higher light transmittance, heightened mechanical resistance, and resilience against corrosive substances.

A challenge and an opportunity: diversification

Just as glass products have evolved, so too has the glass industry itself. Manufacturers produce not just one specific type of glass but a wide variety, often at a single factory. This development requires greater investment by manufacturing enterprises. At the same time, costs for raw materials and energy are on the rise. This means the glass industry is faced with two challenges: on the one hand, market demand must be met, and on the other, cost control must be exerted. And lawmakers and the general public are also requiring proof that production is not harmful to the environment. In order to save resources and preserve the environment for later generations, the glass industry has to go "green."

The key to this is innovation. By introducing new technologies, glass manufacturers can implement their processes more flexibly and more efficiently, improve their product quality, and reduce their consumption of resources. In order to help manufacturers meet these requirements, Siemens works closely with glass manufacturers and mechanical engineering specialists to offer a comprehensive portfolio of products and systems for automation solutions, process instrumentation, analytics, and drive technology for glass manufacturing.

Energy-efficient production...

Over 75 percent of the energy required in glass manufacturing is consumed during melting. The burners are fired with oil or natural gas, and furnace efficiency depends on the quality of the fuel used. Using Sitrans CV, gas quality monitoring through chromatographic determination of the calorific value allows the burning process to be optimally managed within the process control system. This system ensures that the exact amount of natural gas is being fed in, significantly reducing fuel consumption. This additionally results in a more stable burning temperature as well, which extends the service


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The glass industry thrives on innovation: The spectrum of new developments ranges from fiberglass production to safety glass for the automotive industry...

life of the furnace and considerably improves glass quality. The melting process also generates an enormous amount of waste heat that until recently was not sufficiently exploited. By deploying a new, compact Siemens steam turbine, up to 95 percent of the energy consumed can be recovered (see p. 8). Not only does that save money, it also reduces carbon dioxide emissions.

...using energy-saving motors and converters

As in many other industry sectors, there is also a trend in the glass industry to consider not only initial investments but also the total cost of ownership (TCO) over the entire life of machinery and plant equipment. For example, the share of energy costs for motors is often well over 90 percent of TCO. Equipped with energy-efficient motors and converters, Siemens energy-saving drive systems make a big difference to the cost picture, especially in large float-glass processing equipment. Electric drives already consume two-thirds of the electricity required by industry – that is why greater efficiency in this area is so effective.

As of June 16, 2011, two-, four-, and six-pole motors may only be used in the 0.75- to 375-kilowatt performance range, with minimum efficiency equal to or better than IE2. Siemens is ahead of its time and has already met the IE2 efficiency standard by increasing motor efficiency by 2 to 9 percent. With total efficiency of over 90 percent, the technology breaks even after only one year.

As is also true for other industry sectors, Sinamics converters play a significant role in the glass industry because their use offers considerable energy-saving potential. Adjustable-speed drives with frequency converters are used primarily for glass conveyor drives as well as in furnace and annealing lehr fans. These drives perform very well in these scenarios because equipment does not operate at a constant speed, meaning the speed and thus the energy consumption must be rapidly and precisely modified to reflect momentary requirements. Depending on the plant's characteristic consumption curve, savings can be as high as 70 percent.

A second key aspect is the opportunity for energy recovery. Sinamics frequency converters recover energy released during braking and feed it back into the power supply network, making it available to all power-consuming devices. This eliminates the need for braking resistors that generate heat loss. Many frequency converters with energy recovery capability are also able to ensure that there is no phase shift between voltage and current; this prevents reactive power from being used from the network, which otherwise would be a cost factor or would have to be reduced by using reactive power compensation equipment.

Regardless of the energy-saving products, there is also significant savings potential in the configuration of drives. The SinaSave software tool allows the amortization period to be calculated for drives so that the manufacturer can determine the most economical solution for the customer's needs.

Optimizing energy consumption

Sophisticated technology is only one of several possibilities for reducing the level of energy consumption in glass production. To increase energy efficiency in a sustainable manner, plant work processes must be modified. Energy management systems are therefore an essential factor in optimizing a company's energy efficiency. Siemens offers an energy optimization concept for this area based on a holistic view of company processes (for a detailed description, see p. 12).

Another tool for efficient energy management is


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...all the way to solar collectors and high-quality coatings for building glass

called b.data. This energy management and company information system creates transparency by breaking down energy consumption and materials seamlessly so that energy costs can be charged to the correct party and transferred to an invoicing system. The characteristic values established in this way make possible well-founded statements on efficiency improvements and thus allow users to manage energy operations in an optimal and economical manner in controlling, planning, and energy procurement.

Meeting high quality standards

Glass is a highly advanced material whose functionality and areas of use are constantly undergoing further development. More and more diverse types of glass are being called for in the automotive sector, and the glass must also satisfy the most demanding safety and comfort requirements.

The market for solar collector equipment is booming, driving demand for cell-based and thin-layer photovoltaic panels. The solar industry has very stringent requirements for durable glass grades with low iron content for use under the most demanding weather conditions. In addition, solar applications such as concentrated solar power (e.g., Desertec) offer a wide range of uses for solar glass as parabolic reflectors and receivers through which a heated medium flows. This heat is then used to generate electricity using Siemens steam turbines.

As requirements for various areas of application have grown more and more demanding, requirements for consistent quality have increased as well. Whether high-quality tableware glass, Ceran® glass-ceramic cooktop panels, composite safety glass for car windshields, or glass for solar panels, flawless final product quality depends on highly advanced automation solutions, process instrumentation, analytics, and drive technology. Siemens offers products and systems for the glass industry that are perfectly geared to one another. The key to optimizing a company's entire production process – from product quality all the way to energy efficiency – is found in process control. With Simatic PCS 7, a powerful process control system is available for processing manufacturing data. Products for process instrumentation (Sitrans instruments for measuring pressure, temperature, filling level, flow rate, etc.) enable a stable production process and thus high glass quality. The use of Simotion in IS machines guarantees smooth infeed into the machine and consistent gob sizes, not only allowing perfect results in container glass but also effectively utilizing expensive, energy-intensive raw materials. Innovative plant equipment automation with new Profinet functions substantially reduces the amount of hardware and engineering required for safety-oriented tasks in the plant. This product offering is rounded off by user-friendly engineering solutions that make plant configuration easy. Going beyond this, customers receive services throughout the lifecycle of their equipment – from planning and commissioning all the way to modernization and maintenance.

Thanks to efficient and high-performance automation solutions, glass manufacturers can make better use of resources and respond to market requirements with greater flexibility. Plus, glass industry players can then devote their time to their core competencies by including the expertise of a partner such as Siemens. This allows the glass industry to develop further groundbreaking innovations so that the fascinating product of glass can continue to play an important role in our lives. ■

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