



Integrated Controls Automation enables high-speed float-glass stacking

Grenzebach automates new High-Speed Stacker with Siemens SIMOTION motion control and SIMATIC PLCs fully integrated into one system, for increased throughput, reduced production costs, better finished glass quality and improved safety.

The float glass industry is facing multiple challenges, not the least of which is a growing array of applications requiring a broader offering of products and sizes, and competition from offshore producers. The need for more flexibility and speed in the production process has never been so important. Similarly, the necessity to reduce production costs and optimize profit margins has never been so critical. Smart glass producers are finding that replacing manual functions with streamlined automation is not only meeting these objectives, but also has become a requirement for long-term stability and success.

Of all the functions on the float glass line, stacking remains the most labor intensive, and therefore a key target for automation. Glass producers have been looking for a more efficient, reliable and cost-effective method to stack the expanding selection of glass sizes they manufacture. Some producers have automated their stacking, but have experienced difficulties with speed of throughput, because of glass stacking

displacement causing breakage. But many more float glass producers are still handling stacking manually without the aid of any controls automation.

Fully automated cold-end line

Effectively streamlining the uniformity and quality in the making of plate glass - a new generation of glass-handling equipment has emerged, which is destined to change the landscape of cold-end line process efficiencies. Developed by Grenzebach, in tandem with Siemens, a new line of glass-handling equipment is being released featuring integrated controls systems that provide a fully automated solution to the handling of finished float glass. Every function of the cold-end line is being integrated into one controls automation platform – including take-over of the glass from the Lehr, cutting the glass ribbon into sheets of optimum size, glass snapping, rejection of faulty glass sheets, sorting according to size and quality, and stacking into glass racks with robotics.

The cold-end line requires that multiple, continuously-operating functions be

Grenzebach High-Speed Stacker

Answers for industry.

SIEMENS



Grenzebach is a pioneer in float glass cold-end equipment. In 1974, the company developed the world's first processing systems for automated float glass production. In addition to machines for transport and handling operations, and cutting and breaking lines, systems for identifying flaws, glass quality control and optimization of material yield have also been created.

precisely and sequentially connected. Grenzebach and Siemens have effectively brought each of these functions into one complete and totally integrated automation controls system, with the net effect of reducing production costs and increasing throughput. This package of automation controls is equally applicable to individual machines in the line, so additional line equipment can easily be added to the system at the discretion of the plant.

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Grenzebach Corporation is the U.S. subsidiary of Grenzebach Maschinenbau GmbH of Hamlar, Germany, which is a global manufacturer of production equipment for the flat glass and construction material industries. It is recognized as an international mechanical engineering company, with development and production facilities in Germany, the United States and China. Worldwide, the Grenzebach Group has some 1,400 employees.

High-Speed Stacker

The first piece of Grenzebach equipment to exclusively utilize this advanced automation

technology is the company's new High-Speed Stacker. Designed to increase glass manufacturer's efficiency and flexibility, it was developed for stacking small glass formats with high cycle times, and is currently the only device which can stack glass sheets in less than a one-second cycle. The new system is the world's most flexible glass stacker.

It is a robot-assisted float glass stacker, which reaches its speed from quickly forming sub-packs of glass and achieves its flexibility by stacking the sub-packs with a robot. The system improves employee working conditions and stacking accuracy and efficiency, while decreasing product damage and ultimately costs. The High Speed Stacker is an ideal answer to today's flexibility and speed demands in the glass manufacturing industry.

The High-Speed Stacker stacks glass formats from 12" x 18" up to 73" x 97", and then transports glass sheets by a suction belt into a packet frame, where each sheet is placed successively until a sub-pack has been created. Next the packet is transported to a robot for take-off, either from above or from the side, to be stored on a glass rack that is used to transport the product to other facility locations or to end customers.

The system's six-axis robots are capable of correcting the stacking alignment and creating precise glass stacks. For small glass sheets, two packets are built up and stacked parallel. Using this production method, up to 80 glass plates per minute can be taken off and stacked. The robots have a payload

capacity of up to 220 lbs. and also feature integrated energy supply systems to reduce floor space.

The stacker can stack multiple sizes of glass with varying orientation - landscape or portrait, tin side in or tin side out with accuracy and speed. The High-Speed Stacker offers manufacturers the flexibility to adapt to product variations and rack and equipment changes. Feeding can be performed in a double stream, so that two packets are built up and stacked in parallel. It can be integrated into existing side-legs, but also demonstrates its stacking qualities in off-line cutting operations.

High-Speed Stackers can automate the entire packing capacity of a typical float glass production line, and can completely eliminate manual packing of glass.

Ideally, the angle of the glass rack is known and accurate. Since glass is heavy and the racks are being exposed to rough handling during regular operations, this angle can change over time compromising the structural integrity of the rack. As a result, a conventional stacker would not stack the glass in an optimal manner and glass breakage could occur. The robot of the Grenzebach High-Speed Stacker scans the rack for dimensional and angular discrepancies and adjusts its stacking program according to the actual geometry of the rack.

"Our customers have been demanding a better solution for stacking the many different glass sizes that they manufacture,"



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says Gerald Haas with Grenzbaach Corporation. "Until now, they have had to rely on manual labor for their stacking operations. With the High-Speed Stacker, not only do they improve their employee's working conditions, but they increase their operational efficiency and flexibility."

Totally Integrated Automation

Grenzbaach's totally automated cold-end line, and specific application to the High-Speed Stacker, is functionally based on Siemens' concept of Totally Integrated Automation (TIA). TIA is characterized by its unique continuity. It provides maximum transparency at all levels with reduced interfacing requirements. It encompasses the field level and production control level, up to the corporate management level. It also provides maximum interoperability, covering the controller, HMI and drives, up to the process control system. This reduces the complexity of the automation solution in the plant.

Motion Control, PLCs and Tech functions in one system

Central to Siemens' TIA system in place with the Grenzbaach line and High-Speed Stacker is SIMOTION®, Siemens latest generation of motion controller. SIMOTION, which includes a palate of high-tech control system components which are optimally harmonized.

Most machines require motion control (positioning, synchronous operation), PLC functionality and technology tasks (i.e. pressure control and temperature control). The fusion of these functions into one

system - as with SIMOTION - has a number of advantages, such as lower engineering costs, higher machine performance, the elimination of time-critical interfaces between individual components and simple, uniform and transparent programming and diagnostics for the entire machine with a single tool. The focus here is placed on a simple and flexible solution for numerous motion control tasks.

The motion controller, the drives and the motors encompass the scope of the Grenzbaach cold-end line needs. This was a very big step forward technologically for Grenzbaach, in terms of the wiring, drive integration and motion control. Taking standard, off-the-shelf Siemens technologies and applying them to a machine solution presented significant advantages to Grenzbaach as an OEM.

Integrated with SIMOTION is Siemens SIMATIC® S7-300 automation system. Applicable for centralized and distributed configurations, it has the ability to integrate powerful CPUs with Industrial Ethernet/PROFINET interface. It can be set up in a modular configuration without the need for slot rules with I/O modules.

The Siemens SIMOTION motion control and SIMATIC controller provide a fusion of motion control, PLC and technology functions in one unit. This means that the new sophisticated stacking robots in use with the High-Speed Stacker can now be more easily controlled and operated.

Improved safety

A critical requirement of machine manufacturers and operators is seamless safety between humans and machines. A truly safety-integrated system is a complete and consistent safety portfolio, which covers all tasks to be accomplished in the field of safety technology – ranging from detecting through evaluating, to reacting. In float glass production, safety is a critical concern. The automation built into the Grenzbaach system greatly increases safety with handling sheet glass, resulting in far less accidents and injuries.

The Siemens S7 controllers are SIMATIC Safety Integrated, which provide the highest level of safety for humans, machines and environment. They are used to prevent accidents and damage resulting from a fault or mal-function. The safety SIMATIC controllers monitor themselves, detect faults autonomously and immediately change into or remain in a safe mode when a fault occurs. They are optimized for use in production engineering and provide air-tight safety for all operations.

Fail-safe CPUs have been exercised for safety-oriented applications with the Grenzbaach High-Speed Stacker and all other equipment on the cold-end line. The PROFIsafe profile for safe communication via PROFIBUS and PROFINET allows the integration of safety-related functions into standard automation environments.

Automation for a changing market

"We are making the SIMOTION and SIMATIC technology available to float glass producers so they can benefit from its system-wide controls capability and streamline their cold-end line production," says Chad Shaffer with Siemens.

"This totally-integrated solution has been successfully applied to many other industries, but it is quite unique to float glass production until now."

"Siemens has teamed with Grenzebach to help effect production efficiencies in the glass industry," continues Shaffer. "More efficient equipment, safer production systems and a better bottom line for glass producers are our objectives."

As glass producers deal with the influence of an increase in cheaper off-shore glass being imported and a more diverse product mix, production automation is more important than ever before. With new equipment providing better solutions, like the High-Speed Stacker equipped with a truly integrated controls package, glass fabricators stand in a much better position to operate their plants more efficiently and maintain a more competitive stature in the market.

About Siemens

Siemens Energy & Automation, Inc. is one of Siemens' operating companies in the U.S. Headquartered in the Atlanta suburb of Alpharetta, Ga., Siemens Energy & Automation, Inc. manufactures and markets one of the world's broadest ranges of electrical and electronic products, systems and services to industrial and construction market customers. Its technologies range from circuit protection and energy management systems to process control, industrial software and totally integrated automation solutions. The company also has expertise in systems integration, technical services and turnkey industrial systems.

Siemens AG (NYSE: SI) is a global powerhouse in electrical engineering and electronics, focusing on the three key sectors of healthcare, industry and energy. Founded 160 years ago in Germany, Siemens AG reported sales of \$96.6 billion in fiscal year 2007 (ended September 30). Siemens today employs more than 470,000 people in some 190 countries.

In the United States alone, Siemens had sales of over \$25 billion (including export sales), fueled largely by infrastructure projects and innovative solutions in the industry areas of medical, automation and control, power, transportation and lighting. Headquartered in New York City, Siemens in the U.S. employs nearly 72,000 people in all 50 states and Puerto Rico. The U.S. is also home to the global headquarters of nine of Siemens' worldwide businesses. For more information on Siemens in the United States, go to www.usa.siemens.com.

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