Glass-Technology International

May/June
Year 21 - No. 3/2010

THE LEADING MAGAZINE FOR THE INTERNATIONAL FLAT GLASS INDUSTRY

SPECIAL
YELLOW PAGES IN CHINESE
YELLOW PAGES IN RUSSIAN

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Issue distributed at:

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MOSCOW Russia - 7-10 June

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SINGAPORE - 29 June/1 July

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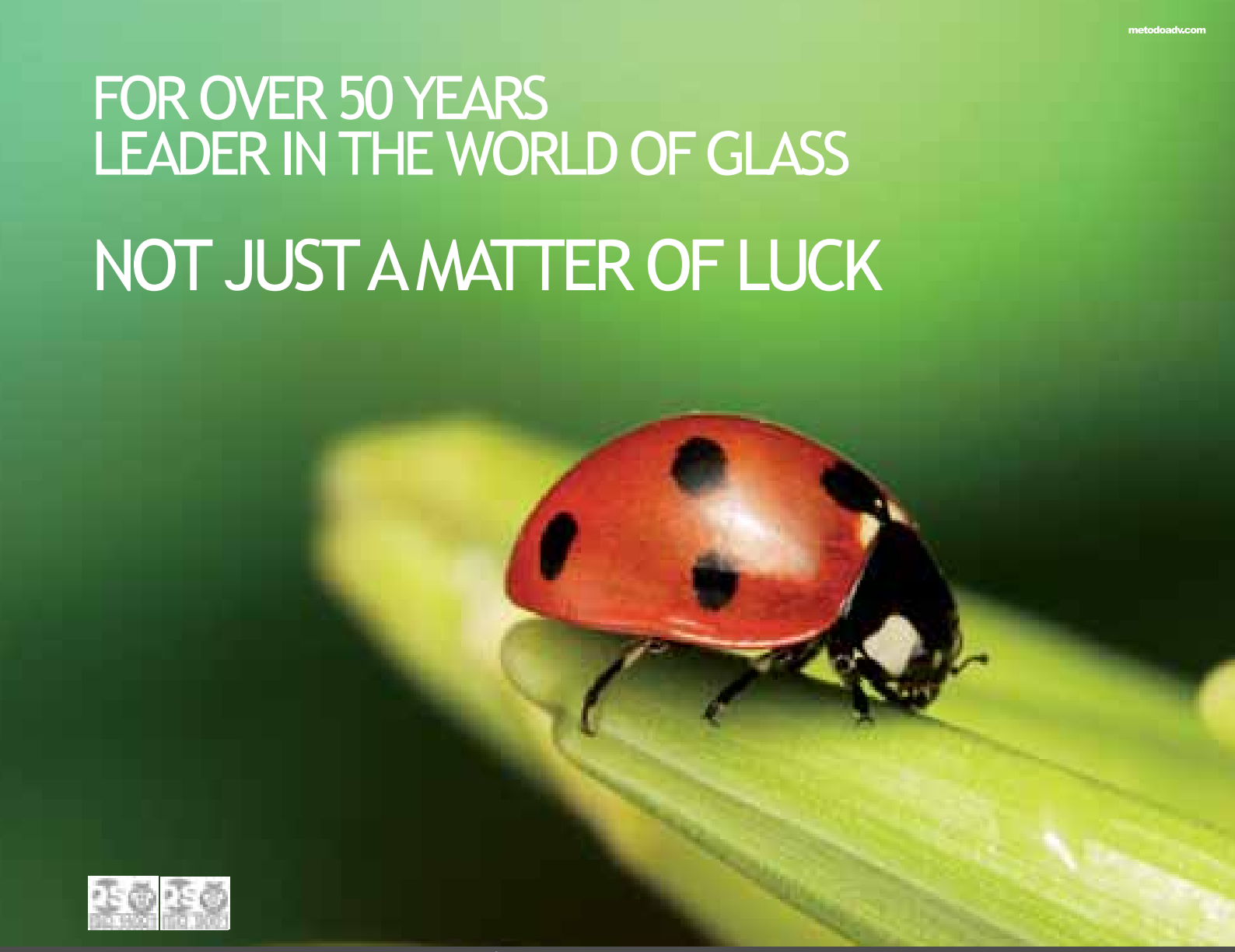

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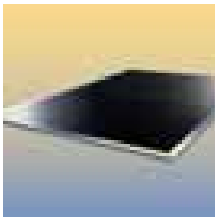
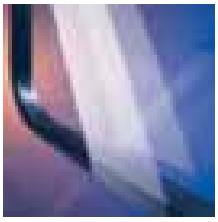


Architectural glass:

Glass cutting

Laminated glass manufacturing

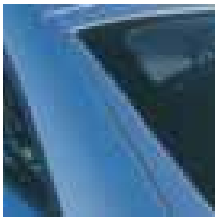
Insulating glass manufacturing



Handling equipment

Automotive glass:

Automotive glass pre-processing



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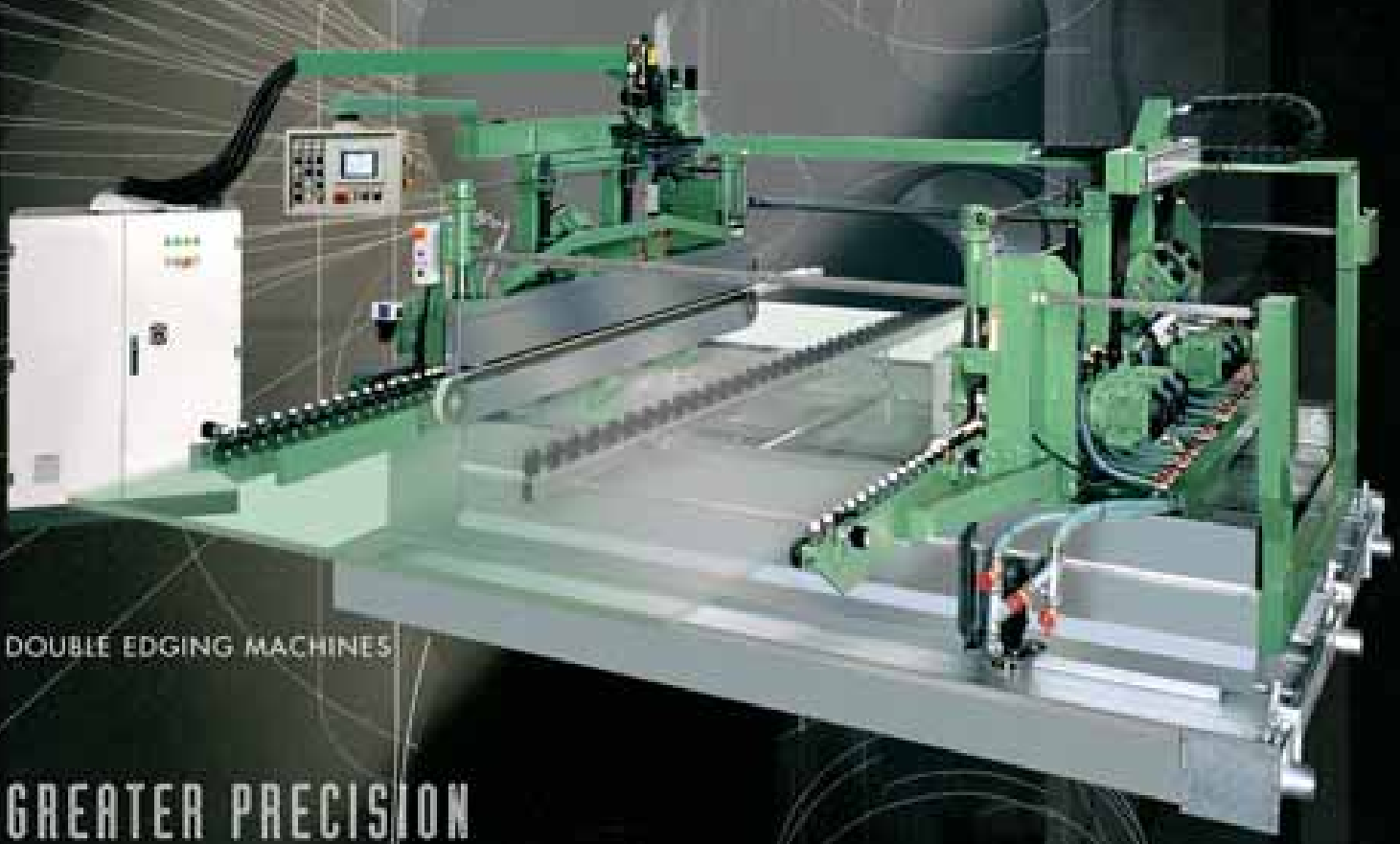

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articles

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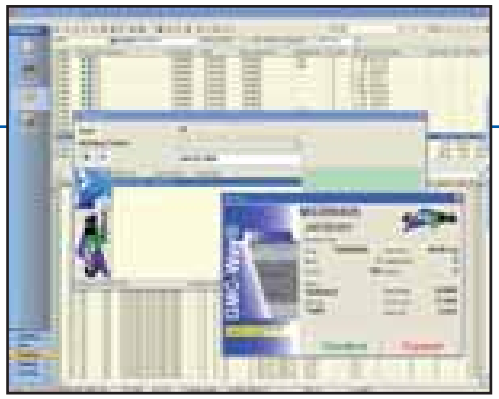

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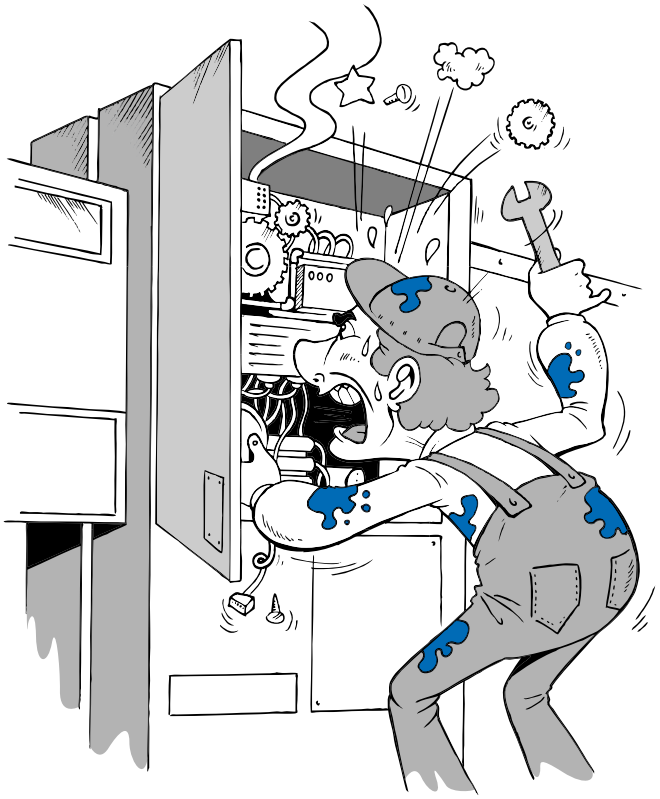

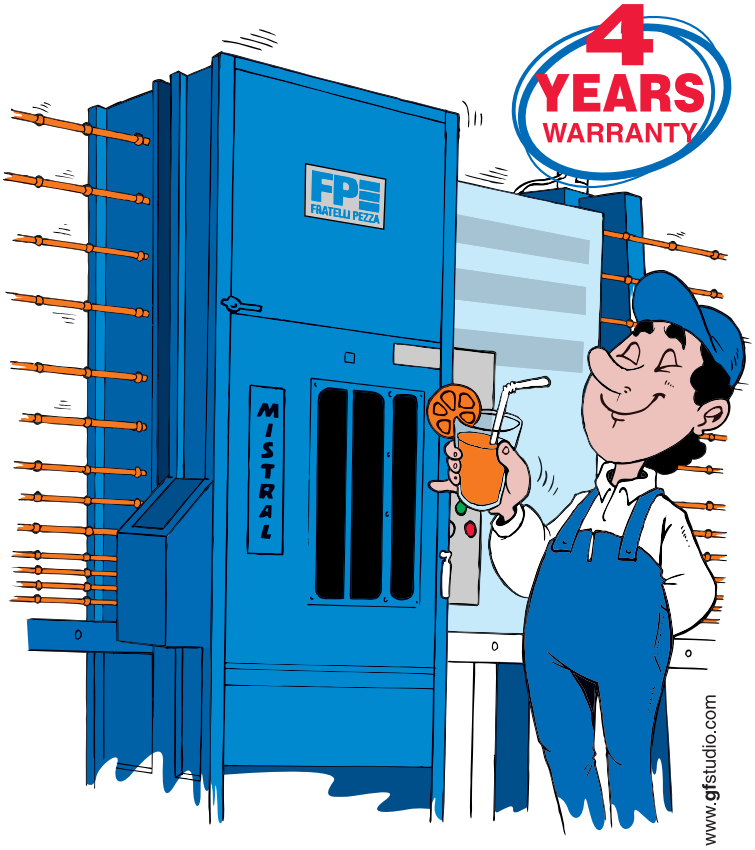

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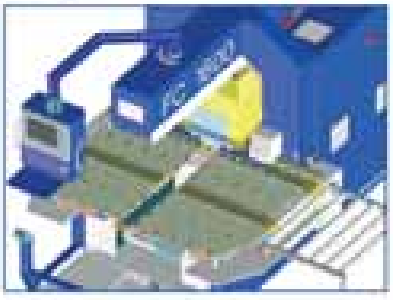

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2010 FAIR CALENDAR

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issue	exhibition/conference	date	venue	insert
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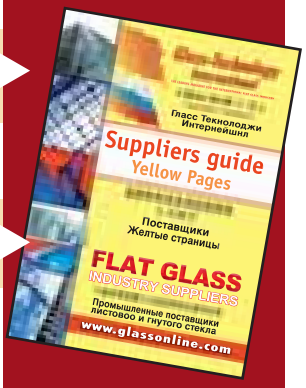
	FENSTERBAU/ FRONTALE	24-27 March	**NUREMBERG** Germany	
	GLASS-TECH POLAND	9-11 April	**KIELCE** Poland	
2010 **2** Publication date: **22 MARCH**	VETECO	4-7 May	**MADRID** Spain	
	GLASS SOUTH AMERICA	6-8 May	**SÃO PAULO** Brazil	
	GLASS WORLD EGYPT	13-15 May	**CAIRO** Egypt	
2010 **3** Publication date: **26 APRIL**	CHINA GLASS	4-7 June	**BEIJING** China	
	CHINESE SUPPLIERS GUIDE / YELLOW PAGES RESERVED FOR ADVERTISERS OF THIS ISSUE			
	MIR STEKLA	7-10 June	**MOSCOW** Russia	
	RUSSIAN SUPPLIERS GUIDE / YELLOW PAGES RESERVED FOR ADVERTISERS OF THIS ISSUE			
	ICCG 8 - INT'L CONF. ON COATING GLASS	13-17 June	**BRAUNSCHWEIG** Germany	
	GLASSTECH ASIA	29 June/1 July	**SINGAPORE**	
2010 **4** Publication date: **12 JULY**	GLASS EXPO AFRICA	8-11 September	**JOHANNESBURG** S. Africa	
	GLASSBUILD AMERICA	14-16 September	**LAS VEGAS (NV)** USA	
2010 **5** Publication date: **30 AUGUST**	GLASSTEC	28 September 1 October	**DÜSSELDORF** Germany	
	ALL GLASSTEC EXHIBITORS WHO ADVERTISE IN THIS ISSUE WILL ALSO RECEIVE A FREE FULL PAGE GLASSTEC PREVIEW			
2010 **6** Publication date: **25 OCTOBER**	PV TECH 2010 / SOLAR GLASS CONFERENCE 2010	17-19 November	**MILAN** Italy	
	THE BIG 5 SHOW	22-25 November	**DUBAI** U.A.E.	
	GLASS & WINDOOR 2010	2-5 December	**SEOUL** South Korea	
	GLASSPEX INDIA	12-14 January 2011	**MUMBAI** India	
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EFI and OMNI DÉCOR corporate partnership

EFI has announced its partnership with Italy-based **Omni Décor** to distribute its exclusive, contemporary, and ISO 14001 environmentally-certified (100% recyclable) etched satin-finish glass to the North American market.

"Customizable in nearly any dimension, pattern, colour, and quantity, the versatility and aesthetics of this glass, which includes a proprietary etching process that minimizes the environmental impact, makes it ideal for interior spaces, furniture components, and as an exterior treatment," says Kevin Moore, president of EFI.

"As a result of Omni Décor's state-of-the-art technology and design leadership, its glass products are hallmarks of some of the world's leading architectural masterpieces, including the Dubai airport," continues Moore.

Glass manufactured by Omni Décor is used in a wide range of residential and commercial applications, which include kitchen cabinet doors and drawers, countertops, islands, pantry doors, table tops, tiles and backsplashes, room dividers, closet doors, architectural doors and walls, and interior and exterior surface wall coverings. With regards to commercial applications, these are: room dividers, architectural walls, office partitions, sliding walls, conference tables, retail displays, and exterior façades.

From the selection of raw materials to the management of orders and deliveries, EFI works with Omni Décor to deliver the products within weeks to North American customers.

EFI, formerly *Exact Finish Inc*., is a leading manufacturer and designer of aluminium framed doors, room dividers, architectural glass and other interior products with modern translucent glass designs.

BYSTRONIC GLASS
equipping new glass processing factory in Saudi Arabia

The **Bystronic glass Group** has received a large multi-million Swiss francs order from Saudi Arabia. The deal was finalized by Richard Jakob and Fahad Al-Harbi, chairman of the *Wajhat Glass & Aluminium Factory* as well as vice chairman and CEO of the Al Harbi Holding, with the system's installation scheduled to begin in April 2010.

"Bystronic glass will be supplying all the equipment for a new production hall to be built in the Arabian Desert," Richard Jakob, CEO of the Bystronic glass Group, commented. He went on to explain: "The hall will be handed over to the customer for immediate occupancy - a project of this magnitude is both exceptional and fascinating."

The order also incorporates a cutting and sorting system, a fully-automated insulating glass line, handling systems along with lines for production of laminated safety glass and tempered glass. This will be the first installation of its kind where the system is directly connected to the furnace and insulating-glass line with an expansion option for the sorting system to include other processes. Until now, the Wajhat Glass & Aluminium Factory, which is a company of the Saudi Marble & Granite Factory Co., has concentrated on processing marble and granite – the acquisition of the Bystronic glass systems marks its entrance into the glass industry.

Richard Jakob, CEO of the Bystronic glass Group, and Fahad Al-Harbi, chairman of the Wajhat Glass & Aluminium Factory

business news

FENESTRATION & GLASS SERVICES move to North Carolina

Fenestration & Glass Services (FGS), which opened its plant in November 2008 for the manufacture of hurricane impact windows, doors and all related components, has decided to leave Grand Bahama and move its production to North Carolina.

The reasons behind this pull-out, which will affect some 50 employees, are due to a dispute over the high cost of electricity from Grand Bahama Power Company. "This sad loss of jobs and future jobs is a huge blow for Grand Bahama and is a direct result of the appalling quality and high costs of the electricity from Grand Bahama Power Company," the release stated.

According to Fenestration, the power company owes it USD 170,000 while Grand Bahama Power Company claims that Fenestration owes USD 120,000. Remaining in Grand Bahama would mean fighting GBPC in court and spending more money on legal fees, Fenestration said.

Talks have begun with both companies with the Minister of State for Finance Zhivargo Laing and Minister of Works Neko Grant, who are concerned over the glass manufacturer's announcement.

Management and supervisory staff have, however, been offered a position to relocate to North Carolina.

FUYAO GLASS 1Q net profit growth

Fuyao Glass Industry Group Co Ltd., a manufacturer of automotive, decorative and industrial glass under the brand name of FY, said that it estimates growth in net profit in the first quarter of 2010 of 287%.

The firm said the estimated profit surge is mainly due to China's rapidly growing automotive market and expanding overseas market; lean production and energy savings; and optimized debt structure and reduction in financial expenditures. Net profit in the first quarter of 2009 was RMB 103 million, while earnings per share were RMB 0.05. Net profit for 2009 was RMB 1.12 billion, 4.54 times the amount it realized in 2008. Its operating revenue totalled RMB 6.08 billion, growing 6.34% year on year and exceeding the original estimate by 12.23%.

ISTANBUL WINDOW post-show report

Istanbul Window took place 11-14 March 2010 at TUYAP with the participation of 416 companies from 26 different countries in 60,000 sq.m. of indoor space.

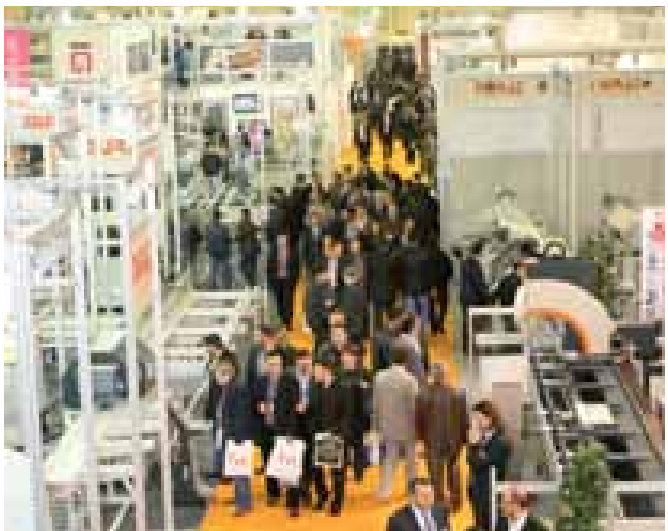
International Istanbul Window Fair, which has become the second largest fair of the world with the support of industry professionals, hosted a total of 30,381 professional visitors from Turkey and 70 different countries, enabling the construction sector and consumers to reach the latest innovations at window, glass technology, accessories and auxiliary industry products.

A total of 2,919 international professionals from 70 different countries visited the 2010 International Istanbul Window Fair, along with delegation organizations from Russia, Georgia, Azerbaijan, Bulgaria, Macedonia, Iran, Syria and Kosovo through its overseas offices and representatives.

The fair was visited by purchase delegations from Sudan, Russia, Afghanistan, Azerbaijan and Albania with the coordination of Prime Ministry Foreign Trade Undersecretary.

The 2010 International Istanbul Window Fair, which is one of the four main global window and glass industry specific exhibitions, has been strengthened even more thanks to the signing of the "Global Fair Association" (GFA) agreement between the four main international organizers.

The next edition of Istanbul Window will take place 10-13 March 2011, along with Glass Expo Istanbul Glass Products, Production – Processing Technologies and Machinery, Supplementary Products and Chemicals Fair and with the third Door Expo Istanbul Door, Shutter, Panel, Board, Partitioning System and Accessories Fair at TUYAP Fair and Congress Centre, Istanbul - Turkey.



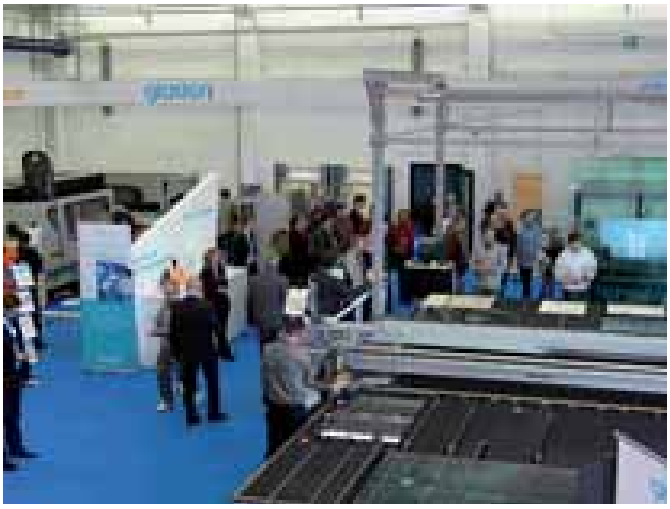
EDGETECH EUROPE new D A CH sales manager

Leading Warm Edge Technology manufacturer, **Edgetech Europe GmbH**, is pleased to welcome a new sales manager for the D A CH territories. The new appointment supports the company's growth as it stays ahead of increasing demand for its *Super Spacer®* warm edge spacer products. Stefan Spehr joined Edgetech in April bringing with him a host of industry experience.

Stefan Spehr comments: "I've been involved in the window industry, and most recently in insulated glass, for the last 25 years. I'm looking forward to working with Edgetech's team and raising awareness of this fantastic product across central Europe. As a sales person it's great to be involved with a product you believe in and for which you can see a massive potential. I'm keen to demonstrate to even more German companies, the productivity and energy efficient benefits of Super Spacer® that so many IGU manufacturers are already enjoying."

Andreas Max Schultheiss, European sales manager adds: "At a time when thermal efficiency is so important to consumers and businesses alike, Super Spacer® is leading the way in helping sealed unit manufacturers meet this demand. We are thrilled that Stefan Spehr has joined the team, to support this growth by working with existing customers and new customers alike. These are exciting times and Stefan will play a pivotal part in Edgetech's expansion plans in Germany, Austria and Switzerland. We are very happy to have him on board."

Stefan Spehr, new D A CH sales manager



BAVELLONI
Open House – second edition

With the target of confirming its presence in the market place, **Glaston Bavelloni** held its second Open House this year with the participation of numerous customers from over 12 EMEA countries.

The 2010 Open House was a success both in terms of positive atmosphere and in terms of sales. This demonstrates how the market recognizes *Bavelloni* as a reliable and quality brand despite the market situation.

The event was held in the Bavelloni Showroom, which was inaugurated last year during *Vitrum*, and is located in Bregnano (Northern Italy) at Glaston Italy premises, a professional environment where live demonstrations on the company's technologies can be operated at any time of the year. A dedicated team is available to demonstrate Bavelloni technologies permanently on display and to offer technical and business consultations.

"The Bavelloni Showroom is a place where we meet with our clients to help bring their vision to a reality. We created the Showroom for glass operators to come and have a good time experimenting with all sorts of equipment, glass processing, software applications, tooling and much more," says Marino Ferrarese, Bavelloni Product Line director.

"It's the perfect place to watch live demonstrations on glass processing machinery showing good ideas of what is possible. We have plenty of solutions to design and create exactly what they are looking for. All our customers have a great and interesting time exploring all the options. Our Showroom offers much more than products and services! We offer our clients pretty much everything they need for glass processing," Ferrarese continues.

The Glaston Bavelloni Open House took place between 8 and 13 April 2010 with customers divided in groups of countries on different days.

During the day, attendees enjoyed the opportunity to see several live demonstrations operated on the Bavelloni glass processing technologies on display. The latest products from the Bavelloni product range of bevelling, straight line and double edging machines were available, as well as cutting solutions for laminated and float glass and the latest generation of CNC working centres. A skilled team of technical and sales professionals was also available on site to offer consultation on the company's tooling offer and on Bavelloni OEM Software, as well as its comprehensive range of service products.

The programme also included guided tours to the Glaston Bavelloni production facilities where Glaston's customers experienced the modern and quality oriented manufacturing environment.

CORNING
melting tanks for China

During a seminar held at FPD China 2010, **Corning** pointed out that the company is in negotiation with clients and the Chinese government with regards to the construction of glass melting tanks in the country, and expects the plan to be settled this year.

According to Corning, global glass substrate demand is expected to increase 14-22% to 2.8-3 billion sq.ft. in 2010, noting that, in 2009, the glass substrate market increased more than 20% to 2.45 billion sq.ft. despite the global crisis.

The forecasts for worldwide LCD TV shipments are 171 million units in 2010, an increase of 21% compared to 2009, due to, according to Corning, demand from emerging markets and China.

The share of LCDs in the TV market of emerging countries is expected to increase to 57% in 2010, an increase of 36% compared to 2009, while the share of LCDs in China will increase to 86% of its total TV market, an increase of 68% compared to 2009.

CRT TV shipments are slumping and are expected to drop to 39 million units in 2010 compared to 50 million units in 2009, the company added.

Corning said it expects the PC market to increase 13% this year, thanks to economy recovery, with more enterprises scheduled to switch to Windows 7. Mobile computing and emerging markets are also forecast to boost the demand for PCs. Moreover, the notebook market will reach 207 million units in 2010, and LCD moni-tor shipments 169 million units.

China is expected to become the largest LCD monitor market in 2010 with estimated shipments of 47.4 million units, an increase of about 11% compared to 2009, Corning said, adding that the LCD monitor market in China will account for 28% of the global market in 2010.

According to Corning, the LCD TV market in China is expected to reach 37 million units, pushed by a subsidy programme from the government and CRT TV replacement demand, adding that China's LCD TV market will account for 21% of the global market in 2010.

APOGEE

CEO speaks at Glass Expo Midwest

Apogee Enterprises' CEO, Russ Huffer, spoke to attendees at *Glass Expo Midwest™ 2010* in Schaumburg, Illinois, about BIPV (building integrated photovoltaics) and achieving zero energy systems. According to Huffer, BIPV technology is still ahead of the glazing industry, adding that Apogee, "spent millions of dollars trying to develop solar panels, but [we found] it wasn't right and that project has been abandoned." As far as zero energy is concerned, Huffer stressed the importance of understanding the values delivered by these systems.

"Why zero energy? Because commercial buildings generate half of all electricity used. Not only that, they are extremely inefficient," Huffer said, explaining that the glazing industry's focus will be on zero energy curtainwall and windows.

"Let's simplify the problem. Glass and metal systems transcend, absorb and reflect energy, so a low-E coating is a mirror to long-wave energy efficiency. For most systems this can be calculated and measured very accurately. We know how much energy is coming in on a hot day and leaving on a cold day," said Huffer. "Solar energy accounts for most heat gain through our systems to the inside of the building; air conditioning is the primary cost for most buildings."

He also pointed out that peak solar energy is about 100 watts per sq.ft.; while on a vertical wall it is about 70 watts per sq.ft.

Another critical factor is that of understanding the payback: "Also, if you are called to install [panels] on a roof, find out the life of the roof," advised Huffer. " If the BIPV payback is 30 years and the roof has to be replaced every 20 years you are at a loss."

He also pointed out that: "Excess solar energy gain moves us further away from a zero energy wall. During heating we want to reduce heat loss through the systems while utilizing heat gain.

"We want the glass to compete for use in zero energy buildings … our designs have to compete aesthetically and designs have to compete economically. And the real measure of energy performance is how much is needed to mitigate the heat gain and loss caused by our systems."

Huffer added that zero energy designs should include the cost of sustainably-designed power systems resulting in zero energy wall designs.

With regards to mitigating energy systems, he said the added cost of a vertical installation system within the curtainwall is about USD 120 per peak watt.

"I recommend keeping them in a green field," he said, "which will provide a greater payback. A zero energy wall is impossible to do in a flat wall. In order for it to exist new technologies will have to capture and concentrate energy. In the end, I think people will be asking for this, but the technology is still ahead of the industry. These systems are limited in their payback and what they can do," he added.

Huffer went on to say: "All things considered, what we're already doing, dual-glazed systems, low-E coatings, etc., is better than BIPV. We're headed in that [BIPV] direction, but we can't get there with today's technology because the payback is so long," he said and added, "PV panels lose 1% of their output every year."

SOUTHWALL

fourth quarter and full year results for 2009

Leading innovator of energy-saving films and glass products, **Southwall Technologies Inc.**, has announced fourth-quarter 2009 revenue of USD 8.7 million, an increase of 23% compared to the same period in 2008, reflecting a stabilizing economy. Full-year revenue for 2009, which was broad-based and driven by the poor economic climate, particularly in the first half of the year, totalled USD 32.1 million, down 23% compared to 2008.

Fourth-quarter net income and fully diluted earnings in 2009 came to USD 1.2 million and USD 0.03, respectively, compared to a net loss for the same period of 2008. The increase was mainly caused by higher gross profit attributable to higher sales volumes, and was partially balanced out by an increase in losses in the company's insulating glass joint venture. Year-end 2009 net income totalled USD 5.7 million, up approximately 9% compared to 2008. Year-end 2009 earnings per fully diluted share were USD 0.16 compared to USD 0.15 for 2008. This increase was mainly caused by improved gross margins deriving from improved production efficiency, controlled operating expenses, and a gain recognized in the first quarter of 2009 thanks to the settlement of its Matrix debt. "In a tough year, we maintained our long-term focus on growth while delivering respectable results - a great tribute to the employees of Southwall," said Dennis Capovilla, CEO at Southwall. "Despite the challenging economy, we invested in growth, retired debt, increased profitability and generated cash. This positions us well for continued growth of our energy efficiency products in 2010."

GPD SOUTH AMERICA final programme released

Use of architectural glass in advanced building structures and the finer points of security glass processing form the base of the first ever Glass Performance Days (**GPD**) Conference in São Paulo, Brazil 6-7 May 2010. The final programme of the Conference has been released and is available in pdf format at www.gpd.fi. The two-day GPD event is part of the *Glass South America* trade fair organized by *Abravidro* and Nürnberg Messe, who are in charge of local arrangements and registration. The Glass Performance Days Conference Programme is organized and coordinated by the GPD Organizing Committee.

"The two-day event has parallel sessions on both days to allow for flexible participation planning, says Jorma Vitkala," chairman of the Organizing Committee. The first day features an architectural session on Design and Glass in Architecture and a Glass Technology session focusing on how the processing and handling of advanced security glass can be made as efficient as possible. On the second day the Architectural Module focuses on Solar Solutions and Energy Efficiency while the Glass Technology session follows up key items from the first day technology part.

"We have managed to engage some outstanding speakers who represent expertise in structural designs using glass and aim to focus on the criteria for successful glass solutions," Vitkala continues.

"Past GPD experiences have shown that innovative architectural designs can gain even more benefits from added know-how of the characteristics and properties of glass while glass specialists are eager to obtain more insights into the requirements of structural designers," Vitkala says.

"In this way we look forward to an effective and highly productive Conference. Participants learning from the experts and from networking with colleagues are likely to learn more about advanced design solutions and increased processing efficiency which will no doubt reflect on the performance of their own operations."

Argon and krypton gas detectors and glass analyzers

Edgetech I.G. has entered into an agreement with Helsinki-based *Sparklike Ltd.* to be the exclusive distributor for *Gasglass* argon and krypton gas detectors and *Spyglass* glass analyzers in the UK, continental Europe, America and Australia. Prior to the invention of the innovative Gasglass technology, manufacturers had to virtually destroy units to test gas fill levels. Sparklike's device is the first to enable testing without compromising the integrity of the IG unit.

"The collaboration with Edgetech will support the mission and business idea of Sparklike perfectly as both companies aim to provide the glass and window industry with high technology tools and solutions helping them to produce energy efficient products," says Erno Launo, managing director of Sparklike Ltd.

"Our relationship with Sparklike is an exciting endeavour for Edgetech that brings this cutting-edge product to the global marketplace," comments Andy Jones, managing director for Edgetech in UK and Europe. "The Gasglass technology for gas measure is the first non-invasive way of measuring the argon and krypton fill level of insulating glass units. It can be used to test both initial fill and the retention of insulating gases in a unit over time."

Sparklike has been involved with the fenestration industry since its founding in 2000, launching three Gasglass products, *Gasglass 1002 Gasglass Handheld* and *Gasglass Handheld v2.* The company's latest innovation, Gasglass Handheld v2, allows freedom of movement and total quality control for windows and doors in the factory or in the field. The new portable, user-friendly detector and sensor design allows for more accurate measurements at lower fill levels ranging up from 50% argon fill level with high precision.

"The new sensor allows the device to measure with greater accuracy and repeatability," continues Jones. "And, because of its user-friendly design and non-invasive methods, the Gasglass detector will help prevent operator error and ensure improved quality in the manufacture of gas-filled IG."

Through its relationship with Sparklike, Edgetech will also offer the new Spyglass technology, a laser-based glass pane analyzer that allows users to perform measurements to determine IG thickness, configuration of panes and identify low-E coatings and laminations. For example, Spyglass is ideal for situations in which a broken window has to be replaced at short notice. Traditionally, it was difficult to immediately define what kind of glass was used in the original unit. With Spyglass, users can instantly measure the exact characteristics of the broken glass and immediately order the right type, saving time and achieving ultimate quality control over the replacement unit.

www.edgetechig.com

product news

Vacuum/ flotation tables

Architectural glass producers and other manufacturers who need a secure and stable platform for glass decoration have their work made substantially easier by using a vacuum holddown/flotation table.

One company that specializes in the production of precision vacuum holddown/flotation tables for glass printers is **Graphic Parts International Inc.** (G.P.I.), a Chicago-based manufacturer and global supplier of OEM vacuum tables, and a division of *A.W.T. World Trade Group.*

Originally used to hold graphics in place while printing, vacuum tables are now finding their way into glass production and other manufacturing applications too. Easily integrated into an existing production line, vacuum tables can be of considerable help, especially where glass positioning and removal are concerned.

Manufactured using a proprietary process, and built around an all-aluminium honeycomb core for maximum airflow, the Stay-Flat™ Vacuum Table from G.P.I. is covered with the thickest top and bottom plates for extra strength, and a durable, non-oxidizing, anodized aluminium tabletop that resists warping. For tougher applications G.P.I. offers a stainless-steel surface, as well as Formica and phenolic tabletops for sensitive materials. When the time comes to move the glass to the next station, the holddown table becomes a flotation table that uses 'blowback' to lift the glass and ready it for transport. Recessed rollers and specially designed rubber coated guides help 'glide' the glass along if necessary. Maintenance-free vacuum motors feature a multi-stage centrifugal design to quickly and quietly provide the proper amount of holddown, and in addition to reducing noise, the brushless motors help to improve workplace safety because they do not emit sparks.

Available in a range of operating voltages with airflow valves to complete any vacuum setup, each table is custom built to client specification at the company's main production facility and world headquarters in Chicago, Illinois, US.

www.awt-gpi.com

CD-ROM catalogue facilitates part ordering

In line with all new plants, **Bystronic Lenhardt GmbH**, which is part of *Bystronic glass Group*, has now launched an optimized, spare-parts catalogue tailored specifically for its machines. "In CD-ROM format this enables customers to easily identify the required parts and order them directly online. This speeds up the entire delivery process while helping to prevent any wrong orders," Harry Auer, head of Customer Service summed up regarding the improvement.

The manufacturer of machines and plants for insulating glass production has provided a spare parts catalogue on CD-ROM for eight years now. "The parts catalogue is recognized by customers as an extremely useful tool having become firmly established with our customers," Harry Auer was pleased to report. However, there were various reasons for a modernization: thanks to an improved search feature, which not only sorts keywords and machine structure, but which can also search various categories. The user can now find the appropriate machine part far more easily. Wear parts such as seals or rollers can now be collected into a group, while durable machine parts such as motors or bearings are located in their own specific category.

Each individual spare part is accompanied by a photo, which immediately appears to the client in the overview. "This not only makes it easier to identify the correct part, it is also in line with the current standards familiar to users in online shops," explained the head of Bystronic Lenhardt Service. In view of this the visual display and navigation also underwent a complete redesign. Customers can place the required parts into the shopping cart at the click of a mouse and then confirm the order straight away online. The customer is then immediately sent an order confirmation email. Alternatively, customers can also request an offer to match their requirements before actually making an order.

To ensure that the new spare parts catalogue is practice-oriented and user-friendly, Bystronic Lenhardt GmbH actively involved several clients in the development process: this enabled them to test the improved service throughout autumn 2009 for the first time, after which they offered their opinion. At the same time, consideration was given to the fact that over the past few years users' habits have also changed in relation to internet browsers used: the new catalogue display and the online ordering process function fully independently of the actual internet browser used.

www.bystronic-glass.com

product news

Low maintenance residential shower products

Guardian Industries has partnered with *Agalite Shower & Bath Enclosures* to manufacture, design and distribute the latest in low maintenance residential shower products based on Guardian's advanced glass technology.

Developed exclusively by Guardian, *ShowerGuard* is, the US company says, an innovative glass that is easier to clean than standard glass and maintains its original, like-new appearance over time. The glass will be featured in Agalite's clean and elegant spa-like shower enclosures.

"Like Guardian, Agalite is a company committed to quality and customer satisfaction," said Chris Dolan, director of commercial glass products for Guardian Industries.

"The timeless beauty of glass combined with Agalite's design simplicity and Guardian's ShowerGuard technology will create enclosures that are not only elegant, but also easy to maintain," said Mark Kaspari, Southwest sales and marketing manager for Agalite. "Offering ShowerGuard with our custom enclosures collections completes our extensive line of heavy glass products."

Started in 1952, Agalite is a premier manufacturer of shower doors and bath enclosures. Agalite is owned and operated by Hartung Glass Industries and has manufacturing and distribution facilities in British Columbia, Canada; Washington, Oregon, California, Colorado, Texas, Utah, and Indiana.

Guardian is a diversified global manufacturing company with leading positions in float glass, fabricated glass products, fiberglass insulation and other building materials for commercial, residential and automotive markets.

Guardian, employs 18,000 people at its facilities throughout North and South America, Europe, Asia, Africa and the Middle East.

www.guardian.com

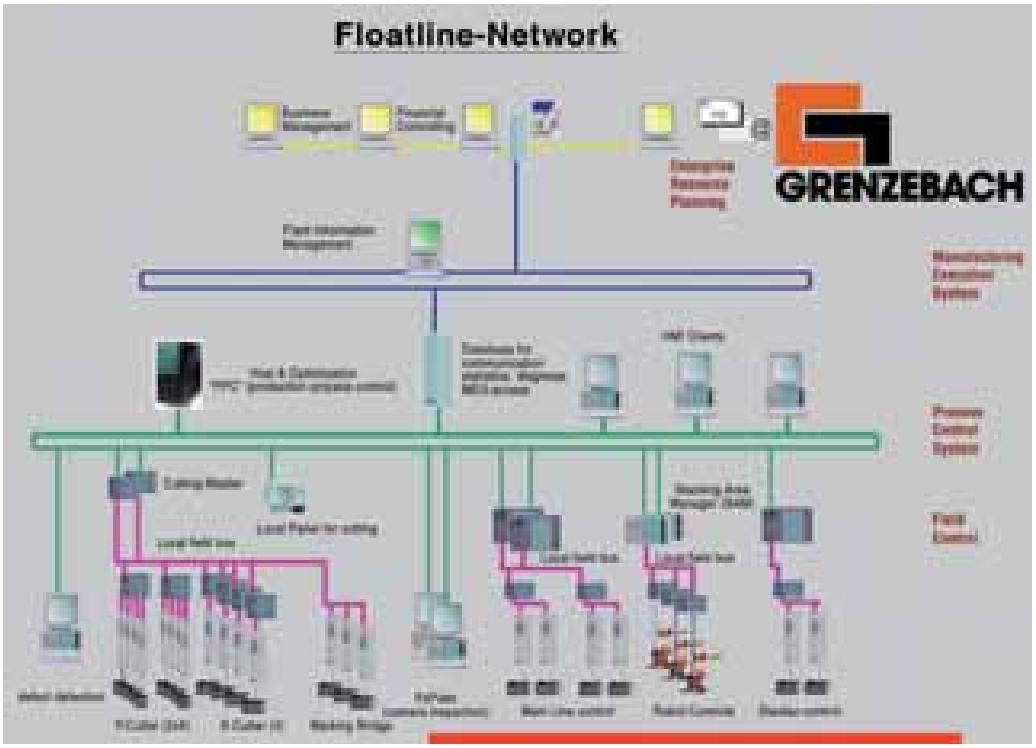
New developments in glass cutting

Developments for the float glass market have often given glass manufacturers a head start in automating their production processes, thus reaching a highly flexible and cost effective manufacturing method.

Grenzebach, well-known as a high quality brand in the construction and manufacturing of processing and handling equipment for the flat glass industry, has always regarded cutting equipment as being the core of the cold end glass production line as it directly influences production results. With highly efficient mechanics and its *PPC* (Production Process Control) system, says Grenzebach, it offers efficient instruments of cutting, optimization, administration and process data visualization. The programme structure is modular, and can be provided with a significant number of add-on modules in addition to the basis software.

Additional yield increase is now also achieved by a new, patent-registered development. For the first time ever it is possible to snap a cullet strip directly at the main snap roll with a length that can be reduced to a minimum of 200mm over the glass ribbon width and which can be disposed of there at the same time. This will, says Grenzebach, avoid glass loss compared to the procedure thus far, where a 600mm strip was snapped and transported towards the next crusher. After successfully completed practical tests, the system is already being used for current orders.

A further new development will be available soon offering an offline version of Grenzebach's optimization software. As a result, glass cutting will be simulated and optimized offline using a standard PC. The resulting data will then be available for process optimization and planning.



Cutting-edge production machinery

One of Western Australia's major glass manufacturers, *Cooling Brothers*, has, after 40 years of activity, opened a new flat-glass production facility, located in the district of High Wycombe in Perth, on an area of 7,000 sq.m.

Part of the production machinery of the new facility was supplied by Italian **For.El.**, with the installation of three different operating lines:

- insulating glass composition line;
- arrissing and washing line; and
- laminated glass composition line,

which, says the Australian company, enable to optimize production and cut the amount of labour required to run the glassmaking facility.

The vertical line for the composition of insulating glass produces high-energy efficiency glazing, which is seeing increased demand in Australian. "Our line of insulating glass has been designed to surpass the heat efficiency standards required by Australian laws on frames and can also assemble several sheets filled with argon gas," says Paul King, owner of the factory.

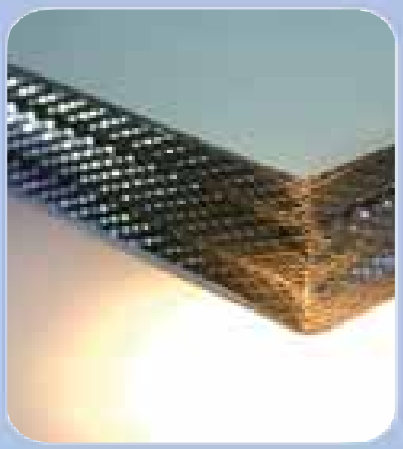
Plant heights enable the easy and safe assembly of large panels, with the highest finish standards thanks to the automation supplied by For.El.

The second line, which, thanks to high operating speed, guarantees large production yield, is for the vertical arrissing of the glass upstream of the glass tempering process or of the insulating glass composition process, thus eliminating breakages caused by cutting.

The last line to be installed was the laminating line *LL2645*. This laminating line was carefully designed to facilitate the production of special glazing: tempered, low emissive, etched, screen printed and all glasses undergoing special production processes, with maximum work dimensions of 4,500 x 2,600mm.

Thanks to this For.El. lamination line, says Cooling Brothers, the glass manufacturing facility has been able to introduce a broad range of laminated glass products, with a wide assortment of PVB membranes with strongly innovative features that upgrade the rigidity of the glass composition and permit solutions in a broad range of colours for decorative purposes.

www.forelspa.com



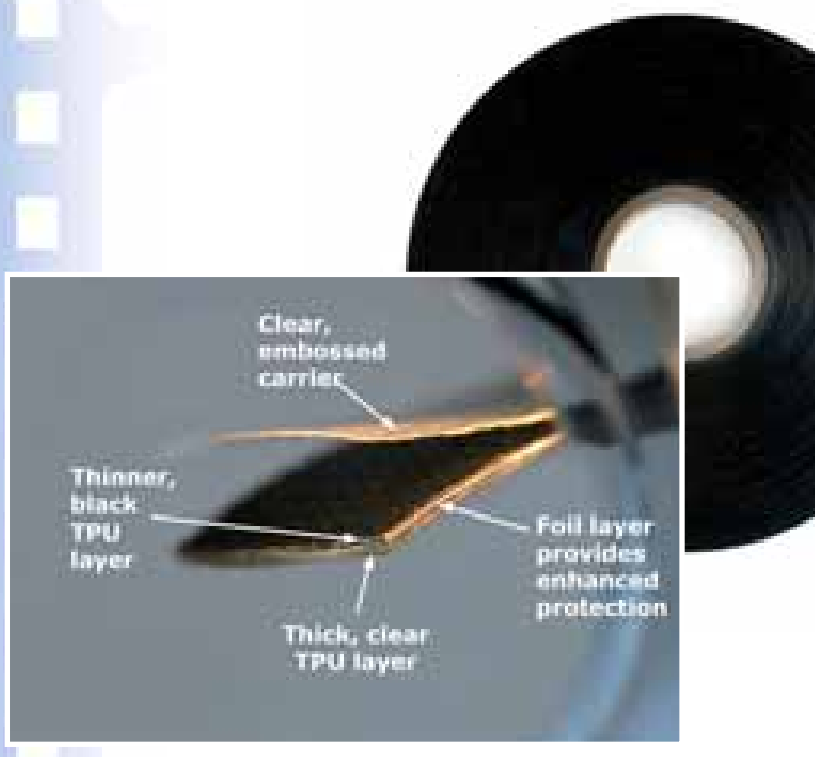
Protection of laminated glass composites

Argotec, Inc., one of the world's largest producers of thermoplastic polyurethane (TPU) film and sheet, has announced the introduction of *EdgeSealPLUS*, a new and improved version of its original product used to seal the edges of multilayered laminated glass composites.

The addition of a patent-pending foil layer between two sheets of TPU, says US Argotec, gives EdgeSealPLUS dramatically enhanced resistance to moisture, window cleaning solutions and the solvents contained in caulks and sealants. These chemicals can penetrate into and degrade the layers within the composite. The product also helps protect the edge of glass laminates from chipping and other minor damage, as well as creating an aesthetically pleasing appearance on the composite edge.

Argotec is a privately held, global supplier of custom-engineered, high-performance, polyurethane film and sheet for a wide variety of critical applications.

www.argotec.com



BAVELLONI

Machinery and Tools for Pre-processing

Bavelloni – your glass processing partner for all customer needs

The Bavelloni brand stands for creative and reliable production. It is also synonymous with state of the art glass processing machinery for the architectural, furniture, appliance and solar glass industries.

To date, we have delivered more than 20.000 quality Bavelloni machines to over 100 countries. Our long-term experience for more than 50 years is your value for glass. We know what it takes to meet new market needs. We are your partner for small-size, middle-size and large enterprise customers. Our clients can choose from a wide range of products including cutting tables and lines, CNC-working centres, straight-line edging and beveling machines, double-edging machines and lines, horizontal and vertical drilling machines as well as diamond and polishing tools. At Glaston it is our goal to create advanced glass technology. What is yours? Learn more about our reliable Bavelloni machines and services at our website **www.glaston.net**

Visit us at China Glass
Hall W1, Booth 1-400

glaston
seeing it through®

Multi-directional side-loaders for solar- and laminated glass

Italcarrelli has expanded its range of multi-directional side-loaders for the transport of flat glass, which now includes new models that, the Italian company says, enable to transport solar- and laminated glass. The production of these particular types of glass involves their storage on special racks and Italcarrelli has, it says, developed the *EN4L 60* special side-loaders to transport and load these glass types without difficulty onto production lines quickly and in complete safety, thanks to the high manoeuvrability that these machines offer operators in each and every situation.

These machines have all the characteristics and advantages of Italcarrelli's normal side-loaders, such as high visibility for the operator during glass loading, unloading and transport phases, along with multi-directional driving systems that enable the loader to move in any direction. The same multi-directional driving systems make the loaders more manoeuvrable, and enable them to move easily in any environment, even in the smallest of spaces.

Features such as size and loading capacity of Italcarrelli's side-loaders are completely customizable so as to adapt the machines to the specific needs of the glassworks where they will be used.

Last but not least, the loaders can be equipped with numerous optional devices such as driving sensors, automatic positioning of the forks, automatic driving systems, this simplifying the operator's use of the machine.

www.italcarrelli.eu

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www.italcarrelli.eu

MADE IN ITALY

Continuous laminating line for flat glass – EVA and PVB

Powerlam is the new line for continuous lamination from **RCN Engineering**. According to the Italian company, Powerlam greatly reduces lamination time when using S-LEC EN EVA, also giving good results with PVB film, thus enabling the use of two different interlayers and enhancing productivity.

Traditional autoclave-free laminating systems with EVA require the use of vacuum bags; time for logistics, including handling, pre-vacuum, cycle, cooling, post vacuum and unloading. In such conditions, the cycle time for a 10mm sandwich is about two hours. Powerlam lowers this timing by about 70%, especially on some glass thicknesses.

The line consists of three sections:

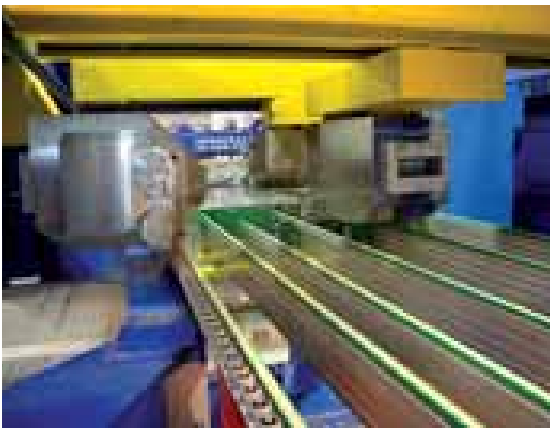
1. an automatic feeding conveyor transporting the glass sandwiches to the chamber;
2. a chamber heated up by means of upper and lower heating elements. The temperature is controlled by a set of thermocouples connected to the PLC;
3. an exit conveyor to facilitate the unloading of the glass.

Vacuum is created by means of an oil pump; while the refrigerating system and fans allow for a faster and more performing cooling.

The opening/closing of the kiln is carried out by two pistons with perfect tightness.

The E1070 PLC controller checks the entire lamination process, and recipes are easy to programme and customize. In the case of limited space, the line can be delivered with a feeding conveyor serving for both glass loading and unloading.

www.rcnengineering.it



Out of square glass doors

Out of square products are a niche market in the production of shower cubicles and curtain walls. The advantages of these needs and demands are that they cannot be realized with mass production and, therefore, will never be affected by the costs of products coming from cheaper markets.

The sure solution for the production of these items is **Forvet**'s integrated production line, where the most imaginative ideas of architects can, says the Italian company, be carried out with the same ease as for rectangular shapes.

With the *Chiara MTP8 Modular* quadrilateral grinder, operations of grinding, as well as those of polishing and arrissing on 3, 4, 5, or more perpendicular or slanted sides of glass sheets can be carried out simultaneously, thanks to independent grinding heads.

The Numerical Control parametrizes the transport of the glass sheets to the processing machines, the transport speed of the axes, the sizes and thicknesses of the glass sheets, the amount of glass to be removed, as well as the speed of the grinding wheels. It also compensates the consumption of the tools and calculates the most suitable movement for out of square sides, checking the angle of the grinding wheels.

The grinding heads are mounted on the four controlled axes of the main structure, and each head contains two diamond grinding wheels for edges, two diamond grinding wheels for arrisses, two edge polishers and two arris polishers. As optional equipment, a corner dubbing wheel can be mounted on each head.

Chiara MTP8 Modular can grind and polish oblique edges of every type of shape thanks to the movements of the guiding heads/beams, which enable to follow any type of angulation of the sides of triangles, parallelepipeds, pentagons, hexagons, etc.

Each single spindle is managed automatically, according to the thickness of the glass and the consumption of the wheels, without operator intervention.

This enables to obtain each glass with the correct size and shape, even after a complete wheel changeover, without the need for marks on the glass to establish the positioning of the wheels with regards to the amount of glass to be removed.

Chiara MTP8 Modular can automatically process each edge of the glass sheet with different finishings while the operator can also choose the different processes to be carried out without the need for human intervention.

Moreover, the machine is also extremely compact, maintaining the transport of glass in line.

The NC-controlled automatic positioning of the suction cups managed as per the different sizes of the glass, keeps the glass in position during grinding, also enabling the processing of low-E glass, regardless of the type of coating.

All Chiara grinders can be positioned in-line with Forvet NC work centres for drilling and milling. Productive capacities depend on the models used, from 220 seconds for a door of 8mm with the Dorma-type notches and two countersunk holes with the *FC 16M 1600 Mill* drill, and up to 105 seconds for the same production using Francesca *FC 32M 3300 Mill.*

www.forvet.it

Sustainability as company mission

As international politics have shown us, it is not easy to speak of sustainability in a time of crisis: the costs of 'ecological choices' are, in fact, often high and in conflict with the cuts of budgets necessary to face the present negative conjuncture. Moreover, making it clear and appreciating the value of certain productive choices represents a real challenge, which implies the suitable 'education' of clients, more inclined to consider product performances than ecological characteristics. For these reasons, the road of sustainability has to be considered particularly virtuous today.

"**Denver** was founded producing systems for the control of the environmental quality in stone workshops, we were the first to produce of dusts collector systems and clarifying water systems in great series: attention to the environment is a fundamental part of our DNA! Our machines have been introduced to the market for the use of innovative materials, such as ABS (Acrylonitrile Butadiene Styrene), for the construction of hulls and sumps. This has assured recyclability, simpler processes of production, fewer pollutants, reduction of the painting cycles and - not less important - acoustic comfort for the operator," says Adolfo Fabbri, manager of Denver's technical department and leader of the ecologist choices.

"We have also improved our research regarding minor environmental impact. All our machines have, as optional equipment, a speed control system or inverter. This device enables to regulate the power of the electric motor, adapting it to the real demands of energy, without waste. We have also foreseen that tool cooling on our electro-spindles is carried out by means of a hydraulic closed circuit to drastically decrease water consumption. There is also the possibility to simulate the process before performing it, thus optimizing machine para-meters without the need to make tests on the material, enabling our clients to save glass otherwise used for the tests." It is important to remember that all Denver products can be transported in 40-foot containers without any special transport: an enormous advantage in terms of pollution, reducing the remarkable impact that transport has on the quality of the environment."

The ecologist choice in Denver is limited not only to the products and the processes of production, but has also an impact on other aspects of the life in the company.

"The whole new facility of Gualdicciolo is cooled without the use of air conditioning systems, but by means of controlling the percentage of humidity in the air. This sophisticated system, at the forefront of technological advancement, with an important initial investment, allows us to pollute less and to save energy."

General manager Roberto Nori, states "This year we have also drastically reduced the use of paper in our offices along with the dispatch of paper documents. We prefer to talk more to our clients rather than to submerge them with brochures, with the double goal of consuming less resources and to aim more at the human value of the relationship."

Denver has even more ambitious plans: "for the next few years we are seriously thinking about the use of recycled paper for all communications along with the certification of our whole productive system. This means that all our production phases, even those managed externally, under control, consequently monitoring the environmental impact.

But what kind of results will be achieved from these policies? Once more Nori clarifies the firm's point of view. "First of all it is necessary to say that the ecologist choice has an important value. However, looking at our case, those who purchase a Denver product can directly verify the advantages in terms of lower costs of electric energy, lower costs of water supply, the best acoustic and environmental comfort, transport costs reduction, less use of stone and glass, drastic reduction in the costs regarding the assembly and dismantling of the machine."

www.denver.sm

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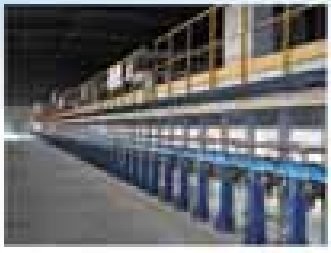


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Case study

Landglass: supplying the US market with top-end products

At *TriView Glass*, which is located in the City of Industry, California, United States, top-end building glass and art glass substrates are being tempered in batches in the jet force convection tempering furnace manufactured by Landglass. To this day, Landglass' force convection tempering furnace has run stably and efficiently for 220 days. Once again, Landglass is the first tempering furnace manufacturer exporting real force convection equipment with completely independent intellectual property to the US.

As early as October 2004, Landglass was the first to access to American market among numerous domestic tempering furnace manufacturers, and, at present, almost 20 Landglass tempering machines are serving American companies efficiently.

Jet force convection tempering furnaces are top-end products developed by Landglass independently in 2004, and have since evolved into mature products after years of market trials. In fact, these furnaces have achieved optimum results regarding design, stable and efficient production and high product quality, all recognized by numerous operators in China and worldwide.

JET FORCE CONVECTION MEETS ART

However, TriView Glass chose the equipment of Landglass not only because of the technical level of its tempering furnaces, but also because of the complexity of art. In fact, TriView Glass'

Being the first to enter the US market with its forced convection tempering furnaces in 2004 was not an easy feat, but now, after six years, and with 20 machines up and running in North America, Landglass is still working to respond to the demanding needs of its clients there. In this article, we find out about TriView Glass, where art meets tempering, and where safety and perfection are mandatory.

production involves various types of laminated glass and insulated glass, as well as tempered glass substrates necessary for creative art glass for its sister company *LifespaceART*.

LifespaceART is a company made up of experts and pattern designers who draw their inspirations and creations directly onto glass, resulting in beautiful patterns and glass attached to each other by means of tempering, thus enabling ordinary buildings to be blended perfectly with art.

Before purchasing, TriView Glass paid a field visit to the tempering furnace manufactured by Landglass in a glass deep-processing enterprise. During the visit, instead of asking too many questions, TriView Glass' Manager Alex reviewed the processing and equipment details meticulously, observing the overall appearance of the machinery. Thanks to his positive judgement, about a month or so later, Landglass received the order from the company.

CHINESE VERSUS EUROPEAN AND AMERICAN

Chinese glass equipment manufacturing enterprises started up about half a century later than their European and American counterparts and large equipment manufactured independently in China is not known and accepted universally in European and American markets, especially in top-end product sectors. It was therefore very difficult for high-tech equipment such as convection tempering furnaces to access and work with the US market.

As a result, during communications with this client, the number 1 rival of Landglass was actually the customary judge of European and American users on top-end products made in China. Nevertheless, the smooth conclusions of this business deal became a good start for Landglass' top-end products to access the American market.

At *GlassBuild America* in October 2009, when Alex met Landglass and IGE again, he said, "Both IGE and Landglass performed above what I have expected. They had me up and running very quickly!" ■

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f l glass: built with German know-how and machines

In Saxony-Anhalt, f l glass GmbH has put one of the world's most modern plants for the production of float glass into operation. Each day, 700 tons of plate glass are manufactured, for the solar industry among other things. The technical know-how and the machines come almost exclusively from Germany.

Photo: f l glass GmbH

Photo: f l glass GmbH

255,000 tons of plate glass are manufactured annually at f l glass GmbH's float glass plant in Osterweddingen

Photo: VDMA

Roller conveyors move the glass ribbon through the various workstations. The photo shows the already finished panes on their way to the stacker

Arjen Steiner points to a wall on which more than two dozen monitors hang. Here, he explains, "is the heart of the entire f l glass facility, so to speak." He is referring to f l glass GmbH's recently completed float glass plant. At the gates of Magdeburg, in the little village of Osterweddingen, one of the world's most modern facilities for the production of float glass was erected under the supervision of *DTEC Engineering & Consulting GmbH*. Founded in 1999 and based in Gelsenkirchen, DTEC and its two subsidiaries, *Continental Glass and Engineering GmbH* (*CGE*) and *Glasinvest Engineering und Anlagenbau GmbH*, are specialized in the planning of glass manufacturing and processing plants. As project manager, Steiner was responsible for the construction of the plate glass plant in Osterweddingen. According to the graduate engineer, "We are capable of placing turnkey facilities for glass production virtually anywhere in the world on a greenfield site." In Osterweddingen, DTEC was responsible for general planning, project management and construction supervision.

GROSS ANNUAL CAPACITY: 255,000 TONS

On an area of 42 hectares, and in the record time of one year, f l glass had a float glass plant erected in close vicinity to the provincial capital of Saxony-Anhalt, in which 255,000 gross tons of window and white or solar glass are manufactured annually. "The goal," states production supervisor and graduate engineer Gerd Steger, "Is a fifty-fifty ratio, although the tendency leans clearly toward white or solar glass." f l glass partners – also active in the glass manufacturing field – are Dutch *Scheuten Group* with 51 per cent, and German-based *Interpane Industry AG*, which holds the remaining 49 per cent of the partnership shares. The total investment amounts to roughly EUR 190 million. Also included in the price is a magnetron facility in which the glass can be processed to serve as sun and heat protection glass by applying metal-oxide layers. This plant is intended to go into operation in the first half of 2010. The same applies to the production start for single-pane safety glass.

As with most float glass facilities, the scale of the new plant is quite impressive. The production line alone is 800 metres long. The chimney for the melting furnace, in which the batch is melted into glass, juts 84 metres into the sky, and the 68,000 square-metre warehouse and shipping hall offers space for 60 days worth of production. Add to this a large silo plant in which the necessary raw materials, including sand, lime and dolomite are stored in 16 enormous steel containers, as well as a several 100-square-metre cullet storage area. According to production chief Steger, approximately 240 people are currently employed at the plant.

TURNKEY BATCH PLANT

The equipment for the plant comes almost exclusively out of German machine and equip-

f l glass: built with German know-how and machines

ment manufacturers' production facilities. The batch preparation plant, in which – depending on the type of glass – various raw materials are, for example, weighed and mixed before they are finally melted into glass in the melting furnace, was delivered by the Wertheim-based specialist for batch preparation plants, *Zippe Industrieanlagen GmbH*. That is to say, as the company's responsible project manager, Heiko Brand, emphasises, 'on a turnkey basis'. Each of the various raw materials is transported via screw conveyer to one of the eight scales and from there via conveyer belt to one of the two mixers. True, one mixer would suffice. Should one malfunction sometime, however, the second can immediately be put into operation to prevent a loss of production. For the same reason, there are also two conveyer belts from each mixer to the trough pre-silo, from which the batch from four batch chargers (also from Zippe) is pushed into the melting furnace. The trough pre-silo serves to translate the discontinuous batch preparation process into a continuous glass melting process – an important step in glass manufacturing, in which no errors can be tolerated. The cullet system, also made by Zippe, handles the transport and subsequent recycling of the cullet accumulated during glass processing. The cullet thus gained is subsequently reused in the manufacture of new glass.

FURNACE SAID TO LAST 20 YEARS

The heart of the entire plant is the mighty melting furnace, of which graduate engineer Wolfgang Räbiger, technical director at f l glass is especially proud. Räbiger was significantly involved in the conception of the furnace. The paragon, he explains, was a furnace he was also involved in and that was in operation for 16 years without a problem. The new one, he is confident, will last at least 20 years. Conceptually it is a dual-chamber side-fired

Photos: VDMA

Figure 1

Figure 2

Photos: VDMA

Fig. 1 - The production process is monitored 24/7 in the control centre

Fig. 2 - The panes are stacked fully automatically either with the tin- or atmosphere side out, depending on the customer's specifications

Production supervisor and graduate engineer Gerd Steger (left) and Dr. Arjen Steiner of DTEC Engineering & Consulting GmbH in front of an inspection system monitor, which optically displays the various flaws in the glass

Photo: VDMA

regenerative furnace. The necessary heat – up to 1,600°C – is delivered by six natural gas-burning burner pairs. The capacity of the 66-metre long and 12.5-metre wide furnace amounts to approximately 2,200 tons, which corresponds to roughly three days' production. It took close to three weeks for it to reach operating temperature during the start-up phase.

TWO ROLLER DRIVE UNITS

After the batch has been melted to liquid glass in the melting furnace, it swims in the form of an endless ribbon on a bed of liquid tin into the annealing lehr, where it is slowly cooled to reduce stress in the glass to a minimum. The drive system that ensures that the 289 rollers always move the glass ribbon steadily and precisely in the right speed through the lehr was delivered by *Z&J Technologies GmbH* in Düren. A second drive unit that can quickly take over in an emergency ensures a high level of production security. Also from the company in Düren are the six rerouting systems for flue gas and combustion air, with which, as explained by Eberhard Ruhland, division director for the glass industry product line at Z&J Technologies, the firing process in the melting furnace can be controlled. The company also delivered the furnace pressure control cap for the melting furnace; it sits in the main channel and ensures that the pressure remains within tolerances.

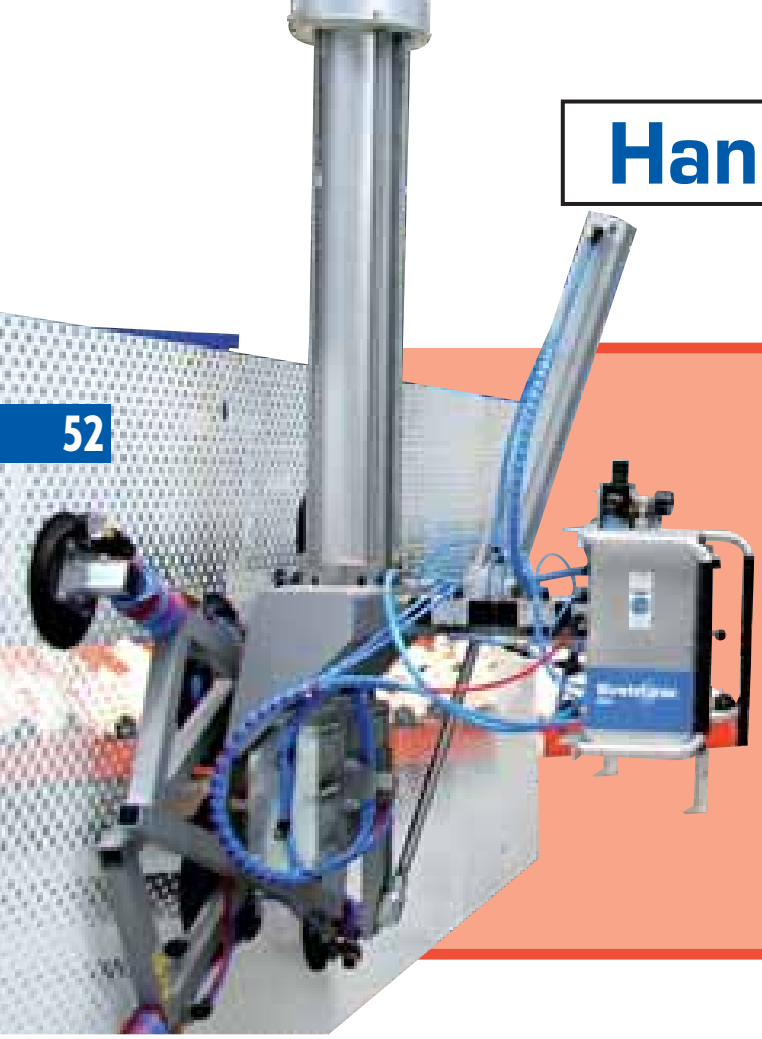
OPTIMIZATION SYSTEM INSTALLED

From the lehr, the glass ribbon is transported into the 'cold end', which was – with the exception of the inspection system for automatic flaw detection – delivered by *Grenzebach Maschinenbau GmbH*, part of the Grenzebach Group. Roller conveyors move the glass ribbon through the various workstations, where it is inspected for flaws and subsequently cut and broken according to the delivered data. In order to ensure the best possible cut quality, the borders are broken on the inside and outside. A further inspection follows, during which the geometry of the panes is controlled and the panes precisely measured. At the end of the line, the finished panes are then stacked, either tin side or atmosphere side out depending on the customer's specifications. This entire process takes place fully automatically. "The optimization system for our plant," states Egbert Wenninger, member of the management at Grenzebach, "ensures that the cull is reduced to an absolute minimum and the entire plant runs optimally according to the respective requirements – all the way to the stackers." ■

Depending on the material, the raw materials for glass manufacturing are delivered either on a silo truck or a dump truck

Photo: VDMA

Handling equipment



"Handling equipment is only popular if it is easy to use," states Stefan Herrmann, Branch Manager at Semcoglas in Nordhorn, commenting directly about one of the reasons to provide the entire production hall with handling systems from the Bystronic glass Group.

The entire hall of *Semcoglas* at Nordhorn in Lower Saxony, which was commissioned in spring 2008, has a framework of lightweight top crane systems and lifts from the Bystronic glass Technology Center Bystronic Armatec. "At that time, the company asked for a fast and secure glass handling system, which could even be used by inexperienced operators," explains Dietmar Weichsel, who is responsible for selling Bystronic glass handling equipment in northern Germany. For this reason, he suggested a combination of equipment for moving light and heavy glass plates at a single work station. With this system, he met exactly the needs of the customer, for whom the safety of his employees is of paramount importance.

USER-FRIENDLY EQUIPMENT

"We want colleagues to move even the lightest of loads with handling equipment and this can be achieved only if the equipment is easy to use," reports Stefan Herrmann from his experience. The Branch Manger especially appreciates the *Easy-Lift* from Bystronic glass: "Its thick hoisting tube, which compresses the air, allows extremely accurate operation," he explains and demonstrates this fact on the glass loader of the production line for laminated safety glass. In general, the handling equipment of the Easy-Lift type is characterized by its rigid connection between the suction frame and the crane track, facilitating exact positioning of the glass lites. At the same time, the aluminium construction keeps the weight of the equipment itself to a minimum.

AN OVERVIEW OF THE PRODUCT RANGE

However, Semcoglas is not only working with the Easy-Lift from Bystronic glass. During the planning of the approximately 15,000-square-metre production facility in Nordhorn, the Swiss-German supplier of system solutions for the

Bystronic glass: lightweight top crane systems – for easy handling

manufacture of architectural and automotive glass was involved from the very beginning. This provides visitors to the Nordhorn-based Semcoglas factory with a good overview of Bystronic glass' handling systems product range: Single- and two-column lifts, manipulators and suction frames, each running on lightweight top crane systems – almost all variants are available. "Thanks to the excellent advisory service, the selection of products and equipment for the entire hall this installation was extremely simple," Stefan Herrmann reports during the guided tour through the hall.

The business relationship goes back more than ten years. In fact, at that time, Semcoglas purchased a number of companies in which handling equipment from the Technology Center Bystronic Armatec was already in use. Today, the company is active in 24 locations at home and abroad – from glass cutting via screen printing to the production of insulating and laminated safety glass, the group is serving the entire value chain of glass. In doing so, machines of the Bystronic glass group are being used in almost every location. "In Nordhorn alone, we installed around 40 handling systems and suitable lightweight top crane systems," Dietmar Weichsel reports. In addition, there are lines for insulating and laminated safety glass production.

ADVANTAGEOUS HANDLING

The reasons for the continuation of the business relationship are obvious: "The products are convincing and save space, especially the handling systems and can be used according to individual requirements because of their modular design," explains Herrmann. And last but not least, this also includes the excellent service, as he points out. "A relationship of trust is important to us. We greatly appreciate that a brief phone call will suffice for a member of the service staff to address the issue shortly afterwards. It is important to have a contact partner who has the technical expertise and is 100 per cent reliable at the same time." ■

Bystronic glass

Bystronic glass
www.bystronic-glass.com

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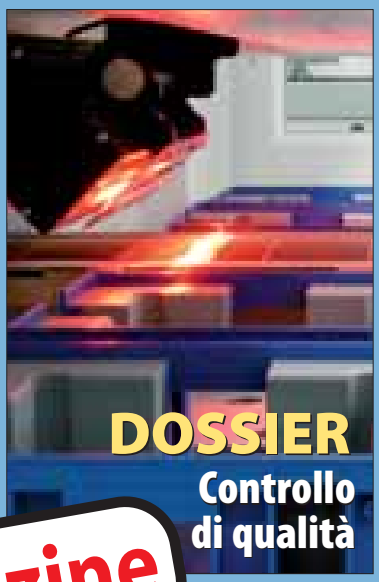
PV TECHNOLOGY

LA RIVISTA DELLE TECNOLOGIE FOTOVOLTAICHE



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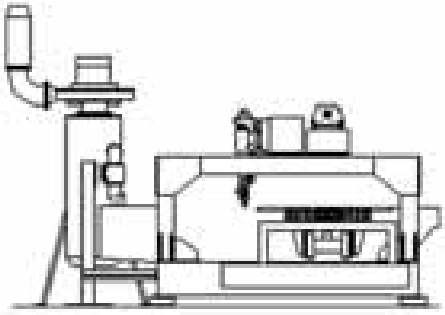
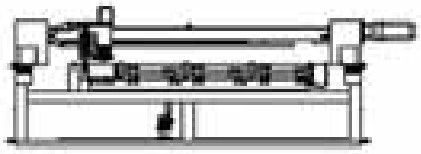
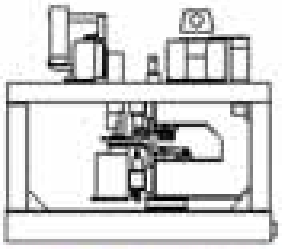


AUTOMOTIVE AND ARCHITECTURAL
CUTTING/BREAKOUT/GRINDING MACHINE
BEVELLING MACHINE



AUTOMOTIVE AND ARCHITECTURAL
STRAIGHT CUTTING MACHINE
SHAPE CUTTING MACHINE WITH EDGE DELETION DEVICE
WITH BREAKOUT DEVICE
DIAGONAL CUTTING MACHINE
LAMINATED GLASS CUTTING MACHINE



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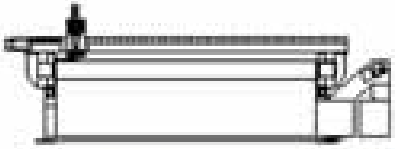
DRILLING MACHINE



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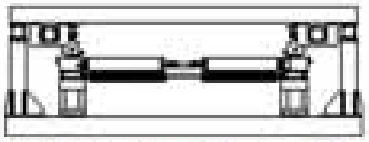
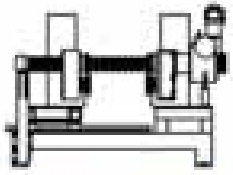
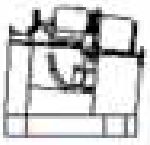
WATERJET CUTTING MACHINE



AUTOMOTIVE LOW-E DELETION MACHINE



HIGH-TECH AND ARCHITECTURAL
DOUBLE EDGING MACHINE WITH CUTTING DEVICE
WITH BREAKOUT DEVICE



AUTOMOTIVE AND ARCHITECTURAL
STRAIGHT EDGING MACHINE
STRAIGHT BEVELLING MACHINE

CE

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INTERPANE GLASS OY
sold to Rakla Finland

Glass processing company **Interpane Glass Oy**, a joint venture of a subsidiary of *Glaston Corporation* and *A A A Glass & Design Finland Oy*, and which began its operations on 1 April 2009, was sold to Rakla Finland Oy on 9 April 2010.

After a rearrangement transaction carried out by the shareholders of Interpane Glass, 100% of the shares in Interpane Glass Oy were sold to Rakla Finland Oy, with Glaston still holding a EUR 4 million secured loan receivable in Interpane Glass Oy.

AGC

TFT-LCD glass substrates production in China

AGC (Asahi Glass Co., Ltd.) has announced that it will open a new production base in Jiangsu, China for TFT-LCD (thin-film transistor liquid crystal display) glass substrates. The plant, with the name *AGC Display Glass (Kunshan) Co., Ltd.*, is scheduled to start operations in Autumn 2011, and will include facilities to process (cutting and polishing) up to 8th generation glass substrates.

Demand for TFT-LCD panels has remained relatively strong, and is expected to continue to see an annual growth rate of 10 to 20%. In line with demand for glass substrates, AGC has expanded capacity and has strived to raise productivity at its facilities in Japan, Korea and Taiwan, with a new furnace starting operations in Korea, and expansions underway in Taiwan.

With regards to China, AGC is supplying orders by shipping from existing production bases, but plans to produce large sized TFT-LCD panels in China are arising, and the future demand for large sized glass substrates is expected to grow greatly. And this is the reason why AGC has decided to set up this new facility, and thus establish a production system with enough flexibility to respond to the growth of the Chinese market, in coordination with its operations in Japan, Korea and Taiwan.

Acquisition of major stake in FGT Polska

AGC Glass Europe, the leading European glass manufacturer, has acquired 70% of the shares in **FGT Polska** (Fassaden Glas Technik-Polska), a key player in architectural glass in Poland, and a manufacturer of high-end architectural glass components for the building projects market. The company operates one of the largest glass bending furnaces in Europe, producing double-glazing, tempered and laminated safety glass for buildings. It is located in Ozorkow, in the centre of Poland, and employs 90 people.

By joining forces, AGC and FGT will strengthen their position on the growing construction market in Central Europe, particularly in Poland, which was the only European country to post a positive GDP growth in 2009. The company is likely to benefit from the strong development of commercial buildings and hotels in view of the upcoming UEFA Euro 2012.

Labelling of flat glass products

AGC Flat Glass Philippines, Inc. is aiming to create a more important impact in the local market in 2010 by labelling its flat glass products with a brand marking visible to its customers and consumers.

According to Virna Liza C. Villareal, head of corporate communications, the labelling will distinguish AGC products from substandard flat glass products, which have infiltrated the domestic market. The labelling is in support of the efforts of the Department of Trade and Industry to stop the proliferation of inferior quality glass products thanks to product traceability and identification.

"Likewise, it is a realization of the thrust of the *Flat Glass Alliance* of the Philippines, Inc. (FGAPI) to promote quality and product standards to the Filipino consumers," Villareal said.

AGC started labelling its products in November 2009, and they are now marked with the AGC logo and a corresponding security code, making it easier for the consumers to differentiate. In March 2010, AGC Figured Glass products followed suit.

AGC products conform to the mandatory requirements of the Philippine National Standards for Flat Glass (PNS 193:2005) for which the company is licensed with a Philippine Standard Mark (PS Mark).

AGC, which has ISO 9001:2000 certification quality management system, OHSAS 18001 certification for Occupational Health and Safety and ISO 14001:2004 certification for compliance to its environmental management system, has been in the Philippine glass industry for more than four decades. The company manufactures and distributes architectural glass products such as float glass and figured glass for the construction, automotive and other industries. Other products such as mirrors, coated glass, fire-resistant glass, tempered glass, laminated glass, double-glazed glass, are likewise available from its worldwide network.

SOLUTIA
new customer service lab

Solutia Inc. announced on 8 April 2010 that it has successfully designed and completed a new, state-of-the-art regional testing facility at the company's Saflex® Polyvinyl butyral (PVB) manufacturing centre in Suzhou, China. The new facility, which marks the third testing lab for the company, will support its laminate testing service programme for customers located in the Asia Pacific region serving the Architectural, Automotive and Photovoltaic markets. Solutia already has centres in Indian Orchard, Massachusetts and Louvain-la-Neuve, Belgium.

"While Solutia has always taken part in rigorous internal and external testing of Saflex interlayers to ensure the quality of our products, the opening of a new customer service laboratory located at our plant in Suzhou, China brings this support to the Asia Pacific region," said Mark Slock, global technical service director for Solutia's Saflex division. "The new laboratory will allow Saflex applications staff to locally test laminated glass products made with Saflex polyvinyl butyral (PVB) interlayers in-house to ensure that they meet critical Architectural, Automotive and Photovoltaic industry norms."

The new investment includes essential testing equipment as a bake oven, thermal bath, pummel testing equipment and an impact tower. The customer service lab will also house a sample cnetre, which will provide Saflex sheet samples on request to customers across the region.

"The investment in the development of this new facility has demonstrated to our customers an ongoing commitment to serving their needs," said Rick Calk, vice president of commercial operations for Saflex. "Previously, Saflex had used our lab located in Belgium to conduct laminate testing for Asia Pacific customers, which had become time intensive and resulted in long lead times for the market. By bringing laminate testing capabilities to our Suzhou plant, this allows Saflex to be more proactive and responsive to our regional customers' needs and requests for additional testing."

CANADIAN GLASS ASSOCIATION
election of new Board Members

The **Canadian Glass Association** (CGA) presented its new Board of Directors during its recently held Annual General Meeting in Pickering, Ontario.

The six Board members, who will be holding their positions for two-year terms, are as follows:

- Richard Verdon, RSVP Agency, Ottawa - president;
- David Langton, *Competition Glass*, Kelowna - first vice president;
- Fred Fulton, *Glassopolis*, Toronto - second vice president;
- David Husson, *DH Glass Solutions*, Langley - past president;
- Stephen Hargrove, *Wescom Glass & Aluminum*, Calgary - treasurer;
- Leonardo Pianalto, Read Jones Christoffersen, Vancouver - technical committee chair;
- Steve Peterson, Automated Entrances, Calgary - membership committee.

VITRO AMERICA
expansion of sales force

Vitro's affiliate company in the US for the flat glass market has strengthened its sales team to offer an even better service to its clients.

Vitro America LLC, located in Memphis, Tennessee, has promoted Kevin Potts to the position of Envision® Glass Systems product line manager. He will be responsible for guiding the expansion of this product offering, which includes all-glass entrances, point supported glass systems, handrails and frameless shower enclosures.

Potts has been with the company since 1986, serving as door sales manager at the Dallas fabrication facility. He will be based in Dallas, and will support distribution and fabrication throughout the US markets.

In addition, the company has also hired Wayne Williams as an estimator for the Envision sales department in Dallas. Williams will be responsible for estimating and technical support. He has more than 30 years experience and was employed previously by *C.R. Laurence* where he served as a sales manager for the Dallas, Houston and Denver markets.

Martin Boonstoppel was hired in Las Vegas as a sales representative for the southwest market, and brings more than 20 years of experience in the sales and marketing of architectural products and most recently served as the western regional sales manager for Dorma Group North America.

In addition, Cathey Finney was also hired in Las Vegas and joins the company as an architectural sales representative. Finney will be responsible for promoting the sale of fabricated products in a multi-state territory and most recently worked for *Oldcastle Glass*, where she served as a senior architectural sales representative for 13 years.

NSG GROUP
senior management appointments

Craig Naylor ha recently been appointed president and CEO of the **NSG Group**, succeeding Katsuji Fujimoto, who has been appointed chairman, taking over from Yozo Izuhara, who will be retiring from the company at the end of June 2010.

Naylor, who completed a 36-year international career with *DuPont* in 2006, as group vice president for DuPont Electronic and Communication Technologies, and was a non-executive director of Delphi Corporation from 2005 to 2009, will join the Group on 1 May 2010 as CEO Designate.

NSG Group chairman Yozo Izuhara said, "We are delighted that Craig is joining the Group as president and CEO. He brings to the company extensive international management experience and expertise in product development, manufacturing and marketing. The Board is confident that he has the qualities to lead the NSG Group into the next phase of its development as a global leader in glass and glazing for the Building Products, Automotive and Specialty Glass markets".

Craig Naylor said: "I am delighted and honoured to have been invited to lead the NSG Group and I am greatly looking forward to the challenge. The Group enjoys an excellent reputation in the industry for quality and service, innovation, technical excellence and a strong product range."

"My aim will be to provide leadership to enable the Group to further strengthen its finances, improve its competitiveness and to grow profitably."

2 ONLY PRECISION SOLUTION

LOV - 622 - 2T/S

- *Two spindles to grind and polish simultaneously two glass sheets on each table*
- *On each table it is possible to grind glasses with shapes different from those worked on the other table*
- *Two sliding tables with alternate movement to facilitate loading and unloading operations Upon request,machine is also produced in the version with fixed table*
- *Automatic loading / unloading system (on request)*

TECHNICAL DATA:

WORKING FIELD / GLASS SIZE ON EACH SLIDING TABLE	***2 glasses 480 x 1700 mm max or 1 glass 1160 x1700 mm max***
WORKING FIELD / GLASS SIZE ON TWO TABLES FASTENED TOGETHER	***1840 x 1700 mm***
GLASS THICKNESS	***2 mm min - 30 mm max***

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Fax + 39 02.48.82.196
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NSG GROUP
bank financing obtained

NSG Group, the Japanese owner of UK glass manufacturer *Pilkington*, has secured GBP 380 million of new banking facilities, which mature in 2013, as part of a refinancing.

The Manchester branch of Handelsbanken has provided GBP 35 million, with other lenders being BNP Paribas, Lloyds TSB, Sumitomo Mitsui and Royal Bank of Scotland.

The new facilities include a GBP 335 million revolving credit facility and a GBP 45 million term loan, and will be used to prepay a portion of the firm's existing borrowings, which mature in FY2011.

NSG Group reported annual sales of EUR 5.7 billion in 2009 and has about 30,000 employees worldwide.

Steve Cox, corporate banking manager at Handelsbanken in Manchester, said: "Handelsbanken has supported Pilkington since 1994 and the latest facility for parent company, NSG Group, represents a considerable increase from our current position. The facilities will ensure that NSG Group is well-positioned for the global upturn and reflects the growing confidence in the manufacturing industry."

THAILAND
crackdown on imports urged

ShowerKing Manufacturing, Thailand's leader in tempered-glass shower enclosures, has urged the country's government to enforce an industrial standard on cheap imported products to curb substandard glass imports.

"An enforcement of industrial standards on imported glass should encourage fair competition and promote safety for consumers," said ShowerKing's founder and chairwoman Ms. Sarindhorn Sarindhorn.

ShowerKing said it was time for the government to support local businesses by ending double standards that allow uncertified substandard imported products to be sold in the country.

Ms. Mativachranon said that ShowerKing was also increasing its efforts to promote the awareness of safety-glass use among its dealers and the public to help sustain the industry's future and promote better consumer understanding.

Tempered-glass makers in Thailand must obtain formal certification from the Thai Industrial Standards Institute (TISI). However, the TISI abandoned the legal requirement on imported glass products, thus resulting in increasingly cheap substandard imports, affecting local manufacturers.

"An enforcement of industrial standards on imported glass should encourage fair competition and promote safety for consumers," said Ms. Sarindhorn.

Founded 17 years ago, ShowerKing says it is the only Thai shower enclosure manufacturer to export products, thanks to its certifications - ISO 9001, TISI's industrial standard and ANSI Z97.1 and US BS6202.

According to Ms. Sarindhorn, the company has a 40% share in the local tempered glass market.

SOLVAY
acquisition of Russian soda ash plant

Belgium's **Solvay** has announced that it has agreed to buy Sodium Group Investments Limited's majority stake in the Berezniki soda ash plant in Russia for EUR 160 million, subject to closing adjustments.

Solvay, which is the world's leading maker of soda ash, said it was buying Sodium Group's 90% stake in *OAO Bereznikovsky Sodovy Zavod* and 100% stake in *ZAO Berkhimprom*, which are merging.

After the closing of the deal, Solvay will immediately gain control of the operation of the plant, while Sodium Group will retain a minority share for three years, during which the acquisition will be paid.

Solvay's shares have risen almost 30% since it announced that it was discussing the possible sale of its drugs unit, with a market cap of EUR 6.3 billion.

According to Solvay, the soda ash plant is one of the three major soda ash producers in Russia, with a capacity of 500,000 metric tonnes per year of light soda ash, but dense soda ash will be available by the end of 2010 when the construction of a densification unit is finalized.

Solvay is already active in Russia in a joint venture with Gazprom bank unit Sibur to build a vinyl plant in Kstovo, in the Nizhny Novgorod region of Russia, which will also produce caustic soda.

In 2008, Solvay also bought Egypt's state-run soda ash company Alexandria Sodium Carbonate Company for EUR 100 million.

MOUNTAIN

Mingte Company, specialized in manufacturing first-grade glass processing machineries。
Main product scope: Flat/bent glass tempering machines, double-curvature glass tempering machines, flat, bent glass laminating production line, automatic mirror silvering line, CNC cutting machines..
The glass products made by such machineries can be fully as architectural glass, elevator glass, shower-room glass, auto glass (windscreen, sidelites, backlites, and skylight windows, etc.), and mirror glass.

Advanced Heating system

Very Low Energy Consumption

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Powerful Advanced Control System

Custom Machines Available

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FENZI - ALU-PRO plant almost ready

The new *OOO Fenzi - OOO Alu Pro* production and distribution facility in Lipetsk, near Moscow, is designed to meet the needs of the vast Russian market, which is now picking up after the financial turmoil of the past two years.

Although the market is remarkably widespread and exceptionally interesting for exporting 'Made in Italy' products, Russia has suffered from the financial crisis as badly as the other industrialized countries, even worse since it has to rely on a relatively young economic structure. Nonetheless, the conditions necessary to consider Russia as one of the most interesting markets worldwide in the insulating glass sector are definitely valid and remain confirmed: because of its climate as well as the evident need to upgrade its existing buildings in order to meet the new standards for energy reduction, Russia offers indeed a huge potential for work for industry specialists.

Now that the turmoil is abating, the countries which are part of what is called Bric (Brazil, Russia, India, China) are gearing up to play the role as leaders in the worldwide economy, although their potential for growth differs considerably. In particular, Russia has come out of the crisis really exhausted, but can count on its enormous availability of natural resources and the positive results of big investments made in research and training during the economic boom. The new phase in economic and industrial recovery, which is anticipated for the entire market of Eastern Europe is a great opportunity for western businesses, as well as a tough challenge to take. In fact, there are large obstacles in the way, particularly dealing with customs and logistic matters due to the long distances necessary for merchandise to arrive at destination. For this reason, a couple of years ago **Fenzi** and **Alu-Pro** started constructing a new manufacturing site in Lipesk, on the outskirts of Moscow, and is about to be completed: built on an area covering 8,000 sq.m., the new plant will be operating this coming summer and will initially be dedicated to the production of Thiover sealants and aluminium spacer bars.

Production will focus on Thiover sealant and Alu-Pro aluminium profiles at Fenzi's new facilities in Russia where building market needs are expected to rise sharply over the coming years.

The productive capacity will be enough to respond completely to the Russian market requirements and will consequently meet the needs of IG processors and producers. Local resources will be integrated, thanks to priorities given by the management, as well as employment for Russian people. Guaranteed product quality will be assured because the technology and productive processes applied meet the high standards of all Fenzi and Alu-Pro plants in Italy and around the world. The same holds true for technical assistance and customer service over the vast Russian territory: in fact, the 11 hour time zone will be completely covered by a tight and efficient network of distribution, already active thanks to the presence of the Glass Alliance network, which has also been strengthened in anticipation of new production lines.

TIGO and AGA solar energy joint venture

Tigo Energy and Architectural Glass & Aluminum Company (**AGA**) will collaborate in a joint venture for the production of solar energy to high-rise occupants. The companies reportedly received a grant from the US Department of Energy and the Israel-United States Binational Industrial Research and Development Foundation. AGA will, according to the JV, incorporate Tigo's Energy Maximizer System into the solar panels it uses for its buildings, with AGA furnishing the glass and silicon coatings and Tigo supplying the electronics to turn the glass into solar receivers.

COO Itzik Weinstein said he believes that with the JV in its "alpha stage", the two companies should be able to offer a commercial solution within a year. Tigo and AGA are also looking to be able to provide apartment residents with the ability to create solar energy.

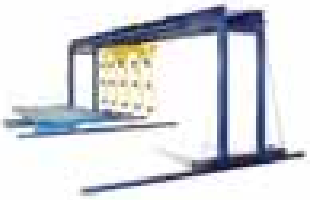
The US federal government gives a fixed 30% subsidy on the cost of a renewable energy project, including labour. Because the installation of solar panels is classified as an expense for renewable energy, the pro-ject can be entitled for subsidies, as long as the covering is used to generate electricity from a renewable resource.

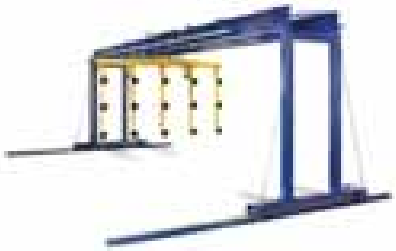
Consequent to the JV and orders from Europe, Tigo has opened an office in Japan and hired a business development manager to be based in Germany. According to Tigo, it has orders and order backlogs, originating through letters of intent from the US, Europe and Japan, of 100MW for 2011, and about USD 20 million in sales for 2010.

Weinstein concluded that the company will be investigating production lines in China with the ability of an industrial-scale production line, in order to keep up with the 100MW demand.

Automatic systems to handle sheets of glass (also with low magnetic emission coating)

SS6000BE





Combined compact loader to handle all dimension glass sheets (chocking of the suction cups)

AUTOMA RBT-SF

Conveyor with bilateral taking and vertical or horizontal unloading directly on the cutting table for glass sheets 6000 x 3210 and 3210 x 2650

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HELIOS ITALQUARTZ FOR THE GLASS INDUSTRY

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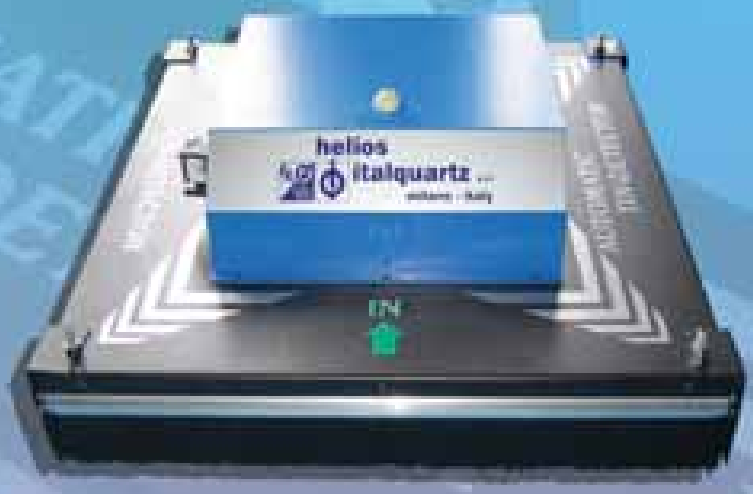
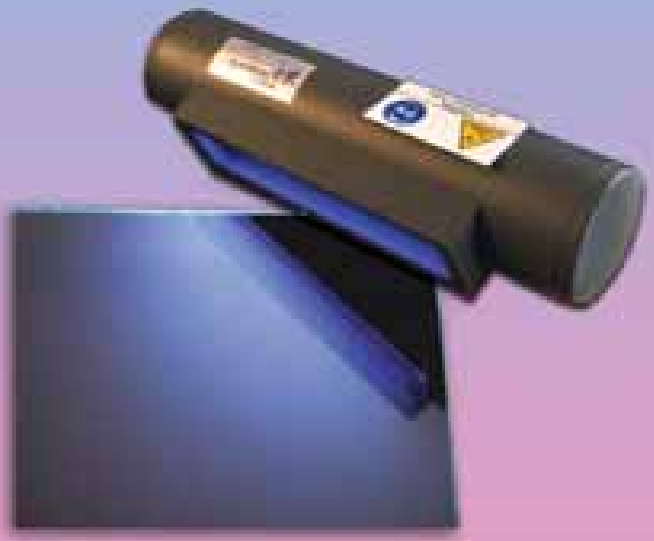


AUTOMATIC TIN - DETECTOR

It is the technological development of the Manwood 25 – N. It can be fixed directly on the glass transportation line before the process starts in order to check every piece of glass. Thanks to the simplicity of the installation and its great flexibility it is suited for the mass manufacturing where the methodological control is essential to support the rate of production.

MANWOOD 25 – N

UV black light apparatus, able to identify the tinned coated side of the float glass even under high brightness conditions. Such identification is very important before the laminating, mirroring, printing and decorating processes.



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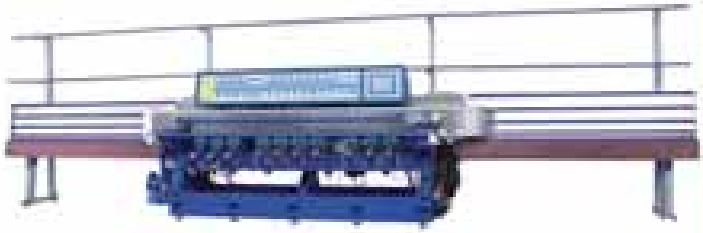

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The building sets new ecological standards and has already won several awards. ipasol solar control glass optimizes the energy balance

Source: Interpane/Adam Mørk

Interpane Glas sustainable

THE PROJECT

Right between Speicherstadt and the Elbe River, on an area of 157 hectares, a new quarter with residential buildings, office buildings, shopping centres, restaurants and leisure time facilities is growing – Hamburg's HafenCity. This growing process will continue well into the 2020s. A total of 40,000 new jobs will be created.

A new architectural highlight in the skyline is the new Unilever headquarters for Germany, Austria, and Switzerland. The building resembles the cruise ships that are anchored in the immediate vicinity. Inside the building, the enormous transparency generates a feeling of openness and freedom. The peripheral *ipasol* solar control glazing façade promotes this concept with its high level of daylight transmission, while preventing excessive heat build-up at the same time in the case of intensive solar radiation. There are hardly any small individual offices: Bridges and stairs connect the wings; conferences take place in so-called "meeting points" that exist on each level and have a positive impact on communication among the staff. Its atrium is the heart of the building: As a "communication spot", it is accessible to the staff and visitors alike – a concept that under-

HafenCity Hamburg is located right on the banks of the Elbe River. This inner-city construction project, currently the largest in Europe, features modern and sustainable architecture. One example is the Unilever building, designed by Behnisch Architects: As graceful as an "ocean liner", the new headquarters of the consumer goods producer is located at Strandkai 1. The building combines climate protection and transparency: ipasol solar control glass (Interpane) allows for high levels of daylight transmission and, therefore, it lowers the costs for indoor lighting. At the same time, it also prevents the rooms from heating up too much on hot summer days and thereby reduces the need for air conditioning. Seven levels spanning 30,000 square metres provide plenty of room for 1,200 employees to interact and communicate.

Industrie: first-rate architecture

scores Unilever's company philosophy of "openness, vitality, and quality of life."

AWARDED FOR SUSTAINABILITY

The building sets new ecological standards with the golden environment award of the HafenCity Hamburg GmbH, the WAF (World Architecture Festival Award), and the international Bex award (Building Exchange Award). The façade, which features ipasol solar control glazing, optimizes the energy balance: In warm months, it minimizes the costs for air conditioning, and in cold months, its insulation value of 1.1 W/m2K (as per EN 673) keeps the warmth inside the building. Another part of the energy concept is the application of LED technology for lighting the workplaces. This reduces power consumption by up to 70 per cent compared to using halogen lamps. Due to the close vicinity of the cruise terminal, special attention had to be paid to the emissions of the ships' motors. The planners, therefore, implemented a special hybrid ventilation system: The primary ventilation is a mechanical type employing compressed air systems in the floor. Via a filter system, outside air is distributed through the offices and then into the atrium, where the air rises up. Heat exchangers inside the roof minimize the heat losses.

Interpane Glas Industrie: first-rate sustainable architecture

A "COCOON" PROTECTS THE GLASS FAÇADE

The small drops that are churned up by the rough maritime climate can soil the façade. In order to protect it, but also for design reasons, it is covered by a single-layer, fully transparent plastic cover. This also supports the association with ships, which is intended for the viewers of the building. Under certain weather conditions, it inflates like a sail and hisses in the wind. It also allows the construction to avoid having horizontal seals, which would have been necessary for fire protection reasons with the use of a double façade. The space between the façades is ventilated and, therefore, it also supplies draught-free fresh air through open windows.

DAYLIGHT AND COMFORTABLE TEMPERATURES – ALL YEAR LONG

Neutral views, lots of daylight and a high level of solar protection are the strengths of the ipasol neutral solar control façade. It comprises two parts: On the ground floor, the generously dimensioned glazing in a pillar-beam design allows plenty of light into the building. Especially in the summer months, the reflecting water caused the façade to let in considerably more light and heat. Therefore, the planners decided to use ipasol neutral 50/27. With the large windows and the special light intensity, as little as 50 per cent of daylight transmission provides for bright rooms, so that artificial light only has to be used relatively late in the day. This reduces operating costs and is good for the environment. The particularly low solar factor (27 per cent as per EN 410) effectively protects the rooms from heating up too much on sunny days, reducing costs for air conditioning. The neutral glass also allows for a pristine view from the offices over the Elbe River and HafenCity.

Since the sophisticated plastic cocoon cover, despite its high transparency, reduces light transmittance, the planners decided to use ipasol neutral 70/39.

The high level of light transmittance (tL = 70 per cent) maximizes the daylight transmission. Together with the "plastic sail" enclosing the building, the solar factor of 39 per cent is sufficiently low. In the wintertime, the Ug-value of 1.1 W/m2K (as per EN 673) provides for effective heat insulation. In some parts of the building, a cold sound-insulation façade, using laminated sheet glass supplied by Interpane, provides additional protection from increased noise levels. ■

The new Unilever headquarters in Hamburg's HafenCity: A sophisticated plastic cover protects the solar control glass façade against the rough maritime climate

Source: Interpane/Adam Mørk

INTERPANE

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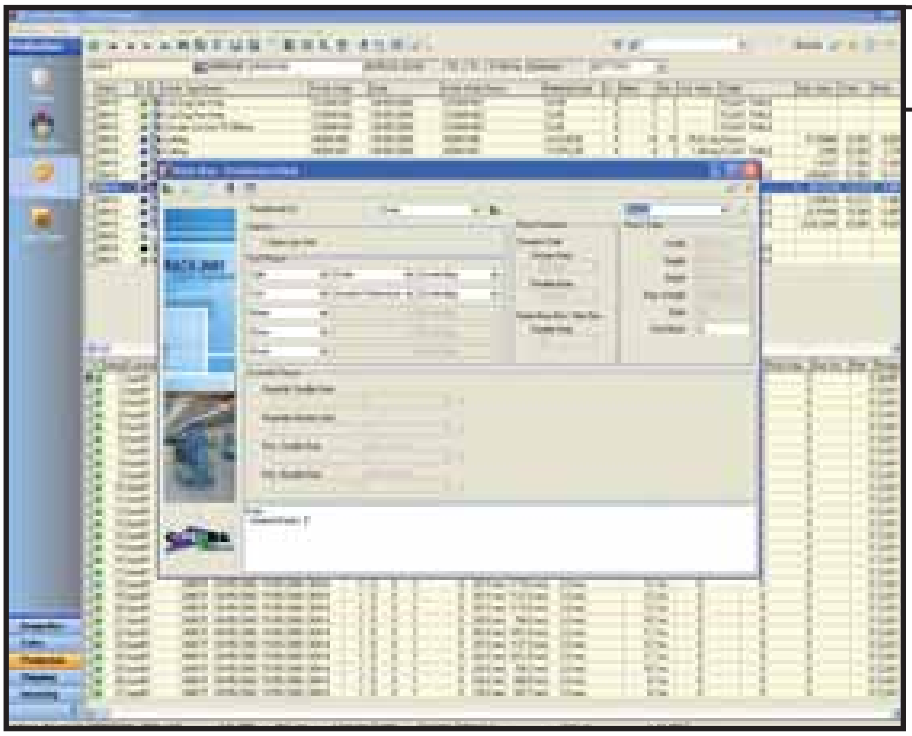


Cristian Zanca
Sales Manager
OPTIMA SRL

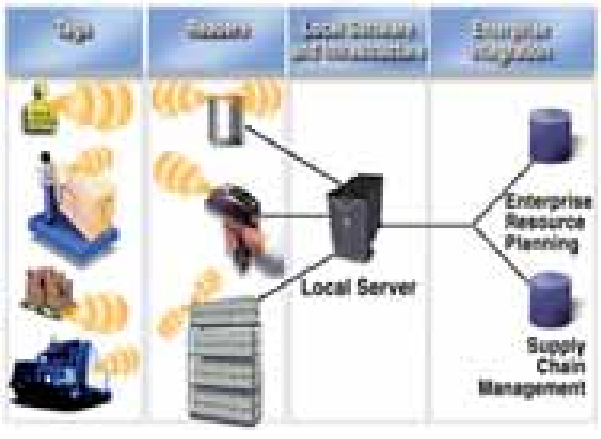
Optima: RFID – beyond barcodes

Barcodes are used the world over in a multitude of situations: from supermarkets to airports – and especially in productive environments where it is essential to have a "live" update of the position of goods. This technology is, however, being overtaken by RFID - Radio Frequency Identification technology, which not only finds applications in the industrial world, but also in medical, safety and free-time activities. Optima uses this technology to enhance the features of the 2010 version of Opty-Way® Enterprise enabling to speed up production processes, maximizing efficiency and quality of productive cycles.

A MORE EFFICIENT TOOL THAN BARCODES IS PRESENTLY CHANGING THE WAY OF WORKING ALL OVER THE WORLD

A skier moves down an Italian ski slope and goes through the turnstile without having to show his pass. In a Danish suburb, the blood pressure of a woman is monitored while she removes the weeds from her garden. And, during a safety exercise at an American power plant, 20 workers are evacuated and registered.

What do all these scenes have in common? RFID - Radio Frequency Identification technology. All over the world and in each and every sector, the use of this technology is in continuous evolution and is expanding extremely fast.



Optima: **RFID – beyond barcodes**

Identification by means of radio frequency and the electronic labelling of items are now a reality with which we can receive a myriad of information, creating a new panorama: the *Internet of objects*.

If, up to now, innovation has been concentrated on the acquisition of accurate information (boxes, packaging), attention is now mainly moving towards the integration of the transmitted data, not only inside company organization, but also along the entire value chain. The predominant aim of innovation, therefore, has moved towards the transformation of this data into company knowledge able to boost the further innovation of processes and strategies. The use of RFID has become widespread in many sectors, with concrete innovations in aerospace, automotive, pharmaceutical, consumer and retail goods, right up to hotels and public services.

"The real value of RFID technology can be found in the continuously acquired knowledge regarding identification, location, and the consequent control of products on which it is used".

BUT WHAT ARE RFIDS?

There are two main types of radiofrequency tags. The most frequently used and most economical are the passive type, which do not contain a battery, but only have a chip and an antenna which, other than receiving and transmitting data, also transforms electro-magnetic energy into electricity to power the transmission system.

The intelligent part of each sensor is made up of a single transmission circuit of the signal and a non-volatile memory with a single code, which is transmitted to the reader, or by a microprocessor, able to elaborate the signals from the readers and transmit the obtained results.

Active tags have their own power source, which is usually a small lithium battery. Other than powering the transceiver circuits, this can also keep the static memory active, where the data regarding the Tags are stored. The advantage of using a power source is that of the possibility of creating systems that work using higher-frequency signals and have a range of action of ten or more metres.

HOW DO THEY WORK?

An RFID system is made up of a transceiver (reader) and by one or more Transponders (for example a simple label) able to communicate by means of a radio frequency signal.

The possibilities of this new and fascinating technology are therefore incredibly vast and will become even more so in the near future, thanks to their ease of us and versatility of the same.

In principle, RFIDs are particularly useful when we need to obtain a reading without direct contact between the reader and the object to be identified, when we want to have the highest level of security in information transfer, when we work in dirty or particularly rigid environments where traditional techniques fail and when, for example, we do not want to reveal the presence of a control system.

SECTORS OF USE FOR RFID

Transponders can be buried in non-metallic materials without damaging their performance in any way. It is evident that the use of RF recognition technology is enhanced by its use in an automatic system of data collection. Diverse possibilities of use are being created for RF recognition systems:

- security systems made up of a dedicated reader that recognizes or simply communicates with a limited number of Transponders: these include, for example, immobilizers for vehicles and electronic locks for which a system of data collection is not foreseen;
- recognition systems made up of even a large number of readers which manage many Transponders, but which have simple data collection systems or even do not have any. Among these we must point out access control systems (that enable the access to a certain environment only to authorized persons or the transit of skiers with validated pass through the turnstiles of the ski lifts), anti-forgery systems (a transponder inserted in designer clothes or in a bottle of perfume can confirm the authenticity of the item) and those based on pre-paid cards;
- integrated control systems with which RF identification combines with complex data collection systems guarantees the complete management of the most diverse situations.

Just consider, for example, the possibility of marking, sorting and tracing in each and every moment, the luggage of all the airports of the world, following all the production phases of a

certain product or controlling the movements of the fiches in a casino.

FROM BARCODE TO RFID

- a tag identifies each object or raw material, with a univocal code memorized inside its microchip. Contrary to barcodes, it is able to gain information (that is, it can register data) and make the data available in real-time with specific systems of reading/writing;
- a tag can have a desired size and shape; it can be coated with material suitable for the type of activity or process that it must carry out or be subject to;
- a tag can be recycled and therefore reused in productive or logistical context, to carry out infinite reading/writing activities;
- with the preparation of a "gap" a tag can be read at the exact same time with a single operation of reading/writing, thus identifying all the packages to be shipped or stored;
- a tag is advisable in operations in which high temperatures, the use of water, detergents, dyes, solvents and chemical agents, do not enable the use of magnetic bands or barcodes since, in the long term, these would deteriorate becoming useless;
- a tag is advisable in very dirty environments, where barcodes become unreadable after a certain number of processes;
- a tag is advisable when the distance to reading barcodes are too large, or the reading is inaccurate or complicated.

RFID FOR THE GLASS SECTOR?

RFID technology is therefore not specific and limited to a single sector of application, and is much more than a position signaller. It is, in fact, a considerably effective tool and source of management innovation.

We at Optima have always believed - with barcodes, and now with RFID technology - that we can develop the characteristics and the performance of our software systems, especially with regards to EPR systems. We are convinced that, by using the latest generation of management software and the application of new technologies, glassworks will be able to find innovative solutions and, therefore, improve all those critical processes that often cause down times and consequent loss of money.

In the 2010 version of *Opty-Way® Enterprise*, we have made available a series of functions that provide the complete support of RFID technology inside the GMC-Way. The use of these technologies enables to speed up production processes, maximizing the efficiency and quality of productive cycles. These are just a few practical examples:

- automatic scanning of the glass at the simple passing at a given point in the production lay-out;
- no restraints regarding positioning and/or orientation of the label with regards to the physical characteristics of the reader;
- automatic filling in of the packing list of the pallet;
- automatic and selective recognition of the pallet and/or rack.

The complete support of this advanced technology makes Opty-Way® Enterprise an integrated informative system, the use of which inside the glassworks involves changes and benefits to company organization.

"With Opty-Way® Enterprise, glassworks have the opportunity of setting up a company information system able to collect, elaborate, memorize and distribute information supporting decisional and control activities of the glass industry".

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Glassman Glass Machinery: high speed, quality vertical processing

WHY VERTICAL CNC DRILLING AND MILLING

The continuous progress in the developments of high-speed and high-tech machinery, is resulting in more and more equipment being used in the glass processing industry, and, therefore, machinery manufacturers must provide glassmakers with equipment that performs faster and with the highest production quality, in order to survive.

What should a good machine do? First and foremost, it must simplify complex tasks. Moreover, a good machine must not only be able to cope with more complex work, but also achieve perfect processing results that normal machines cannot realize.

For example, the notch to fit the hardware on a glass door requires very high accuracy, along with the very important task of processing all sides of the glass sheet, because the final effect gives a directly impact to the consequent processes of tempering and breakage rate at installation. To mill such a notch in a factory with laggard equipment would mean using two or three machines, resulting in poor quality, high breakage rate and low efficiency. With Glassman CNC Vertical Drilling and Milling Machine the entire processing of the glass sheet is carried out on one machine.

High accuracy and efficiency

High precision can help gain high level customers, enabling glassworks to work in line with international standards, playing a more important role in costs and labour savings, and winning over fierce competition.

Glassman equipment passes strict tests, drilling four holes in the four corners on two sheets of glass with the same dimensions, then putting the two pieces together, with the holes resulting perfectly in the same position.

THE ADVANTAGES OF GLASSMAN CNC DRILLING AND MILLING MACHINES

At present, most glassmakers processing flat glass cope with work such as drilling, milling and arrissing, completed using a combination of drilling machines, water jets and horizontal work centres. There are, however, many difficulties regarding the use of water jet or drilling machines, such as low speed, poor accuracy or high breakage rate.

With these problems in mind, and combining today's most recent trend of glass processing equipment and industry leaders' experience, Glassman has spent seven years of development, resulting in the perfect solution: the G*M-BZX-VI* CNC Vertical Drilling and Milling Machine.

Lack of space, the need for high-speed processing, and continuous demand for the maximum levels of quality, are the demands that machinery manufacturers of the glass sector are having to face up to. The response to one of these demands – space – is that of verticality, but what about quality? This has also been considered by Glassman Glass Machinery with its Vertical Drilling and Milling Machines presented in this article.

The sixth generation GM-BZX-VI from Glassman can complete drilling, milling and arrissing in one step, thus greatly enhancing the efficiency and quality of work processes. Compared with drilling machines and water jets, the GM-BZX-VI therefore has numerous advantages.

Compared with drilling machines

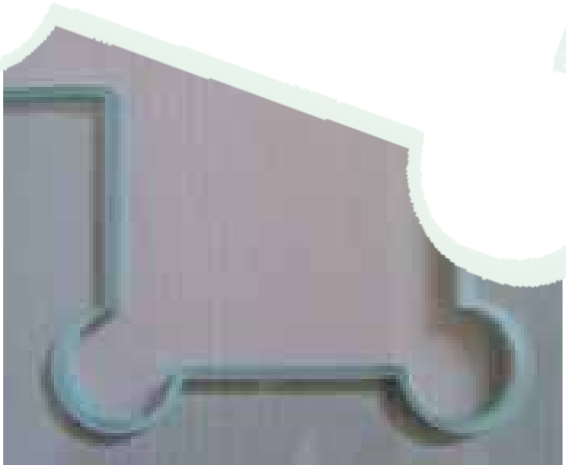
- High speed: the routing speed of the electric spindle in the GM-BZX-VI can achieve 12000 rpm, and only takes 15 seconds to drill a hole in glass with 8 millimetres thickness, while ordinary drilling machines take more than 30 seconds.

Glassman Glass Machinery: high speed, quality vertical processing

- High precision: the GM-BZX-VI CNC Vertical Drilling and Milling Machine uses French NUM, the most advanced control system in the industry, (also used by *Bavelloni*), ensuring precision up to ±0.1 millimetres, meeting higher processing requirements. However, ordinary drilling machines are controlled by PLC, with lower accuracy, and therefore result in a large number of substandard productions, wasting raw material and increasing unnecessary costs.
- Humanization of structure design: the main working area of the GM-BZX-VI is closed so that the cooling water does not splash everywhere during processing, while ensuring the recycling of the coolant water. This means that it not only saves water but also keeps the plant clean and ensures operator safety, conforming to European CE standards.
- Glassman's CNC Vertical Drilling and Milling Machine can perform drilling, milling and arrissing at the same time, while an ordinary drilling machine can only drill, which means that the glass must then be transferred to another machine to finish the other processes. The GM-BZX-VI therefore significantly shortens processing time, increasing efficiency, and reducing possible damage to the glass caused by manual handling.
- GM-BZX-VI is an essential machine for a glass processing line, since an automatic production line for flat glass is usually made up of a cutting table, edging machine, washing machine, CNC vertical drilling and milling machine, and tempering furnace. This high degree of automation cannot be obtained by ordinary drilling machines.

Compared with water jet machines

- Working speed: water jet processing of glass with carborundum and high pressure water can seriously affect processing speed. With Glassman's CNC Vertical Drilling and Milling Machine, on the other hand, the speed of electric spindle can reach 12,000 rpm, thus driving the diamond tool routing at high speed, and, as a result, the processing speed is two or three times higher than with water jet cutting.
- Although water jet machines can carry out milling much better than drilling machines, the CNC Vertical Drilling and Milling Machine also carries out arrissing, another procedure before tempering, thus increasing efficiency.
- Because water jet machines use high pressure water to spout the carborundum during processing, a considerable amount of residual carborundum remains on the surface of glass, causing numerous nicks on the glass during washing, and seriously affecting the quality of the glass. This same procedure also damages the low-E film, meaning that water jet machines cannot process low-E glass.
- Restricted by these processing characteristics, water jet machines cannot process large glass sizes, but large glass is very popular in the field of decorative glass or architectural glass. This means that the CNC Vertical Drilling and Milling Machine is more practical than water jet machines.
- Moreover, most water jet machines are horizontal, making it difficult to form a production line with other machines.
- Compared with horizontal working centres, vertical machines have numerous advantages. Moreover, with the Glassman CNC Vertical Drilling and Milling Machine, the force on the glass is in the correct direction while processing, making the glass position more suitable for drilling and milling.
- Humanization of structure design: the main working area of the GM-BZX-VI is closed, thus keeping the plant clean and ensuring operator safety, conforming to European CE standards. When the water jet machine is working, the speed of the jetting water may reach 100-600m/s, and water pressure 196-



294mpa when cutting the glass, creating considerable noise. This high-pressure is very dangerous for operators.

Compared with horizontal work centres

- Limited by the structure, horizontal work centres drill holes with single drill bits, with an effect that is not always ideal.
- Occupying less room means saving plant space. Vertical machines take up more aerial space and never take up as much floor space as horizontal working centres.
- Better water recycling. The processing area of the CNC Vertical Drilling and Milling Machine is a closed structure, the coolant water generated during processing flows directly to the water case to be reused, recycling the water and coolant fluid, both saving costs and keeping the plant clean.
- Limited by the special structure like all horizontal lathes, horizontal work centres are not convenient to be connected to other machines, while vertical machines can be connected in series with other machines to create a production line, thus saving labour and time. That is a defect that horizontal CNC work centres cannot overcome.
- It goes without saying, moreover, that with Glassman's CNC Vertical Drilling and Milling Machine, operations of loading and unloading glass are facilitated, without the need for excessive handling.

CONCLUSIONS

Thanks to the above comparisons, it is easy to see that Glassman's CNC Vertical Drilling and Milling Machine has outstanding features and advantages, and is therefore very popular among today's flat glass processors, also thanks to the complex technology used by Glassman and several European companies. Moreover, glassmakers can now install and use CNC Vertical Drilling and Milling Machines at highly competitive prices.

Machine structure

The main structure of the machine is made of stainless steel, which is heat treated and then painted. The unique internal beehive structure meets European CE standards, and never distorts even with alternated hot and cold temperatures.

The machine is equipped with high-tech components, such as:

- world-level French NUM control system;
- YASKAWA servo-motor made in Japan;
- Seimens and Schneider electric parts;
- Taiwan ABBA ball screw and slide way;
- Software Super CAD/CAM developed by Glassman independently.

All body parts coming into contact with water and standard parts are stainless steel, while all pipe fittings come from Sino-finternational joint ventures.

MOVING FORWARD

Constantly providing the market with the latest and optimal solutions is the business purpose of Glassman. In the future, the company will continue to study the status of the Chinese market, continuing innovating, and providing high quality, inexpensive CNC machines for China's flat glass processing industry, thus contributing to the development

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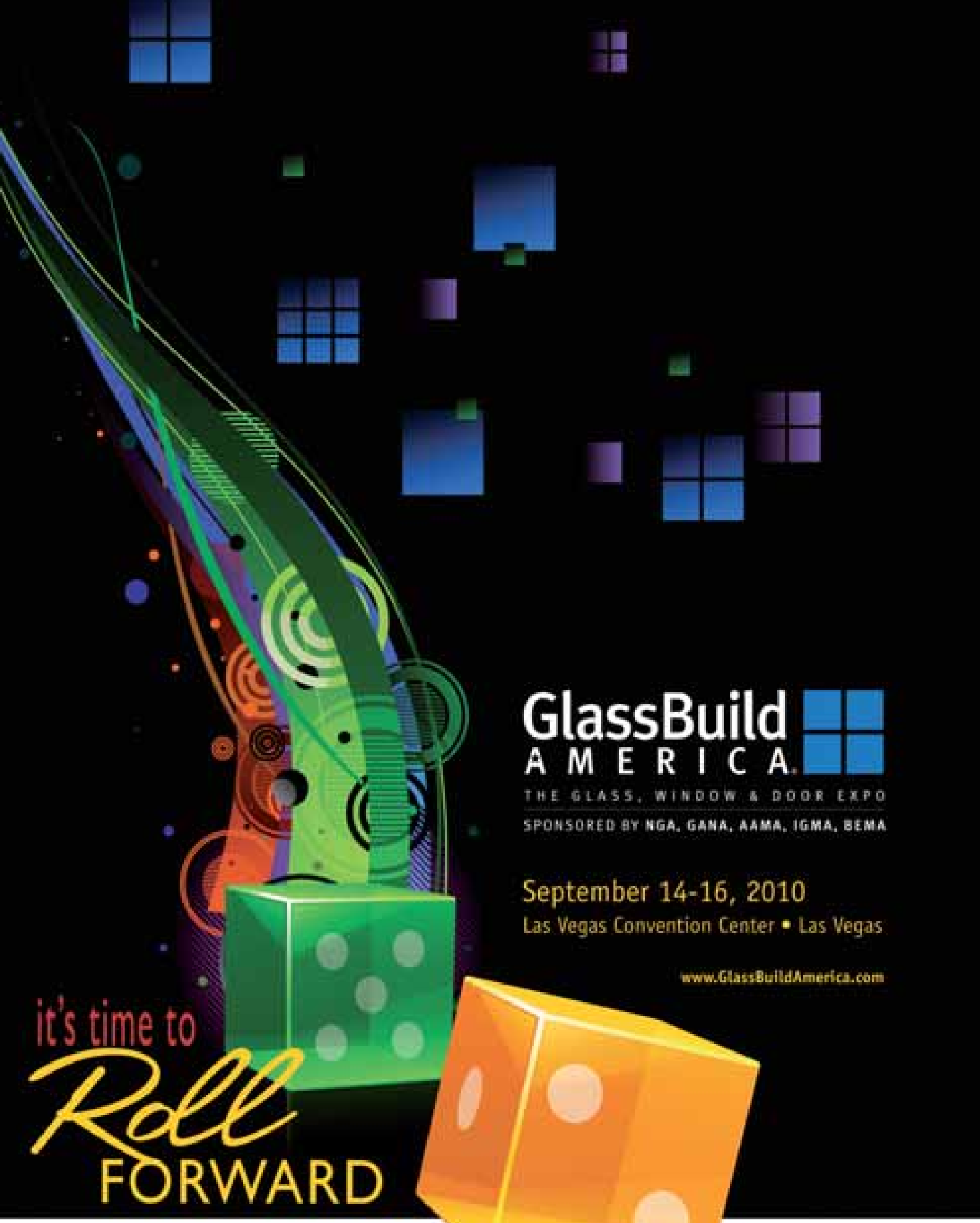

NGA

AAMA American Architectural Manufacturers Association

GLASS ASSOCIATION OF NORTH AMERICA

IGMA

bema

Glass-Technology International

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Máquinas para corte redondo y perfilado

圆或异形切割机

СТАНКИ ДЛЯ РЕЗКИ КРУГОВ И ФИГУРНОЙ РЕЗКИ

Bando Kiko
Bystronic glass
CMS Brembana
For.El.
Glaston Bavelloni
Hegla
Lisec Group
Mingte Glass Tech.
OCS Glass
Putsch-Meniconi
CMS Brembana

➤ Cutting accessories

Accessoires pour découpe
Schneidezubehör
Accesorios para el corte

切割机附件

АКСЕССУАРЫ

Ayrox
Bando Kiko
OCS Glass
Softeco

➤ Saw machines

Scieuse pour le verre
Glassägemaschinen
Maquinas de sierra para vidrio

锯切机

ПИЛЫ

OCS Glass

➤ Automatic saws for cutting laminated and bullet-proof glass

Machine automatique à scies verticales pour la coupe du verre stratifié et anti-effractions
Automatische Senkrechtsägemaschinen zum Schneiden von Verbund- und kugelsicherem Glas
Maquinas automaticas de sierras verticales para el corte de vidrios estratificados y a prueba de balas

自动锯切机
夹层和防弹玻璃

АВТОМАТИЧЕСКИЕ ПИЛЫ ДЛЯ РЕЗКИ ЛАМИНИРОВАННОГО И ПУЛЕНЕПРОБИВАЕМОГО СТЕКЛА

OCS Glass
Putsch-Meniconi
CMS Brembana

Suppliers guide

原材料和设备供应商指南 - 公司黄页

Поставщики - Желтые страницы

Yellow Pages

➤ Breaking systems

Systèmes de brisure
Bruch-Systeme
Sistemas de troncado

掰片系统

СИСТЕМЫ ЛОМКИ

Bando Kiko
Bystronic glass
Fushan
Glaston Bavelloni
Hegla
Lisec Group
Mingte Glass Tech.
OCS Glass
CMS Brembana

➤ Cutting machines with breaking and edge deleting devices

Machines de découpage du verre avec système de polissage des bords
Glas-Schneidemaschinen mit Kantenabschleifungs-Vorrichtung
Máquinas para corte y desbarbado

有掰片和净边装置的切割机

СТАНКИ ДЛЯ РЕЗКИ И ЛОМКИ СТЕКЛА СО СНЯТИЕМ НИЗКОЭМИССИОННОГО ПОКРЫТИЯ

Bando Kiko
Bystronic glass
Hegla
Lisec Group
OCS Glass
CMS Brembana

➤ Glass cutting fluids

Fluides pour la découpe du verre
Glasflüssigkeit
Fluidos para el cortamiento del vidro

玻璃切割用溶剂

ЖИДКОСТИ ДЛЯ РЕЗКИ

OCS Glass

➤ Accessories

Accessoires
Sonstiges Zubehör
Accessorios varios

附件

АКСЕССУАРЫ

OCS Glass

EDGING AND BEVELLING

FAÇONNAGE DES BORDS ET BISEAUTAGE

KANTENBEARBEITUNG UND FACETTIERUNG

CANTEADORAS Y BISELADORAS

磨边和斜边设备

ОБРАБОТКА КРОМКИ И ФАЦЕТА

➤ Complete edging lines

Installations complètes pour le façonnages des bords
Komplette Kantenbearbeitungsanlagen
Línea canteadora completa

磨边全套生产线

ЛИНИИ ДЛЯ ОБРАБОТКИ КРОМКИ

Bando Kiko
C.M.B. - Besana
Forvet
Fushan
Glaston Bavelloni
Lovati F.lli
OCS Glass
SKG - Skill Glass
CMS Brembana

➤ Complete bevelling lines

Installations complètes pour le biseautage
Komplette Facettieranlagen
Línea completa para biselado

斜边全套生产线

ЛИНИИ ДЛЯ ОБРАБОТКИ ФАЦЕТА

Bando Kiko
C.M.B. - Besana
Fushan
Lovati F.lli
OCS Glass
CMS Brembana
Zafferani Glas

➤ Complete automotive glass edging and bevelling lines

Lignes complètes pour le biseautage et le meulage de verre pour l'industrie automobile
Komplette Strassen zum Abfasen und Schleifen von Glas für die Automobilindustrie
Líneas completas para achaflanar y biselar el vidrio para la industria automovilística

汽车玻璃磨边和斜边全套生产线

ЛИНИИ ДЛЯ ОБРАБОТКИ КРОМКИ И СНЯТИЯ ФАСКИ АВТОМОБИЛЬНОГО СТЕКЛА

Bando Kiko
B.H.T.
Bystronic glass
Glaston Bavelloni
Intermac
Lovati F.lli
SKG - Skill Glass

➤ Double edge grinding machines

Rectilignes bilaterales
Doppelseitige geradlinige Kanten-schleifmaschinen
Rectilíneas bilaterales

双磨边机

СТАНКИ ДЛЯ ДВУСТОРОННЕЙ ОБРАБОТКИ КРОМКИ

Bando Kiko
C.M.B. - Besana
CMS Brembana
Forvet
Fushan

Glaston Bavelloni
Intermac

➤ Vertical edge grinding machines

Rectilignes verticales
Vertikale Kantenschleifmaschinen
Rectilíneas verticales

立式磨边机

ВЕРТИКАЛЬНЫЕ СТАНКИ ДЛЯ ОБРАБОТКИ КРОМКИ

Bando Kiko
Bystronic glass
C.M.B. - Besana
Fushan
Glassman Glass Machinery Technology
Glaston Bavelloni
OCS Glass
SKG - Skill Glass
Zafferani Glas

➤ Grinding spindles

Mandrin pour le rodage du verre
Schleifspindel
Tala dradoras para el pulido de vidrios

研磨轴

ШЛИФОВАЛЬНЫЕ ШПИНДЕЛИ

OCS Glass

➤ Bevelling machines for round and shaped glass

Biseauteuses pour ronds et formes diverses
Facettiermaschinen für Rund- und Formschliffe
Biseladoras para vidrios redondeados y perfilados

圆形和异形玻璃斜边机

СТАНКИ ДЛЯ ОБРАБОТКИ ФИГУРНОГО ФАЦЕТА

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Fushan
Glassman Glass Machinery Technology
Glaston Bavelloni
Intermac

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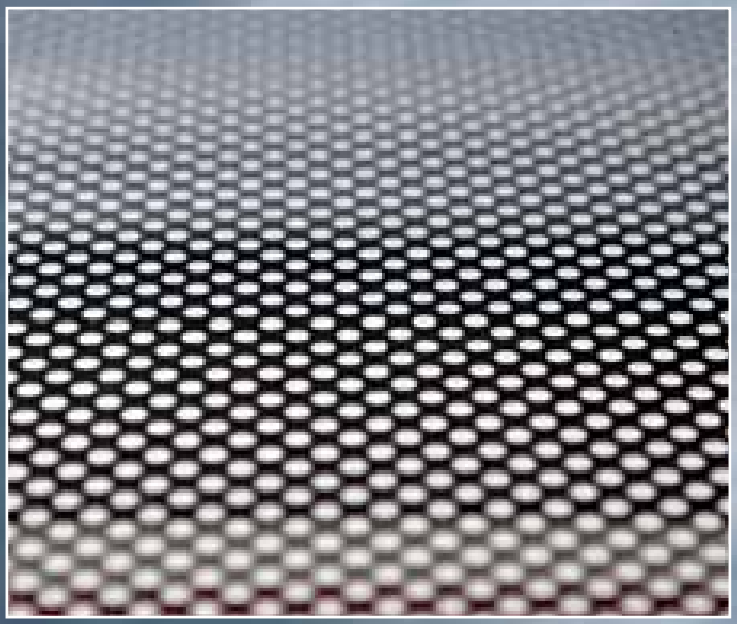

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MEN AT WORK ON RESEARCH AND INNOVATION
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ELECTRONIC STRAIGHT-LINE BEVELLING MACHINES WITH 5 OR 7 WHEELS WITH ANGLE ADJUSTMENT FROM 3° TO 45°
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SHAPE BEVELLERS AND EDGERS
DOUBLE HEADED DRILLING MACHINES
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VERTICAL WASHING MACHINES FOR DOUBLE GLAZING FROM 1.3M UP TO 2.5 M
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Flat and bent glass industry suppliers

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Промышленные поставщики листового и гнутого стекла

Lovati F.lli
OCS Glass
CMS Brembana

➤ Straight-edge bevelling machines

Biseauteuses rectilignes
Geradlinige Facettenschleifmaschinen
Biseladoras rectilíneas

直边抛光机

СТАНКИ ДЛЯ ОБРАБОТКИ ПРЯМОЛИНЕЙНОГО ФАЦЕТА

Bando Kiko
Bovone Elett.
Fushan
Glaston Bavelloni
OCS Glass
CMS Brembana
Zafferani Glas

➤ Bevel polishing machines

Polisseuses pour biseaux
Facettenpoliermaschinen
Lustradoras para corte a bisel

斜边抛光机

СТАНКИ ДЛЯ ПОЛИРОВКИ ФАЦЕТА

Bando Kiko
Bovone Elett.
Glaston Bavelloni
Intermac
Lovati F.lli
CMS Brembana
Zafferani Glas

➤ Straight-edge engraving machines

Machines pour gravures rectilignes
Geradlinige Gravurmaschinen
Máquinas para incisiones rectilíneas

直线刻花机

СТАНКИ ДЛЯ ПРЯМОЛИНЕЙНОГО ГРАВИРОВАНИЯ

Glaston Bavelloni
Intermac
SKG - Skill Glass
CMS Brembana

➤ Shaped glass engraving machines

Machines à découper pour des plaques de verre découpées selon gabarit
Gravurmaschinen für Formgeschnittene Glasplatten
Máquinas cortadoras para hojas de vidrio cortado según plantilla

异型玻璃刻花机

СТАНКИ ДЛЯ ФИГУРНОГО ГРАВИРОВАНИЯ

Glassman Glass Machinery Technology
Glaston Bavelloni
Intermac
Lovati F.lli
CMS Brembana

➤ Corner grinding machines

Machines pour le rodage des angles
Winkelschleifmaschinen
Máquinas para el pulido de ángulos

磨脚机

СТАНКИ ДЛЯ ОБРАБОТКИ УГЛОВ СТЕКЛА

CMS Brembana
Fushan
Glaston Bavelloni
Intermac
SKG - Skill Glass
CMS Brembana

➤ Shaped glass grinding machines

Machines pour le rodage de verres en forme
Formschleifmaschinen
Máquinas para el pulido de vidrios en forma

异型玻璃磨边机

СТАНКИ ДЛЯ ОБРАБОТКИ ФИГУРНОЙ КРОМКИ

Bando Kiko
For.El.
Fushan
Glaston Bavelloni
Intermac
Lovati F.lli
CMS Brembana

➤ Belt grinding machines

Machines a bande
Bandmaschinen
Máquinas a cinta

带式磨边机

ЛЕНТОЧНЫЕ ШЛИФОВАЛЬНЫЕ СТАНКИ

C.M.B. - Besana
For.El.
Fushan

➤ Lathes - vertical and horizontal

Tours horizontaux et verticaux
Horizontale und vertikale Schleifböcke
Tornos horizontales y verticales

立式和卧式转床

ГОРИЗОНТАЛЬНЫЕ И ВЕРТИКАЛЬНЫЕ ПРОТОЧНЫЕ СТАНКИ

C.M.B. - Besana
CMS Brembana

➤ Embossing machines

Machines pour échancrures
Hohlschliffmaschinen
Máquinas para muescas

浮刻机

СТАНКИ ДЛЯ РЕЛЬЕФНОЙ ГРАВИРОВКИ

C.M.B. - Besana
CMS Brembana

➤ Portable machines

Machines portatives
Tragbare Maschinen
Máquinas portátiles

便携式机械

ПОРТАТИВНЫЕ СТАНКИ

Helios Italquartz

➤ Diamond Tools

Outils diamantés
Diamantwerkzeuge
Utiles de diamante

金刚石工具

АЛМАЗНЫЕ ИНСТРУМЕНТЫ

Bando Kiko
Belfortglass
Bovone Diamond Tools
Glaston Bavelloni
Lovati F.lli
Mole Moreschi
OCS Glass

➤ Polishing wheels

Meules de polissage
Polierscheiben
Muelas de brillo

抛光轮

ПОЛИРОВАЛЬНЫЕ КРУГИ

Bando Kiko
Belfortglass
Bovone Diamond Tools
Glaston Bavelloni
Lovati F.lli
Mole Moreschi
OCS Glass
RBM Italia

➤ Polishing agents and oxides

Agents de polissage
Poliermittel und -oxyde
Abrasivos y oxidos limpiadores

抛光剂

ПОЛИРОВАЛЬНЫЕ МАТЕРИАЛЫ

Bovone Diamond Tools
OCS Glass

➤ Polishing belts

Bandes abrasives
Polierbänder
Cintas abrasivas

抛光带

ПОЛИРОВАЛЬНЫЕ ЛЕНТЫ

OCS Glass

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Yellow Pages

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➤ Coolants

Liquides réfrigérants
Kühlflüssigkeiten
Líquidos refrigerantes

冷却液

ОХЛАЖДАЮЩИЕ ЖИДКОСТИ

Bovone Diamond Tools
OCS Glass

➤ Glass grinding and bevelling coolants

Liquides réfrigérants pour le biseautage et le meulage de verre
Kühlflüssigkeiten zum Abfasen und Schleifen von Glas
Líquidos refrigerantes para achaflanar y biselar el vidrio

玻璃研磨和抛光用冷却液

шлифование стекла и фаски хладагентов

OCS Glass

➤ Separators for glass-solids

Séparateurs verre/autres matériaux solides
Schicht zur Trennung von Glas und festem Material
Separadores del vidrio de otros materiales sólidos

玻璃板间固态分离材料

сепараторы для стекла твердых

OCS Glass

➤ Accessories

Accessoires divers
Sonstiges Zubehör
Accessorios varios

附件

АКСЕССУАРЫ

Belfortglass
CMS Brembana
Helios Italquartz
Mole Moreschi
OCS Glass

WASHING

MACHINES À LAVER

WASCHMASCHINEN

MÁQUINA LAVADORAS

清洗设备

ОБОРУДОВАНИЕ ДЛЯ МОЙКИ

➤ Horizontal washing machines

Machines a laver horizontales
Waagerechte Waschmaschinen
Lavadoras horizontales

卧式清洗机

ГОРИЗОНТАЛЬНЫЕ МОЕЧНЫЕ МАШИНЫ

Bando Kiko
B.H.T.
Bovone Elett.
Bystronic glass
For.El.
Fushan
Glaston Bavelloni
Lisec Group
Mingte Glass Tech.
OCS Glass

➤ Vertical washing machines

Machines à laver verticales
Senkrechte Waschmaschinen
Lavadoras verticales

立式清洗机

ВЕРТИКАЛЬНЫЕ МОЕЧНЫЕ МАШИНЫ

Bystronic glass
For.El.
Glaston Bavelloni
Lisec Group
Mingte Glass Tech.
OCS Glass
Zafferani Glas

➤ Washing machines for automotive glass

Machines à laver pour verres automobiles
Waschmaschinen für Automobilgläser
Lavadoras para vidrios de automóvil

汽车玻璃清洗机

МОЕЧНЫЕ МАШИНЫ ДЛЯ АВТОМОБИЛЬНОГО СТЕКЛА

Bando Kiko
B.H.T.
Bystronic glass
Mingte Glass Tech.

➤ Washing purification systems

Systèmes de purification pour les machines à laver
Reinigungsystem für Waschmaschinen
Sistemas de purificatión del agua

清洗净化系统

СИСТЕМЫ ОЧИСТКИ ВОДЫ

Bystronic glass
Mingte Glass Tech.
OCS Glass

➤ Liquid washing concentrates

Liquides concentrés pour le lavage du verre
Flüssige Glasreinigerkonzentrate
Líquidos concentrados para el lavado del vidrio

清洗液浓缩

КОНЦЕНТРИРОВАННЫЕ ЖИДКОСТИ ДЛЯ МОЙКИ

OCS Glass

➤ Accessories

Accessoires
Sonstiges Zubehör
Accessorios varios

附件

АКСЕССУАРЫ

Helios Italquartz
OCS Glass

MIRROR PRODUCTION

INSTALLATIONS POUR MIROIRS

SPIEGELBELEGANLAGEN

INSTALACIONES PARA ESPEJOS

制镜设备

ПРОИЗВОДСТВО ЗЕРКАЛ

➤ Complete plants & conveyors for mirror production

Installations complètes & convoyeurs pour la production de miroirs
Komplette Fertigungslinien & Förderanlagen zur Spiegelfertigung
Líneas completas & trenes para la producción de espejos

制镜用输送机

УСТАНОВКИ ДЛЯ ПРОИЗВОДСТВА ЗЕРКАЛ

Bovone Elett.
Fushan
Mingte Glass Tech.

➤ Painting equipment

Installations pour vernir
Lackieranlagen
Installaciones para pintura

涂漆机

ОБОРУДОВАНИЕ ДЛЯ ОКРАСКИ

Mingte Glass Tech.

➤ Drying ovens

Fours de séchage
Trockenöfen
Hornos desecadores

烘干箱

ПЕЧИ ДЛЯ СУШКИ

Bovone Elett.
Mingte Glass Tech.

Flat and bent glass industry suppliers

平板和弯玻璃工业原材料和设备供应商

Промышленные поставщики листового и гнутого стекла

➤ Automotive mirror bending furnaces

Fours de bombage pour miroirs et rétroviseurs pour véhicules automobiles
Biegeöfen für KFZ-Rückspiegel
Hornos de curvado para retrovisores de automoviles

汽车后视镜弯化炉

ПЕЧИ ДЛЯ МОЛЛИРОВАНИЯ АВТОМОБИЛЬНЫХ ЗЕРКАЛ

B.H.T.

➤ Accessories

Accessoires
Zubehör
Accessorios

附件

АКСЕССУАРЫ

Helios Italquartz

INSULATING GLASS

MACHINES ET INSTALLATIONS POUR VERRES ISOLANTS

ISOLIERGLASMASCHINEN UND ANLAGEN

MÁQUINAS E INSTALACIONES PARA VIDRIO - CÁMARA

中空玻璃生产设备

ОБОРУДОВАНИЕ ДЛЯ ПРОИЗВОДСТВА СТЕКЛОПАКЕТОВ

➤ Complete insulating glass lines

Installations complètes pour verres isolants
Komplette Fertigungslinien für Isolierglas
Líneas completas para vidrio cámara

中空玻璃全套生产线

ЛИНИИ ДЛЯ ПРОИЗВОДСТВА СТЕКЛОПАКЕТОВ

Bystronic glass
For.El.
Glaston Bavelloni
Lisec Group
OCS Glass
Zafferani Glas

➤ Automatic sealing lines

Installations automatiques pour le scellage
Automatische Versiegelungsanlagen
Líneas automáticas para sellado

自动密封生产线

АВТОМАТИЧЕСКИЕ ЛИНИИ ГЕРМЕТИЗАЦИИ

Bystronic glass
For.El.
Glaston Bavelloni
Lisec Group

➤ Automatic spacer bending machines

Plieuses automatiques pour entretoises
Automatische Faltmaschine für Abstandhalter
Plegadoras automáticas para separadores

间隔框弯曲自动设备

АВТОМАТИЧЕСКИЕ СТАНКИ ДЛЯ ИЗГИБАНИЯ ДИСТАНЦИОННОЙ РАМКИ

Bystronic glass
For.El.
Glaston Bavelloni
Lisec Group
OCS Glass

➤ Desiccant salt filling machines

Remplisseuses pour sels déshydratants
Trockensalzeinfüller
Embudos para llenado con deshidratantes

干燥剂填充设备

СТАНКИ ДЛЯ ЗАСЫПКИ МОЛЕКУЛЯРНОГО СИТА

Bystronic glass
For.El.
Glaston Bavelloni
Lisec Group
OCS Glass

➤ Spacer cutting saws

Scies pour la coupe d'entretoises
Spezialsägen für Abstandhalter
Sierras para el corte de los separadores

间隔框切割机

ПИЛЫ ДЛЯ РЕЗКИ ДИСТАНЦИОННОЙ РАМКИ

For.El.
Glaston Bavelloni
Lisec Group
OCS Glass

➤ Butyl extruders

Extrudeuse de Butyl
Butilextruder
Extrusores de butilo

丁基胶挤出装置

БУТИЛОВЫЕ ЭКСТРУДЕРЫ

Belfortglass
Bystronic glass
For.El.
Glaston Bavelloni
Lisec Group
OCS Glass

➤ Hot-melt extruders

Extrudeuse de Hot-Melt
Hot-Melt-Extruder
Extrusores de fusión en caliente

热熔型挤出装置

ЭКСТРУДЕРЫ ДЛЯ HOT MELT

Belfortglass
For.El.
Glaston Bavelloni
Lisec Group
OCS Glass

➤ Polyurethane extruders

Extrudeuse de polyurethanes
Polyurethanextruder
Extrusor de poliuretanos

聚胺酯挤出装置

ЭКСТРУДЕРЫ ДЛЯ ПОЛИУРЕТАНА

Bystronic glass
For.El.
Glaston Bavelloni
Lisec Group
OCS Glass

➤ Polyurethane encapsulation

Capsulage de polyurethanes
Polyurethaneinkapselung
Encapsulado de poliuretano

聚胺酯密封

ГЕРМЕТИЗАЦИЯ ПОЛИУРЕТАНОМ

Bystronic glass
Lisec Group
OCS Glass

➤ Silicone extruders

Extrudeuse de silicone
Silikonextruder
Extrusores de siliconas

硅酮挤出装置

ЭКСТРУДЕРЫ ДЛЯ СИЛИКОНА

Bystronic glass
For.El.
Lisec Group
OCS Glass

➤ Polysulphide sealant extruders

Extrudeuse de scellants polysulfuriques
Extruder fur Schwefelsaurehaltige Klebemittel
Extrusores de polisulfuros

聚硫化物密封胶挤出装置

ЭКСТРУДЕРЫ ДЛЯ ПОЛИСУЛЬФИДА

Belfortglass
Bystronic glass
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Lisec Group
OCS Glass

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Yellow Pages

➤ Gas filling equipment
Appareils pour remplissage de gaz
Gasfüllgerate
Equipos para relleno con gas
红外灯管
ОБОРУДОВАНИЕ ДЛЯ ГАЗОНАПОЛНЕНИЯ

Bystronic glass
For.El.
Lisec Group
OCS Glass

➤ Desiccant salts
Sels déshydratants
Trockenmittel
Sales deshidratantes
干燥剂
МОЛЕКУЛЯРНЫЕ СИТА

For.El.
OCS Glass

➤ Spacers/profiles
Entretoises
Abstandhalter
Separadores
间隔框 / 间隔条
ДИСТАНЦИОННЫЕ РАМКИ

Belfortglass
Edgetech Europe
For.El.
OCS Glass
TruSeal Technologies

➤ Georgian bars
Croisillons de vitrages isolants
Sprossen
Barrotillos para vidrios aislantes
乔治亚（防火）夹丝玻璃用夹丝
ДЕКОРАТИВНЫЕ РАСКЛАДКИ

Hegla

➤ Butyl
Butyle
Butyl
Butilo
丁基胶
БУТИЛ

For.El.

➤ Polysulphide sealants
Produits de scellage polysulfuriques
Schwefelsaurehaltige Dichtungsmittel
Sellantes polisulfúricos
聚硫化物密封胶
ПОЛИСУЛЬФИДНЫЕ ГЕРМЕТИКИ

For.El.

➤ Hot Melt
Hot Melt
Hot Melt
Hot Melt
热熔
ХОТ-МЕЛТ

For.El.
TruSeal Technologies

➤ Other sealants
Produits de scellage divers
Dichtungsmittel
Sellantes varios
其他密封胶
ДРУГИЕ ГЕРМЕТИКИ

For.El.
TruSeal Technologies

➤ Pantographs
Pantographes
Pantographen
Pantógrafos
比例绘图仪
ПАНТОГРАФЫ

For.El.
Fratelli Pezza

➤ Accessories
Accessoires
Zubehör
Accessorios
附件
АКСЕССУАРЫ

Belfortglass
For.El.
Helios Italquartz
OCS Glass
TruSeal Technologies

TEMPERING

TREMPE

TEMPERTECHNIK

TEMPLADO

钢化设备

ЗАКАЛКА

➤ Tempering furnaces (architectural glass)
Fours de trempage pour le verre destiné à la construction
Härtungsöfen für das Glas, das für Bauwesen bestimmt ist
Hornos para templar el vidrio para la construcción
钢化炉（建筑玻璃）
ПЕЧИ ДЛЯ ЗАКАЛКИ (АРХИТЕКТУРНОЕ СТЕКЛО)

B.H.T.
Fushan
Keraglass
Landglass Technology
Lema
Lisec Group
Mappi International
Mingte Glass Tech.
OCS Glass

➤ Tempering furnaces (automotive glass)
Fours de trempage pour le verre destiné à l'industrie automobile
Härtungsöfen für das Glas, das für die Automobilindustrie bestimmt ist
Hornos para templar el vidrio para la industria automovilística
钢化炉（汽车玻璃）
ПЕЧИ ДЛЯ ЗАКАЛКИ (АВТОМОБИЛЬНОЕ СТЕКЛО)

B.H.T.
Keraglass
Landglass Technology
Mingte Glass Tech.

➤ Accessories
Accessoires
Zubehör
Accessorios
附件
АКСЕССУАРЫ

Helios Italquartz
Keraglass
Landglass Technology
Mingte Glass Tech.

BENDING

BOMBAGE

BIEGEN

CURVADO

热弯设备

МОЛЛИРОВАНИЕ

➤ Bending furnaces (architectural glass)
Fours de courbure pour le verre destiné à la construction
Biegeöfen für das Glas, das für Bauwesen bestimmt ist
Hornos para curvar el vidrio para la construcción
热弯炉（建筑玻璃）
ПЕЧИ ДЛЯ МОЛЛИРОВАНИЯ (АРХИТЕКТУРНОЕ СТЕКЛО)

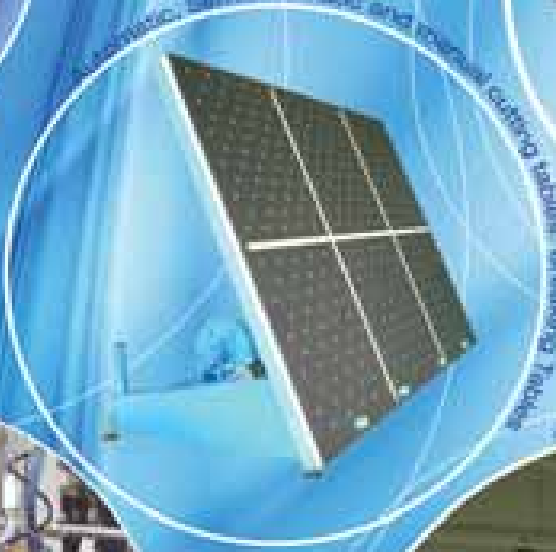
B.H.T.
Fushan
Keraglass
Mingte Glass Tech.

➤ Bending furnaces (automotive glass)
Fours de courbure pour le verre destiné à l'industrie automobile
Biegeöfen für das Glas, das für die Automobilindustrie bestimmt ist

O.C.S. Glass

MADE IN ITALY

GLASS PROCESSING MACHINES



Glass clamps, vacuum lifters, special vacuum lifters with rechargeable batteries and extendible arms, electric and pneumatic manipulators, automatic/semiautomatic cutting tables, breaking tables, table with belts, loading/unloading table, special tables, cranes, electric and manual carriages, drilling machines, straight edging machines, automatic sandblasting machines.

OCS Glass S.r.l. Via Cave Ticino, 20020 Robecchetto con Induno (MI) Italy
tel: +39 0331 897904 - fax: +39 0331 890645
info@ocsglass.it **www.ocsglass.it**

HIGH-TECH AUTOCLAVES FOR FLAT & CURVED GLASS

THE WINNING KEY

- Continuous research, ad hoc solutions personalized with Clients, technological development, excellent performance and quality standards.
- Use of certified materials, of top quality components of primary brands, special attention to the internal insulation for energy saving.
- Certified safety systems of the pressure equipment, with inter-block logics to prevent tampering.
- Team of skilled technicians to assist Clients over the phone, via web or directly on site, in the shortest time possible.
- Quality/competitive price ratio, advanced technology, high performance, with considerably reduced working and maintenance costs compared to traditional autoclaves.

LA CHIAVE VINCENTE

- *Continua ricerca, soluzioni ad hoc personalizzate con il cliente, sviluppo tecnologico, performance e standard qualitativo eccellente.*
- *Utilizzo di Materiali certificati, di componentistica di prima scelta delle primarie marche, particolare attenzione all'isolamento interno per il risparmio energetico.*
- *Sistemi di Sicurezza certificati del recipiente a pressione, con logiche di interblocco per prevenire manomissioni.*
- *Team di tecnici specializzati e preparati ad assistere i propri clienti per telefono, via web oppure direttamente in luogo, tutto in tempi rapidi e certi.*
- *Rapporto qualità/prezzo competitivo, tecnologia all'avanguardia, elevate performance, con costi di esercizio e manutenzione molto ridotti rispetto alle autoclavi tradizionali.*

RESULT

- More than 60 plants for the production of laminated flat and curved glass, designed, manufactured and assisted all over the world in the last 5 years, with the complete satisfaction of our Clients.

RISULTATO

- *Più di 60 impianti per la produzione di vetro laminato piano e curvo, progettati, realizzati ed assistiti nel mondo negli ultimi 5 anni, con la completa soddisfazione dei nostri clienti.*

Flat and bent glass industry suppliers

半板和弯玻璃工业原材料和设备供应商

Промышленные поставщики листового и гнутого стекла

Hornos para curvar el vidrio para la industria automovilística

热弯炉（汽车玻璃）

ПЕЧИ ДЛЯ МОЛЛИРОВАНИЯ (АВТОМОБИЛЬНОЕ СТЕКЛО)

B.H.T.
Keraglass
Mingte Glass Tech.

➤ ACCESSORIES

Accessoires
Zubehör
Accessorios

附件

АКСЕССУАРЫ

Ayrox
Keraglass
Mingte Glass Tech.
Softeco

LAMINATED GLASS PRODUCTION

INSTALLATIONS POUR VERRES FEUILLETÉS

VERBUNDGLASANLAGEN

INSTALACIONES PARA VIDRIO ESTRATIFICADO

夹层玻璃生产设备

ИЗДЕЛИЯ ИЗ ЛАМИНИРОВАННОГО СТЕКЛА

➤ COMPLETE PLANTS

Installations complètes
Komplette Fertigungslinien
Instalaciones completas

全套生产线

КОМПЛЕКТНЫЕ УСТАНОВКИ

B.H.T.
Bovone Elett.
Bystronic glass
Fushan
Italmatic
Mingte Glass Tech.
Terruzzi

➤ LAMINATED WINDSCREEN BENDING FURNACES

Four de bombage pour pare-brise feuilletés
Ofen zur Biegung von Sicherheitswindschutzscheiben
Horno de curvado para parabrisas de vidrio estratificado

风挡夹层玻璃热弯炉

ПЕЧИ МОЛЛИРОВАНИЯ ЛОБОВЫХ АВТОМОБИЛЬНЫХ СТЕКОЛ

B.H.T.
Keraglass
Mingte Glass Tech.

➤ AUTOCLAVES

Autoclaves
Autoklaven
Autoclaves

蒸压釜

АВТОКЛАВЫ

Bystronic glass
Italmatic
Isisan
Terruzzi

➤ CLIMATIC CABINS

Cabines climatiques
Klimazellen
Cabina climática

恒温室

КЛИМАТИЧЕСКИЕ КАБИНЫ

Bystronic glass
Mingte Glass Tech.

➤ INFRARED OVENS

Four à radiations infrarouges
Infrarotöfen
Hornos a rayos infrarrojos

红外加热箱

ПЕЧИ ИНФРАКРАСНОЙ СУШКИ

B.H.T.
Bystronic glass
Mingte Glass Tech.

➤ PVB - SHAPING AND CUTTING EQUIPMENT

Machines pour la découpe selon gabarit du PVB
Maschinen für die Formung und den Schnitt von PVB
Máquinas para perfilar y cortar el PVB

PVB仿形和切割设备

ОБОРУДОВАНИЕ ДЛЯ ОБРАБОТКИ И РЕЗКИ ПВБ-ПЛЕНОК

Ayrox
Bystronic glass
Softeco

➤ PVB - WIRING TECHNOLOGY FOR HEATABLE LAMINATES

Cablage du PVB pour verre feuilleté chauffant
Heizdrahtverlege - Technologie für beheizbares Verbundglas
Cableado del PVB para el vidrio laminado calentable

可电加热的夹层玻璃用PVB胶片布线技术

ТЕХНОЛОГИИ ПРОИЗВОДСТВА ОБОГРЕВАЕМОЙ ПВБ-ПЛЕНКИ ДЛЯ ТРИПЛЕКСА

Ayrox
Softeco

➤ ACCESSORIES

Accessoires
Zubehör
Accessorios

附件

АКСЕССУАРЫ

Ayrox
Helios Italquartz
Softeco

DRILLING

PERÇAGES

BOHRTECHNIK

TALADROS

钻孔设备

СВЕРЛЕНИЕ

➤ AUTOMATIC DRILLING LINES

Installations automatiques de perçage
Automatische Bohranlagen
Líneas automáticas de taladro

自动钻孔生产线

АВТОМАТИЧЕСКИЕ ЛИНИИ СВЕРЛЕНИЯ

Bando Kiko
Bystronic glass
C.M.B. - Besana
Forvet
Glaston Bavelloni
Intermac
SKG - Skill Glass

➤ MULTI-SPINDLE DRILLING MACHINES

Perceuses multiples
Reihenbohrmaschinen
Taladradores múltiples

多轴钻孔机

МНОГОШПИНДЕЛЬНЫЕ СВЕРЛИЛЬНЫЕ СТАНКИ

Bando Kiko
Bystronic glass
C.M.B. - Besana
CMS Brembana
For.El.
Forvet
Glaston Bavelloni
Intermac
OCS Glass
SKG - Skill Glass
CMS Brembana

Suppliers guide

原材料和设备供应商指南 - 公司黄页

Поставщики - Желтые страницы

Yellow Pages

➤ Drilling machines with opposite drilling heads

Perceuses à pointes oposées
Bohrmaschinen mit entgegengesetzten Bohrern
Taladradores a puntas contrapuestas

对位钻孔机

СТАНКИ ДЛЯ ДВУСТОРОННЕГО СВЕРЛЕНИЯ

Bando Kiko
Bystronic glass
C.M.B. - Besana
CMS Brembana
For.El.
Forvet
Fushan
Glassman Glass Machinery Technology
Glaston Bavelloni
Intermac
OCS Glass
SKG - Skill Glass
Zafferani Glas

➤ Column drilling machines

Perceuses à colonne
Säulenbohrmaschinen
Taladradores a columna

行列式钻孔机

КОЛОНОЧНЫЕ СВЕРЛИЛЬНЫЕ СТАНКИ

For.El.
OCS Glass

➤ Portable drilling machines

Perceuses portatives
Tragbare Bohrmaschinen
Taladradores portátiles

便携式钻孔机

ПОРТАТИВНЫЕ СВЕРЛИЛЬНЫЕ СТАНКИ

CMS Brembana
OCS Glass

➤ Drilling and milling machines

Maquines pour percer et fraiser les plaques de verre
Bohr- und Fräsmaschinen für Glasplatten
Máquinas para agujerear y fresar hojas de vidrio

钻孔和铣削机

СВЕРЛИЛЬНЫЕ И ФРЕЗЕРНЫЕ СТАНКИ

C.M.B. - Besana
CMS Brembana
Forvet
Glassman Glass Machinery Technology
Glaston Bavelloni
OCS Glass
SKG - Skill Glass

➤ Diamond drills

Forets diamantes
Diamantbohrer
Pequeños agujeros diamantados

金刚石钻孔机

АЛМАЗНЫЕ СВЕРЛА

Bovone Diamond Tools
Glaston Bavelloni
Mole Moreschi
OCS Glass

➤ Accessories

Accessoires divers
Sonstiges Zubehör
Accesorios varios

附件

АКСЕССУАРЫ

CMS Brembana
OCS Glass

OTHER EQUIPMENT AND PLANTS

INSTALLATIONS DIVERSES

SONTIGE ANLAGEN

INSTALACIONES VARIAS

其他机械和设备

ДРУГОЕ ОБОРУДОВАНИЕ И УСТАНОВКИ

➤ Turnkey plants / Engineering - for building glass

Istallations clefs à la main - Engineering - verre plat pour constructions
Schlüsselfertige Anlagen - Engineering - für Bauflachglas
Instalacíones llave en mano - Engineering - para vidrio plano para la construcción

建筑玻璃交钥匙工厂 / 工程

ИНЖИНИРИНГ ДЛЯ ПРОИЗВОДСТВА АРХИТЕКТУРНОГО СТЕКЛА

Bando Kiko
B.H.T.
Bystronic glass
Intermac
Keraglass
Lisec Group
Sinoma

➤ Turnkey plants / Engineering - for automotive glass

Installations clefs à la main - Engineering - verre automobile
Schlüsselfertige Anlagen - Engineering - für Automobilglas
Instalacíones llave en mano - Engineering - para vidrio para de automóviles

汽车玻璃交钥匙工厂 / 工程

ИНЖИНИРИНГ ДЛЯ ПРОИЗВОДСТВА АВТОМОБИЛЬНОГО СТЕКЛА

Bando Kiko
B.H.T.
Bystronic glass
Intermac

➤ Turnkey plants / Engineering - for display glass

Installations clefs à la main - Engineering - display deverre
Schlüsselfertige Anlagen - Engineering - Glasdisplay
Instalacíones llave en mano - Engineering - Display para vidrio

显示屏玻璃交钥匙工厂 / 工程

ИНЖИНИРИНГ ДЛЯ ПРОИЗВОДСТВА ДИСПЛЕЕВ И ИНДИКАТОРОВ

Bando Kiko

➤ Working centres - CNC controlled

Centre de travail à control numérique
Arbeitszentrum mit Zahlenkontrolle
Centro de trabajo de control numérico

数控加工中心

ОБРАБАТЫВАЮЩИЕ ЦЕНТРЫ С ЧПУ

Bando Kiko
Bystronic glass
C.M.B. - Besana
Fushan
Glassman Glass Machinery Technology
Glaston Bavelloni
Hegla
Intermac
Lovati F.lli
Mingte Glass Tech.
SKG - Skill Glass

➤ Float plants/lines (equipment & accessories)

Installations pour la production du verre au méthode Float (systèmes & accessoires)
Float Methode - Anlagen (Systeme und Zubehör)
Instalacíones para la producción de vidrio con el método float (máquinas & accessorios)

浮法线（设备及配件）

ФЛОАТ ПРОЦЕСС (ОБОРУДОВАНИЕ И АКСЕССУАРЫ)

Bovone Elett.
Sinoma

➤ Fiberglass/Glasswool production lines, equipment and products

Installations pour la production du fibre de verre (systèmes & produits)
Glasfaser - Anlagen (Systeme und Produkte)

Flat and bent glass industry suppliers

半板和弯玻璃工业原材料和设备供应商

Промышленные поставщики листового и гнутого стекла

Instalacíones para la producción de fibra de vidrio (máquinas & productos)

玻璃纤维/玻璃棉生产线、设备和产品

ЛИНИИ ДЛЯ ПРОИЗВОДСТВА СТЕКЛОВОЛОКНА / СТЕКЛОВАТЫ - ОБОРУДОВАНИЕ И ПРОДУКЦИЯ

Lipex

➤ Weighing and dosing systems

Systèmes de pesage et dosage des matières premières
Wäge- und Dosiersysteme der Rohstoffe
Sistemas de pesada y dosificación de las materias primas

承重和计量系统

Взвешивания и дозирования

Sinoma

➤ Cullet handling systems

Systèmes de manutention des bris de verre
Glasscherben-Handlingsysteme
Sistemas de manejo del vidrio de desecho

碎玻璃处理系统

системы обработки стеклобоя

Sinoma

➤ Complete batch plants

Installations complètes pour la fusion des matières premières
Komplette Schmelzanlagen für die Rohstoffe
Instalaciones completas para la fusión de las materias primas

完整的配料车间

Комплектные установки партии

Sinoma

➤ Enamelling equipment and plants

Systèmes et installations pour la peinture du verre
Systeme und Anlagen für die Emaillierung von Glas
Systemas y equipos para el esmaltado del vidrio

搪瓷全套设备

ОБОРУДОВАНИЕ ДЛЯ ЭМАЛИРОВАНИЯ

Rollmac

➤ Hot- and cold-end coating systems and materials (CVD, Roller, Curtain coaters, Dryers)

Matériaux et systèmes pour le traitement à chaud et à froid de la surface du verre.
Materiale und Systeme für Wärme-und Kältebehandlung von Glasoberflächen
Materiales e sistemas para tratamiento an caliente y en frío de la superficie del vidrio

玻璃板的热端和冷端镀膜系统

ПОКРЫТИЕ ДЛЯ СТЕКЛА - УСТАНОВКИ И МАТЕРИАЛЫ

➤ Sandblasting systems, equipment and plants - optimizers

Machines et installations pour le sablage - Optimisation
Sandstrahlmaschinen und -anlagen - Optimalisierung
Maquinas e instalaciones para pulido con arena - Optimizadores

喷砂全套设备

ОБОРУДОВАНИЕ И УСТАНОВКИ ДЛЯ ПЕСКОСТРУЙНОЙ ОБРАБОТКИ

Fratelli Pezza
Fushan
OCS Glass
SKG - Skill Glass

➤ Screen printing equipment and plants

Machines et installations de sérigraphie - verre pour le bâtiment/l'automobile
Siebdruckmaschinen und - anlagen, Glas für Bauwesen/Kraftfahrzeuge
Máquinas y equipos para serigrafía - vidrio para la construcción/vehículos

石英生产设备

ОПТИМИЗАТОРЫ ДЛЯ ПЕСКОСТРУЙНЫХ УСТАНОВОК

Ayrox
For.El.
Keraglass
Rollmac
Softeco

➤ Screen printing drying systems

Systèmes de séchage pour la sérigraphie
Siebdruck-Trockensysteme
Sistemas de secado para la serigrafía

丝网印刷的干燥（烘干）系统

ПЕЧИ СУШКИ ДЛЯ ШЕЛКОТРАФАРЕТНОЙ ПЕЧАТИ

Rollmac

➤ Aciding glass equipment and plants

Machines et installations pour la gravure à l'acide
Ätzmaschinen und -anlagen
Máquinas e instalaciones para vidrio al àcido

酸蚀刻全套设备

ОБОРУДОВАНИЕ ДЛЯ КИСЛОТНОГО ТРАВЛЕНИЯ

Rollmac

ARTISTIC GLASS PRODUCTION

FABRICATION DE VERRE

ARTISTIQUE PRODUKTION VON KÜNSTLERISCH GESTALTETEM GLAS

PRODUCCIÓN VÍDRIO ARTISTICO

艺术玻璃制造设备

ПРОИЗВОДСТВО ХУДОЖЕСТВЕННОГО СТЕКЛА

➤ Chamber electric kilns

Fours électriques à chambre
Elektrische Kammeröfen
Hornos eléctricos de cámara

电熔窑

ЭЛЕКТРИЧЕСКИЕ ОБЖИГОВЫЕ ПЕЧИ

Keraglass

➤ Accessories

Accessoires divers
Sonstiges Zubehör
Accesorios varios

附件

АКСЕССУАРЫ

Helios Italquartz

Suppliers guide

原材料和设备供应商指南 - 公司黄页

Поставщики - Желтые страницы

Yellow Pages

MISCELLANEOUS

MELANGE

SONSTIGES

VARIOS

杂项

РАЗНОЕ

➤ Automotive glass approval services

Services d'approbation du verre pour vehicules
Zulassungsdienst Glas für Kfz-verwendungen
Servicio de aprobación del cristal para auto

汽车玻璃质量认证服务

СЕРТИФИКАЦИОННЫЕ ИСПЫТАНИЯ ДЛЯ АВТОМОБИЛЬНОГО СТЕКЛА

Ayrox
Softeco

➤ Automotive glass quality control

Controle qualite du verre pour vehicules
Kontrolle der Glasqualität für Kfz-verwendungen
Control de calidad del cristal para auto

汽车玻璃质量控制

КОНТРОЛЬ КАЧЕСТВА АВТОМОБИЛЬНОГО СТЕКЛА

Ayrox
Bando Kiko
Bystronic glass
Carl Zeiss Microimaging
Softeco

➤ CE marking - quality control equipment for glass in building

Instruments de contrôle de qualité et marquage CE du verre utilisé dans la construction
CE-Kennzeichnung - Qualität Kontrolle Austattungen für Glas in Bauwesen
Instrumentos para el control de calidad y marcado CE del vidrio utilizado en la construccion

CE标识-建筑玻璃质量控制设备

КОНТРОЛЬ КАЧЕСТВА АВТОМОБИЛЬНОГО СТЕКЛА

Ayrox
Softeco

➤ Deionizing and water softening equipment

Deionisateurs et adoucisseurs d'eau
Entionisierungs-Anlagen und Wasserenthärter
Instalaciones deionizadoras y ablandadores del agua

去离子水和水软化设备

СИСТЕМЫ ПОДГОТОВКИ ВОДЫ

For.El.
Lisec Group

➤ Flat glass quality control devices

Systèmes de contrôle de qualité pour plaques de verre
Qualitätskontroll- Systeme für Glasplatten
Sistemas de control de calidad para hojas de vidrio

平板玻璃质量控制装置

СИСТЕМЫ КОНТРОЛЯ КАЧЕСТВА ЛИСТОВОГО СТЕКЛА

Ayrox
Carl Zeiss Microimaging
Sinoma
Softeco

➤ Furnaces

Fours
Schmelzöfen
Hornos

窑炉

ПЕЧИ

Sinoma

➤ Furnaces / Oxy fuel recuperative

Fours/ Oxy-carburant or récupération
Schmelzöfen/Oxy-fuel oder Rekuperativ
Hornos/ Oxy-combustible or recuperación

窑炉 / 富氧换热器

ПЕЧИ НА КИСЛОРОДНОМ ТОПЛИВЕ ИЛИ РЕКПЕРАТИВНЫЕ ПЕЧИ

Sinoma

➤ Gases

Gaz
Gase
Gases

天然气

ГАЗЫ

Sinoma

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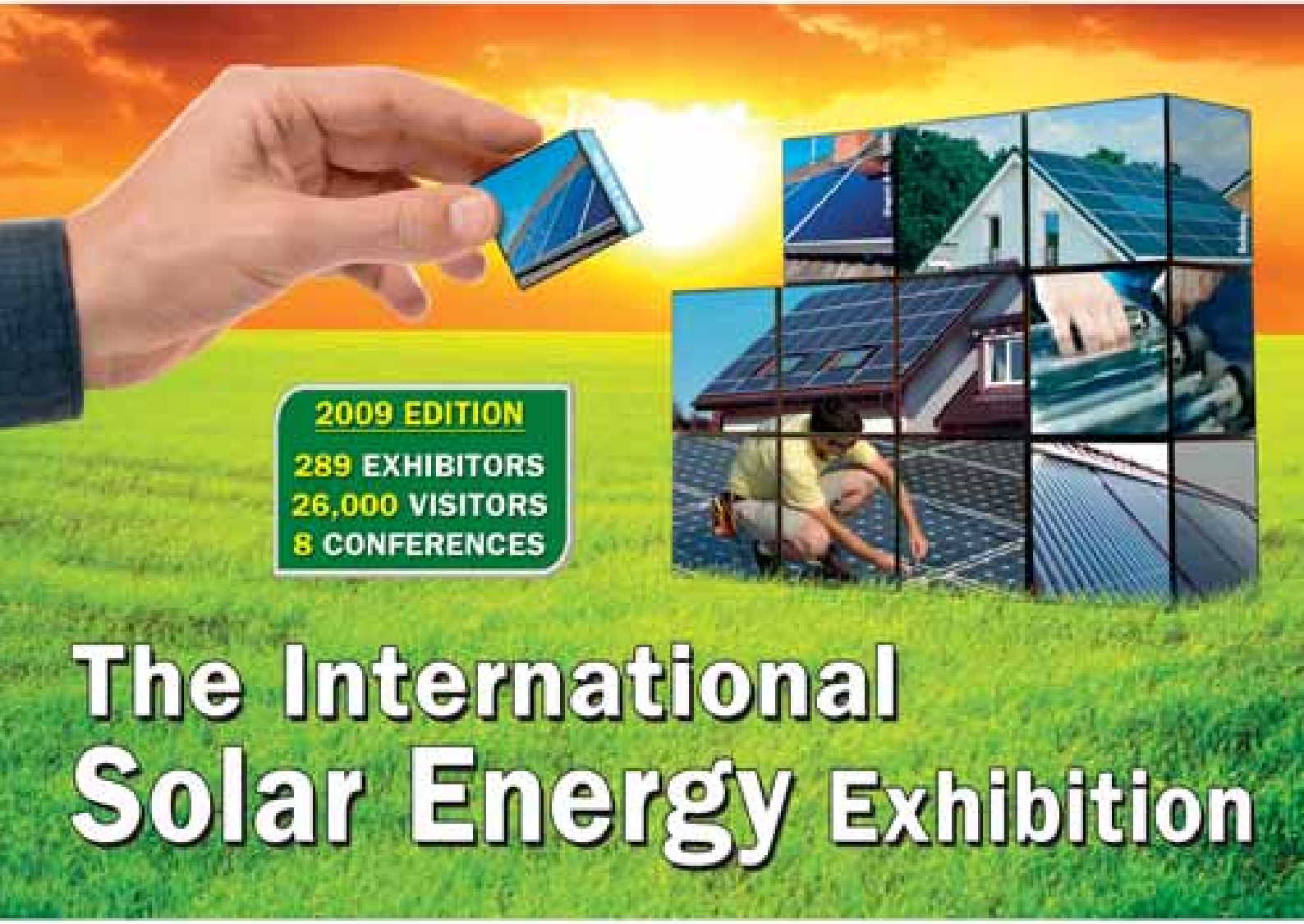

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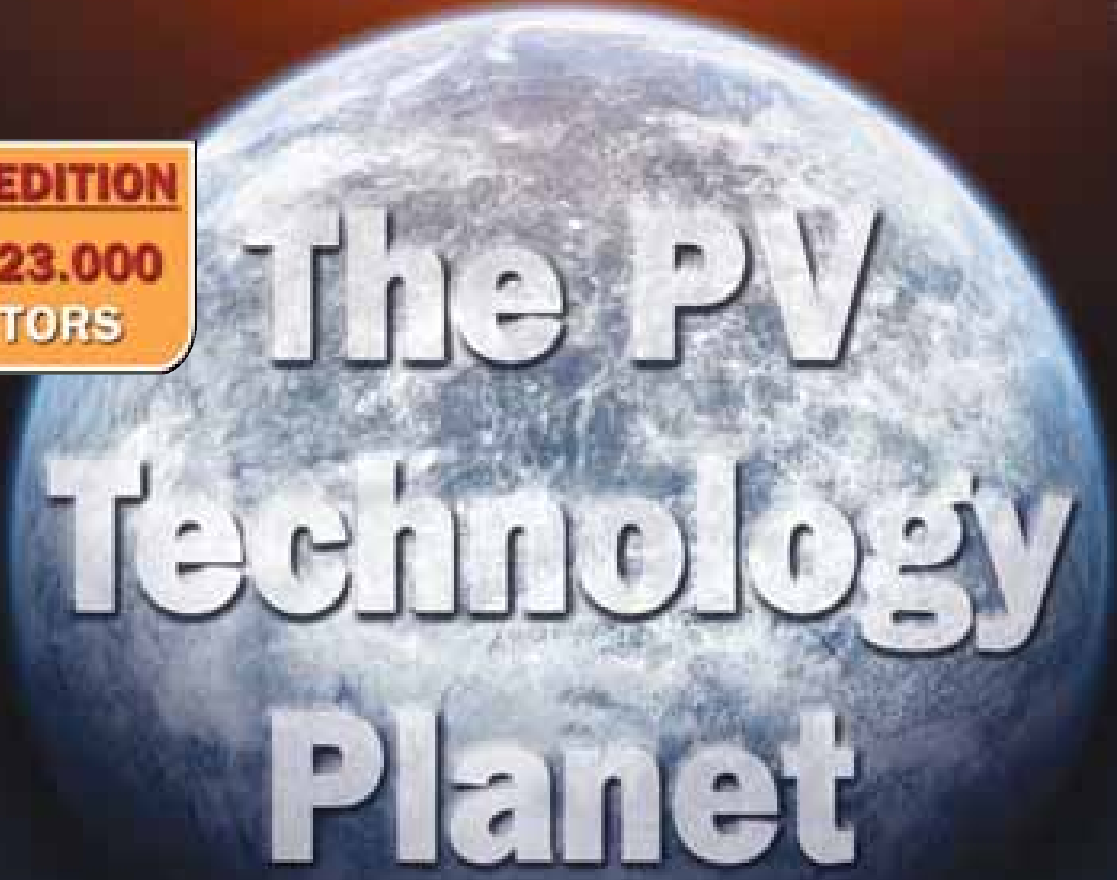

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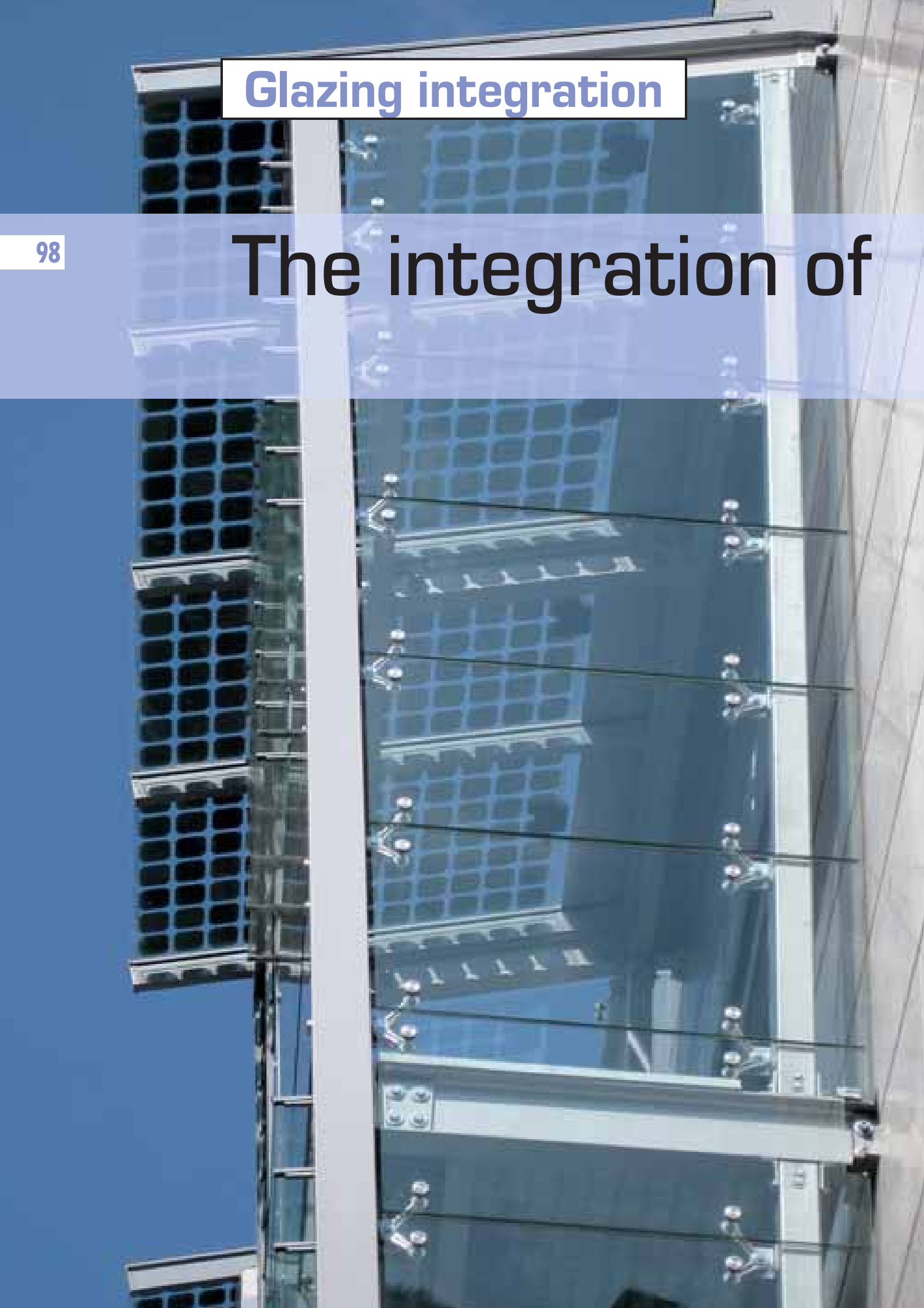

photovoltaics in architecture

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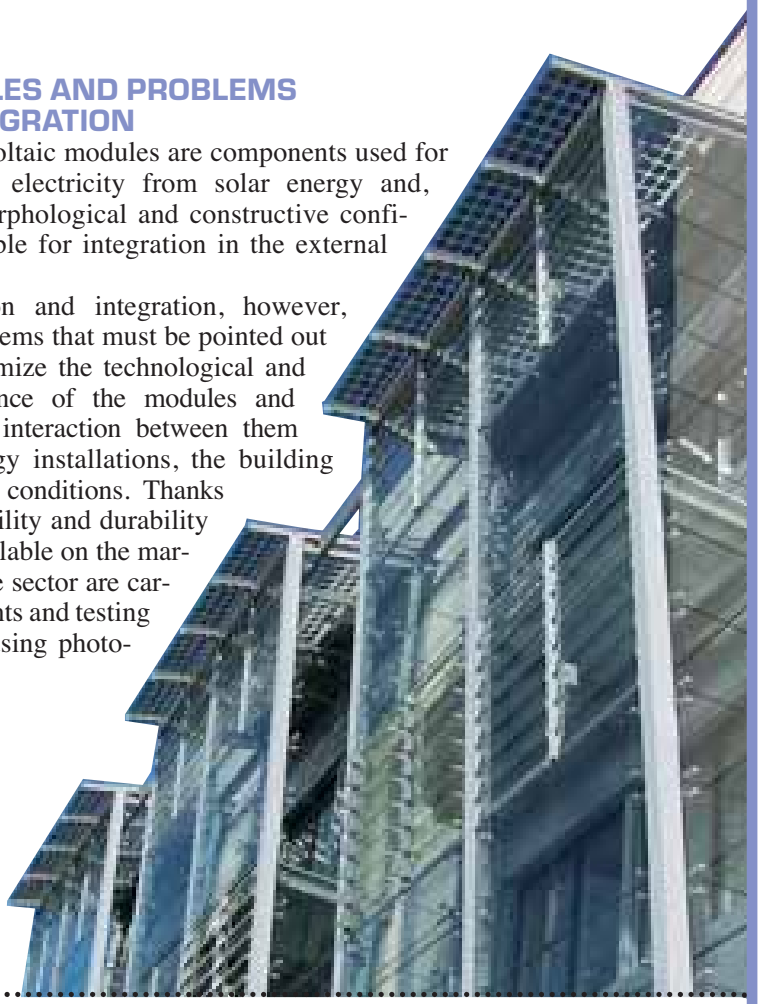
Department of Science and Technology of the Construction Environment (BEST)
POLITECNICO DI MILANO

Photovoltaics and buildings and the combination of the two. It should be easy, we all say, but the application of this renewable energy source in today's architecture has to be studied in detail to integrate modules in existing and new constructions. Energy needs of the building where the installation is to take place, but also those required for the production of the modules, are all taken into consideration.

PRINCIPLES AND PROBLEMS OF INTEGRATION

Photovoltaic modules are components used for the production of electricity from solar energy and, thanks to their morphological and constructive configuration, are suitable for integration in the external skins of buildings.

Their application and integration, however, involve some problems that must be pointed out if we want to optimize the technological and energetic performance of the modules and obtain the correct interaction between them and the other energy installations, the building and environmental conditions. Thanks to the safety, reliability and durability of components available on the market, operators of the sector are carrying out experiments and testing different ways of using photo-



The Energy Account (Ministry Decree 19 February 2007, Annex 3) foresees an incentive tariff per kWh produced in ratio to the size/power of the photovoltaic plant and to the major or minor comprises of the plant in the building skin as per the following table:

	TYPE OF PHOTOVOLTAIC PLANT		
Nominal power of the plant (kW)	❶ Not integrated	❷ Partially integrated	❸ Integrated
A) $1 \leq P \leq 3$	0.392	0.431	0.480
B) $3 < P \leq 20$	0.372	0.412	0.451
C) $P > 20$	0.353	0.392	0.431

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voltaics, even considering the substitution of traditional building elements, with valid results both at architectural level, as well as with regards to energy performance.

Despite numerous positive experiences, we can still see how the availability of 'solar' areas suitable for the integration of active conversion components is not proportional to the real use of building practices that include the use of photovoltaic modules among their technological options.

1 Non-integrated plant of 49,28 kWp at Santo Stefano Ticino (Milan) on the skin of an industrial building. Rack structure

The modules are positioned on the skin of an industrial building and anchored to a metal structure, which is, in turn, anchored to the reinforced concrete elements of the building skin.

Number of modules installed:	224
Capture surface:	394 m^2 circa
Orientation of the modules:	0° South
Inclination of the modules:	25°
Total peak power at STC:	49.28 kW_p

2 84,6 kWp plant in Meda (Milan) on the skin of an industrial building

The modules are positioned on the skin of an industrial building and and anchored to a metal structure, which is, in turn, anchored to the reinforced concrete elements of the building skin.

Section of plant A:	
Number of modules installed:	184
Capture surface:	309 m^2
Orientation of the modules:	0° South
Inclination of the modules:	8°
Total peak power at STC:	41,40 kW_p

Section of plant B :	
Number of modules installed:	192
Net surface area:	322 m^2
Orientation of the modules:	0°
Inclination of the modules:	4°, 5° e 8°
Total peak power at STC:	43,20 kW_p

The mechanical, acoustic, hygrometric and thermal characteristics of photovoltaics are compatible with the needs and parameters of other construction materials, after, of course, due considerations and assessments. However, these modules are usually created as additional devices, which are postioned onto a building already constructed using components with functions as per the norms in force, satisfying the performance requirements of the building.

Their combination with the technological requirements of the energetic functions of the building skin, not included previously in the requirements of buildings, considers photovoltaic components as additional elements, to be added at a later date and often placed close together. This is due to a consolidated construction culture that conceives buildings as containers that use energy produced by systems to maintain optimum comfort. This, in other words, means that buildings are energy users, and must control, protect, make safe and carry out passive adjustment of the flow of energy and material which, coming from the outside, integrate with the building. The installation of these systems is carried out in technical rooms and comprises the distribution of the energy needed for the air conditioning of the construction by means of devices in the walls or in the loft, as well as in floors.

Moving the systems that supply energy to the building and which, in the case of devices for the conversion of solar energy, must be vis-

ible, to the outside, is frequently used by architects and by end users who have a static, unchangeable idea of construction but which, in any case, are now gaining new significance and functions, also thanks to the continuously changing norms in force.

In fact, the complete integration of photovoltaics, which can substitute part of the external building skin and not only overlap the traditional layers, is exploited thanks to incentives in the Energy Account (Legal Decree dated 19 February 2007). This ideal solution is preferred to ground level installations or those with supports and anchorage structures, also from the economic point of view.

The optimization of photovoltaic integration in construction is related to numerous parameters, including environmental and construction factors, such as, for example, orientation, level of solar insulation, construction materials and methods, photovoltaic technology and production methods used for the modules, cost of electricity and promotional and financial strategies. These measures have enabled photovoltaic systems to enter the market, thus responding to increased awareness of the problems and environmental quality of buildings as per the European Directive (EPBD).

In any case, the success of a photovoltaic integration project, in the case of retrofit (energetic re-qualification of existing buildings) or of a new construction, is closely connected to an in-depth preliminary study regarding the convenience and constraints of its realization. The numerous solutions that can be used and that provide different opportunities must be considered.

For a comprehensive assessment of the possibilities and constraints regarding the architectural integration of photovoltaic systems, we must consider the variables regarding the characteristics of the modules, which are the basic elements of the systems. These elements have technological and energetic performances with regards to climatic conditions and solar irradiation, the type of integration, the portion of skin involved in the change or substitution.

The basic assumption for the integration of photovoltaics in the construction sector is the availability of construction surfaces directly facing the sun during the day and during the year. These surfaces can be opaque or transparent, vertical, horizontal or inclined, with a series of particular conditions that the alternate or covering component of that part of the skin must face up to and satisfy, compatibly with the requirements.

The topics that must be dealt with in order to have a complete vision of the problem must take into simultaneous consideration the different areas of relevance and their interrelationships. Sometimes, in fact, the problem of integrating an innovative component with a specific function in construction, such as for example, photovoltaic modules, is carried out with simplification that can lead to a lack of consideration of the optimization of energy production and, at the same time, to underestimate the potential of technological elements. This can lead to constructions in which the modules are applied not applied suing the best orientation, or photovoltaic elements that shade each other, or even the installation of flexible modules on areas with double radius, as well as the application of modules without considering the possibilities associated with the substitution of the bulding skin, with criticizable aesthetic results.

The specificity of photovoltaic components as part of construction therefore comes from the numerous possibilities that they offer and, at the same time, from the risks that their installation involves, in which the parameters of their correct application are only partially exploited.

In fact, the primary and fundamental rules and regulations that must be taken into consideration, can be summarized as follows:

- optimization of the energy produced by the system (positioning of the collecting components, study of installation methods, assessment of possible shading);
- highest possible level of integration, so that the component carries out technological and construction functions other than its main

TABLE 1

TYPE OF ASSEMBLY AND STRATIFICATION OF PHOTOVOLTAIC MODULES

	MONOCRYSTALLINE SILICON	POLYCRYSTALLINE SILICON	AMORPHOUS SILICON OR THIN FILMS
Glass-glass	•	•	•
Glass-Tedlar®	•	•	•
Flexible sheath	-	-	•

energetic function (thermal insulation, waterproofing, protection and filtering of light);
- attention to the aesthetic results of the installation with regards to the acceptability and visibility of a technology that, today, is still not completely part of the general ideas of buildings (using components suitable for the intervention and assessing the context in which they must operate);
- economic feasibility achievable substituting parts of the skin and evaluating the savings obtained from applications that exploit the solar potential to the utmost.

Further considerations must then be carried out with regards to the type of module used, since the modules present on the market have mechanical, thermal, and physical characteristics able to carry out diverse technological functions according to the comprised stratifications of material and their method of production.

Photovoltaic modules differ essentially as per the production technology used for cells, the layers of materials used for the physical configuration of components, the layout and density of the cells inside the module(s). Diverse applications depend on these characteristics in which the use of a specific module (with frame, without frame, opaque, semi-transparent, etc.) is advisable, and which provide specific technological performance and energy contribution, leading to the substitution of functional elements of the building skin.

MATERIALS USED TO PRODUCE PHOTOVOLTAIC CELLS

The most frequently used material for the photovoltaic cells is silicon, even if other materials such as gallium arsenide (GaAs), cadmium telluride (CdTe), copper indium diselenide (CulnSe2), are also used, above all for the realization of thin films, which differ mainly because of their production and doping process. Moreover, plastic cells are now in the experimental phase, with rather limited yield at the moment, but if improved could become competitive from the cost point of view.

The modules on the market and used in construction at present are mainly those made of mono-crystalline and poly-crystalline silicon and amorphous cells.

From the construction point of view, the biggest difference can be seen between crystalline silicon and amorphous cells. As far as the first sector is concerned, cells made of monocrystalline silicon are made using a single crystal, while those in poly-crystalline silicon come from an ingot created by the solidification of the molten mass of silicon in a parallelepiped-shaped crucible.

The difference between the two types of cells, other than their aesthetic appearance, is also their different yield in terms of conversion of solar radiation and, therefore, of production of electricity. The former have an efficiency that can reach 20 per cent (about 15 per cent average), while the latter reach an efficiency of about one or two per cent less.

Cells in amorphous silicon, on the other hand, are produced by the deposition of silicon vapours onto a suitable substrate, in vacuum or controlled atmosphere. This technology enables to use much less material compared to crystalline silicon and to therefore produce cells that are called “thin film”. In fact, a layer of only a few micron is sufficient to obtain photovoltaic conversion. However, the stabilized average yield is, at about six to nine per cent, considerably less. It must be noted that amorphous silicon undergoes deterioration in performance during the first months of exposure to sunlight (Staebler-Wronsky effect) followed by stabilization, but, nevertheless, causing an initial reduction in efficiency conversion that can reach 30-40 per cent. In operative phases, the panels reach high temperatures (even 40-45°C higher than environmental temperature), causing a negligible decrease in photoelectric conversion performance. In the long term, however, amorphous silicon modules can undergo a regeneration of efficiency, proven by experimental data.

A further observation regards the production of thin film cells. This process requires less energy compared to that of the production of crystalline silicon wafers, with consequent reductions in energy and economic costs of amorphous cells compared to crystalline cells, with a positive comparison at equal power, and is a consequence of the smaller amount of material needed. In fact, the ratio between the amount of material needed for amorphous silicon cells compared to that needed for crystalline silicon cells is from 1 to 150-200 in favour of the first, also because the production processes of crystalline silicon wafers are affected by the problem

of waste product, with consequent increased costs of finished products. Moreover, the production temperature of amorphous silicon is about 300°C, a lot less than the 900-1,000°C needed for the production of crystalline silicon.

There are other materials and technologies at experimental level for the production of cells, which are still not used in the construction market as they are still not completely reliable or because their production is extremely expensive.

Until now, silicon, used in thin crystal layers as in the case of mono-crystalline or poly-crystalline silicon, or deposited by means of particular procedures as in the case of amorphous silicon, has demonstrated stability, efficiency, reliability over time and production costs that have made it preferable compared to other material for photoelectric conversion.

In any case, components made from other materials with photoelectric characteristics are presently undergoing studies and experimentation that include production processes to produce thin films: vacuum deposition per layer and thermal treatments for CIS – copper indium selenite or with gallium (CIGS – resulting in laboratory yields of up to 18 per cent), screen printing and electro-deposition for cadmium telluride (CdTe), or also hetero-junction cells for copper sulphide (Cu2S) and cadmium (CdS).

As far as thin films are concerned, polycrystalline layers of gallium arsenide (GaAs) and gallium arsenide and aluminium (GaAlAs), are, at present, not competitive for the construction sector due to their high costs. They are, however, highly reliable and have a good level of conversion (theoretical efficiency of single-junction cells of 30 per cent, such as mono-crystalline silicon, which can be improved using multi-junction cells).

COMPOSITION OF PHOTOVOLTAIC SANDWICHES, CONSTRAINTS AND OPPORTUNITIES

The stratification of the crystalline silicon photovoltaic modules available on the market include several layers of material creating a sandwich. The side in direct sunlight is made up of a pane of high-transparency tempered glass, which guarantees the highest passage of solar irradiance along with excellent mechanical resistance. This is followed by a sealing film (EVA), the photovoltaic cells with electrical contacts, another sealing film (EVA) and a back support that can also be in glass or in light polymeric material with good insulation qualities (such as, for example Tedlar®).

Both external layers are often made of polymeric material and the panel can (if required) be inserted in a frame with extruded aluminium borders, which are the stiffening supports of the panel.

Amorphous silicon cells, on the other hand, are made up of material deposited on different substrates: rigid (glass, for example) or flexible (also thin transparent laminas) which do not need sealant.

The resulting cells can now be inserted in a sandwich to create crystalline silicon mod-

TABLE 2

REGULATORY REQUIREMENTS FOR GLASS PANES IN DIFFERENT CLIMATIC CONDITIONS OF ITALY

AREA	DAILY DEGREES	CLIMATIC ZONE	THERMAL TRANSMITTANCE OF THE TRANSPARENT CLOSURES AND FRAMES U [W/M²K]	THERMAL TRANSMITTANCE OF THE GLASS PANES U [W/M²K]	
			AS OF 1 JANUARY 2010 Uw (W/M²K)	AS OF 1 JANUARY 2008 Ug (W/M²K)	AS OF 1 JANUARY 2011 Ug (W/M²K)
Milan	*2404*	*E*	*2.2*	*1.9*	*1.7*
Rome	*1415*	*D*	*2.4*	*2.1*	*1.9*
Palermo	*751*	*B*	*3.0*	*3.4*	*2.7*

The integration of photovoltaics in architecture

ules or laminated with rigid or flexible polymeric materials such as sheaths (for example Tefzel®, Sarnafil®).

Regardless of the kind of cells, the type of assembly of the modules is particularly important since the materials used determine the building skin, resistance to atmospheric agents, thermal, acoustic and mechanical behaviour.

Possible stratifications can therefore be as follows:

- glass-glass modules (semitransparent);
- glass-Tedlar® modules (opaque);
- flexible sheathed modules (opaque or semitransparent).

3 **3 kWp integrated plant in Milan as double-skin façade for the energy retrofit of a building for the service sector**

The modules of the photovoltaic plant cover the slanted and semitransparent surface of the three glass overhangs. The vertical metal structures of the glass façade therefore support the slanted walls made up of photovoltaic modules and joints, that protect the cavity walls below from bad weather and solar irradiance.

Number of modules installed:	12
Capture surface:	24 m^2
Orientation of the modules:	-10° (SW)
Inclination of the modules:	15°
Total peak power at STC:	3 kW_p

Opaque or semitransparent panels can be obtained as per the substrate and positioning of the cells.

The transparency of photovoltaic modules can be obtained using transparent closure surfaces and by distancing the cells. Thanks to developments in production systems, some module manufacturers are able to offer architects the possibility of personally deciding the positioning of the cells, thus creating tailor-made, versatile components, able to adapt to diverse planning and architectural needs.

Other types of modules comprise, other than the transparency of the front and back layers, the creation of micro-pores, which enable the light to pass through. In opaque modules, which are simpler and less expensive to produce, standard-type cells are placed closer together and the back layer is opaque, generally made of Tedlar®.

Numerous types of construction material are available on the market with different-sized modules for various functions. These range from small modules of a few tens of centimetres to modules of more than two square metres, thus enabling a wide range of uses in architectural applications.

With particular reference to glass-glass or glass-Tedlar® modules, it is important to note how their characteristics of mechanical stability, resistance to weather and operational temperatures (from -50° a +90°), safety with regards to electricity, have enabled them to be integrated perfectly in cladding systems, such as, for example, in curtain walls.

For this kind of façade, frequently used in construction for some years now, and, therefore, with reliable performance and standardized construction features, the glass enclosure can be substituted with opaque or semi-transparent photovoltaic modules, using the same installation procedures. Compared to traditional cladding elements, electrical cables and wiring must be suitably positioned when installing photovoltaic panels. Some producers of curtain wall, for example, have studied systems that place electrical connections inside structural struts.

In the building sector, photovoltaic modules are not only used as opaque cladding on the façade or roof. They are, for example, used as solar protection thanks to their installation

in sunshades, or, in the case of semitransparent modules, as windows elements that filter sunlight (openings, skylights, façades).

TERMS OF PHOTOVOLTAIC INTEGRATION

It is important to stress that the term "integration" is often used incorrectly to indicate any kind of installation of photovoltaic components in building skin, while, generally, it would be more appropriate to speak about the ratio of photovoltaics *with* the building skin. There are, in fact, diverse methods of interaction between the two systems of application of the component, with integration being just one of the possibilities.

The same difference can be found in the English acronyms PVIB (photovoltaics in buildings) and BIPV (building-integrated photovoltaics) used in technical literature, to indicate the different ratio existing between the photovoltaic generator and the building:

PVIB - photovoltaics in buildings: this refers to all the possible anchorages of photovoltaics to buildings, both in retrofit interventions on existing buildings or on the surfaces of new constructions. These interventions do not generally presuppose la compliance of the photovoltaic modules to the technological requirements of the traditional materials of building skins. The modules are fixed to the construction using diverse methods and mainly carry out energetic or ancillary item functions.

BIPV - building-integrated photovoltaics: this regards the real integration of photovoltaics into the building, more often new constructions, in which the photovoltaic elements have a secondary function as part of the same building, that is as components of the skin that must be able to carry out the same technological functions with results similar to those of normal construction materials.

THERMAL PERFORMANCE OF THE SKIN

The use of photovoltaic modules as external building skins requires the evaluation of the actual performance of thermal insulation obtained by the installed component since, because of the construction sector's energy savings goals, heat loss transmission containment must be respected.

The inclusion of energy generation devices in buildings must therefore guarantee physical and thermal characteristics to reduce energy needs, and be able to correctly combine technological plants for the use of renewable sources, (for example, heat pumps for winter- and summer air conditioning, photovoltaic systems for the production of electricity needed for the functioning of these devices).

Determining the thermal characteristics of photovoltaic modules depends on the stratification of the panel and on the conductivity of the materials used. The installation of photovoltaic modules as elements of an external wall does not cause particular problems, as the limited thermal resistance is, in any case, added to technological features that delegate insulation functions to other materials in the stratification of walls.

In cases where the thermal evaluation of photovoltaics must be assessed in detail, the ones to be used are those with semitransparent modules as external closure of the skin, created using metallic anchorage systems, which can be similar to window and door frames (even thermal bridge) in the case of fixing structures to curtain wall, used for façades, glass atria, etc.

In the case of solutions that comprise the ventilation of the modules and, therefore, the presence of a cavity wall for the realization of a cold, transparent façade, the thermal resistance of photovoltaic components is not significant, while, on the other hand, the transmission of the internal layer to satisfy the needs of thermal insulation must be considered.

In the case of double skins with external photovoltaic layer (generally semitransparent), advantages can be obtained during the winter, with a reduction in heat losses by creating a space between the inside and the outside.

With regards to the thermal resistance of photovoltaics as skin cladding, warm façades or similar, or those with a cavity wall of still air are only the ones considered important. As is already known, the glass parts of building skins are subject to the highest part of thermal losses and for this reason are not recommended for large transparent areas in countries with cold winters.

For the evaluation of the values of transmittance and compatibility of installation of modules substituting transparent enclosures, a table summarizing the values is defined by Legal

The integration of photovoltaics in architecture

Decree 192, dated 19 August 2005 "Fulfilment of Implementation of the 2002/91/CE Directive regarding the energetic yield in construction" and following updates (Legal Decree 311/06, DPR 59/09). This includes the definition of transmission value limits for building skins in relation to the climatic area of the site, deriving from daily degrees of heating.

The established values range from 5.5-5.0 W/m^{2}K to 2.4-2.2 W/m^{2}K; these report, as examples, the information regarding three areas representing the different climatic conditions of Italy.

Thermal insulation performance deriving from the use of photovoltaics is comparable to that of a single glass pane of 6 millimetres (U = 5.7 W/m^{2}K). The values of conductivity of the materials of the sandwich are:

- glass λ: = 1,16 W/mK
- Tedlar λ: = 0,18 W/mK

The stratification comprises thicknesses of 3-4 millimetres for each layer with results of 5.7-6 W/m^{2}K of thermal transmittance for glass-glass (4 millimetres + 4 millimetres) or glass-Tedlar. This result is also lower than the minimum limit comprised by the normative per zone with daily degrees lower than 600 (U = 5.5 – 5 W/m^{2}K).

It is therefore evident that double-glazing stratifications with an external barrier of photovoltaics are necessary. In this way, transmission values the same as those of traditional double-glazing – about 2.5-2.7 W/m^{2}K can be ensured.

In order to obtain values established by the norms for northern Italy, it is necessary to insert low-E coating in the cavity wall (vacuum or pyrolitic deposition).

These types of treatment, applied to internal glass panes, can reduce the exchange between the surface of the laminated photovoltaics and that of the glass, reaching overall transmittance values of 1.5-1.7 W/m^{2}K for cavity wall with air and 1.4-1.1 W/m^{2}K with the addition of noble gases such as argon or kripton.

The technological transparent group of elements with photovoltaics have the advantage, in winter, of stemming the "cold wall" effect thanks to thermal resistance and to heat loss during the photoelectric conversion phase. In the summer, in any case, the fact that the photovoltaic part cannot be opened and is subject to strong sunlight can cause considerable discomfort, due to the increase in solar radiance temperature, other than penalizing the production of electricity.

Alternatively to the introduction of photovoltaic double-glazing, semitransparent stratifications with ventilated cavity walls to remove the heat from the back of the module and to mitigate the overheating effect in the summer, releasing the hot air, are also a possibility. The flow of air in the cavity wall can also be used during the winter to preheat the air for air conditioning, with a consequent decrease in the energy needs of the building (hybrid photovoltaics).

In fact, it is not economically convenient to use technologies from renewable sources if, at the same time, they create a burden by means of energy needs for internal environment air conditioning. ■

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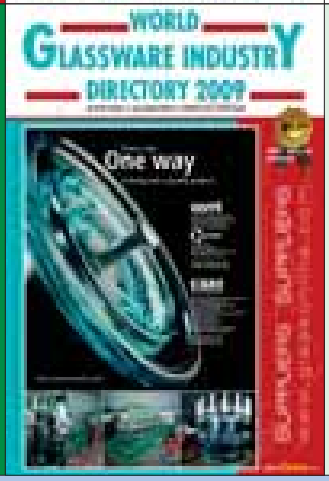

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