Glass-Technology International

May/June
Year 22 - No. 3/2011

THE LEADING MAGAZINE FOR THE INTERNATIONAL FLAT GLASS INDUSTRY

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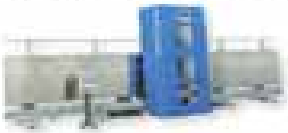

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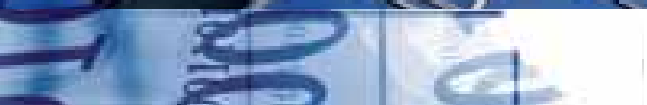

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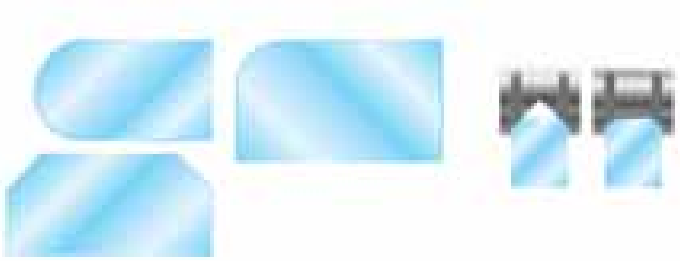

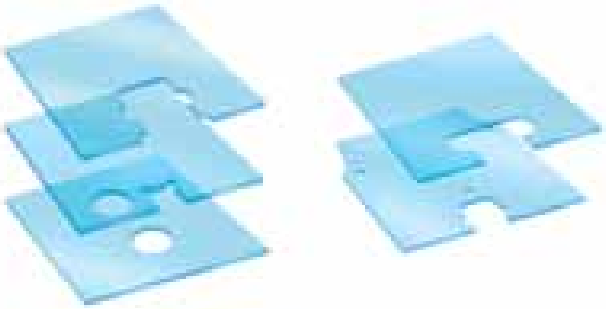

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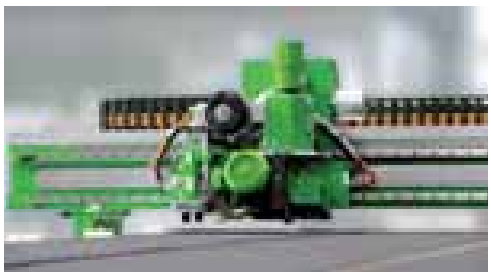

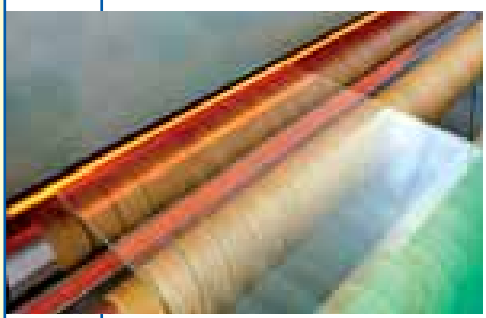

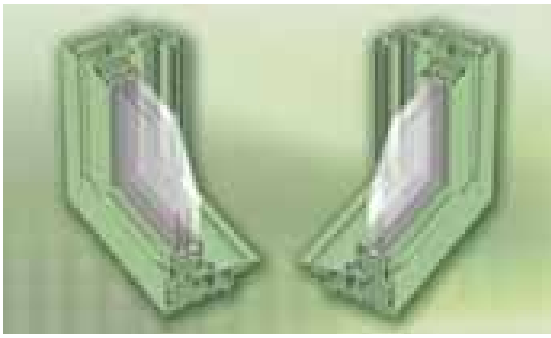

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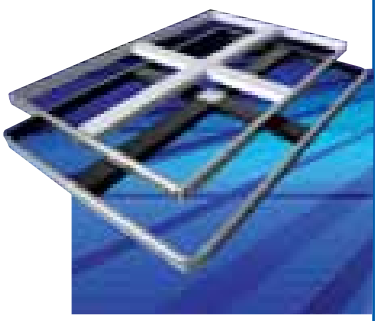

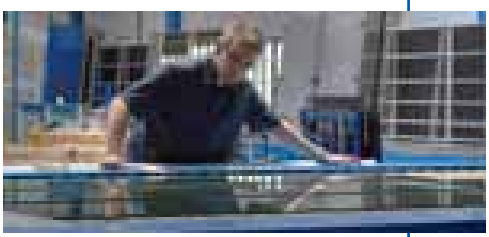

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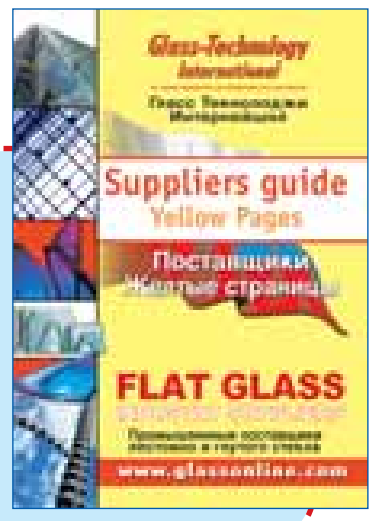

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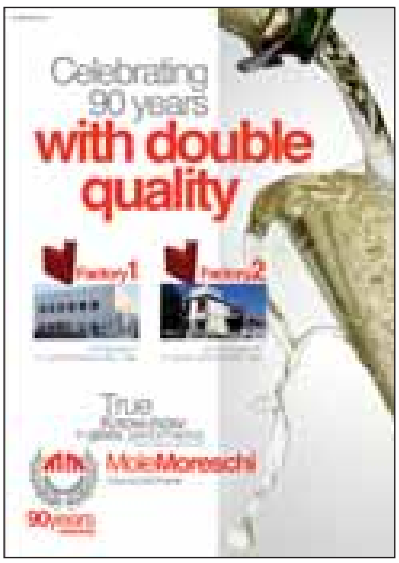

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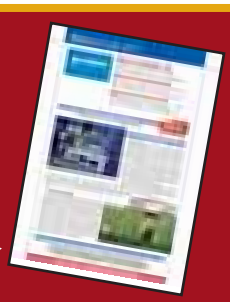
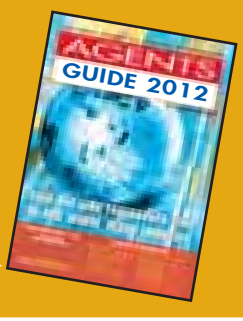
2011 FAIR CALENDAR

issue	exhibition/conference	date	venue	insert
2011 **1** Publication date: **4 FEBRUARY**	**GULF GLASS**	7-9 March	**ABU DHABI** UAE	
	ISTANBUL WINDOW 2011	10-13 March	**ISTANBUL** Turkey	
2011 **2** Publication date: **7 APRIL**	**CHINA GLASS**	11-14 May	**SHANGHAI** China	
	CHINESE SUPPLIERS GUIDE / YELLOW PAGES RESERVED FOR ADVERTISERS OF THIS ISSUE			
	CONSTRUMAT	16-21 May	**BARCELONA** Spain	
2011 **3** Publication date: **2 MAY**	**MIR STEKLA**	6-9 June	**MOSCOW** Russia	
	RUSSIAN SUPPLIERS GUIDE / YELLOW PAGES RESERVED FOR ADVERTISERS OF THIS ISSUE			
	GPD - GLASS PERFORMANCE DAYS	17-20 June	**TAMPERE** Finland	
2011 **4** Publication date: **25 JULY**	**GLASSBUILD AMERICA**	12-14 September	**ATLANTA (GA)** USA	
	GLASSEX@ INTERBUILD	16-19 October	**BIRMINGHAM** UK	
2011 **5** Publication date: **26 SEPTEMBER**	**VITRUM**	26-29 October	**MILAN** Italy	
	ALL VITRUM EXHIBITORS WHO ADVERTISE IN THIS ISSUE WILL ALSO RECEIVE A FREE FULL PAGE VITRUM PREVIEW			
2011 **6** Publication date: **24 OCTOBER**	**PV TECH 2011**	16-19 November	**MILAN** Italy	
	GLASSTECH ASIA	23-25 November	**JAKARTA** Indonesia	
	ZAK GLASS TECHNOLOGY	8-11 December	**MUMBAI** India	
	THIS ISSUE WILL ALSO PRESENT THE AGENTS WORLD GUIDE 2012, 17TH EDITION			

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DFI

Glass coating supplier for Heights Glass

Officials at US Diamon-Fusion International (**DFI**), have announced that **Heights Glass & Mirror Co.**, Illinois, manufacturer of commercial, residential and architectural glass products, has chosen DFI as its exclusive glass protection supplier. Heights Glass has chosen to offer its customers DFI's flagship coating Diamon-Fusion protective glass coating product as an upgrade feature for all its shower door product lines. It will also market and sell restoration services of existing residential and commercial glass using proprietary DFI cleaners, as well as DFI's aftermarket consumer kit product line.

Diamon-Fusion nano-coating provides a brilliant, hygienic and easy-to-clean shower enclosure resulting in less time spent cleaning the enclosure, as well as protection against mildew, hard water stains, soap scum, and other contaminants that can permanently damage the glass.

"Heights Glass is known for outstanding customer service, high quality products and industry leadership and we are so pleased to have this company offer Diamon-Fusion treatment for shower enclosures, as well as DFI's restoration and consumer kit products," said Adam Zax, CEO, Diamon-Fusion, in a press release release. "The team at Heights really understands what we're trying to accomplish with our consumer kit products and the great value each presents to the consumer."

"After using other protective coatings in the past, we have discovered nothing compares to the level of performance Diamon-Fusion provides," said Arnie Harris, president, Heights Glass & Mirror Co., in the release. "Not only are we enthusiastic about upgrading our coating line for our shower enclosures, but we also see great potential to increase value for our at-home service customers by offering restoration services for existing interior and exterior glass features, and of course the consumer kits."

Canadian distribution strengthened

DFI has signed a new license agreement in Canada with *Diamante Glass Systems Ltd*. to further expand its Canadian distribution. The new agreement provides an exclusive distribution of Diamon-Fusion® NanoPax® product in the provinces of Ontario and Saskatchewan in automotive (car and light trucks) dealerships. This eastern region of Canada provides a strong economic outlook for the expansion of DFI's patented technology with the key metropolitan area of Toronto as Canada's largest automotive market.

Diamante Glass systems, the marketing arm for DFI products of 25-year Calgary-based *King's Glass Ltd*. a privately-held Canadian company, specialized in glass replacement for motor vehicles, particularly passenger cars and recreational vehicles (RV's), heavy equipment, rail cars. Diamante Glass has been growing its Diamon-Fusion® business steadily over the last two years, gaining solid traction for its current nationwide expansion as one of DFI's strategic partner in the automotive car dealer market.

"Diamon-Fusion® has become a standard feature in all our windshield replacements as we offer, unlike any other product in the market place, an unlimited replacement warranty, no questions asked; the improved impact resistance, added reaction time through better visibility while driving during adverse weather conditions makes the superior Diamon-Fusion® product a 'must add'; I keep saying that no vehicle should be driven without the protection of such a great and necessary product," said Charles King, President of Diamante Glass Systems Ltd.

Guillermo Seta, Corp. vice president and executive director of DFI, stated, "Our partner Diamante Glass has earned this new expansion with its overall great performance and, principally, with outstanding customer service that has translated into many happy drivers in Canada while enjoying the added protection, and enhanced safety, on their windshields."

Primary glass coating supplier for Intex Glass

Intex Glass (Xiamen) Co. Ltd., a leading Chinese manufacturer and fabricator of clear glass, has chosen DFI's Clear-Fusion™ Pro as its primary glass coating. Intex's processed glass product components are used in a wide-variety of finished products in North America, Europe and Asia for both interior and exterior glass applications. Xiamen, China-based Intex will import its coating supplies from US-based DFI, having chosen the DFI for its superior product performance, quality customer service and competitive pricing.

"Knowing that Intex had the option of partnering with any coating company in the world, the choice of DFI is an affirmation of our commitment to offering the best combination of price and performance in any and all markets around the globe," stated Russ Slaybaugh, vice president and general manager of DFI. "We look forward to working with Intex to capitalize on the growing demand for easy-to-clean glass coatings in North America, Europe and Asia."

"We believe this new coating will add value to our products and satisfy the growing demand for a high-quality coating from our new and existing customers," added Helen Chang, director of Exporting Department for Intex Glass.

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Celebrating two-billionth foot of Super Spacer®

For more than 20 years, **Edgetech I.G.** has been a pioneer in warm edge spacer technology, supplying *Super Spacer*® to some of the most energy-efficient and sustainable insulating glass systems in the world. The company announced that on 31 March 2011, the two billionth foot of Super Spacer was produced at its newly opened manufacturing facility in Heinsberg, Germany.

"Just five years ago we celebrated production of our one-billionth foot of Super Spacer," said Mike Hovan, President, Edgetech I.G. "Today, we've doubled that number. When we did the calculations we were surprised to see that this milestone was so close and we couldn't pass up the opportunity to share this moment with our employees and customers. After all, it is their loyalty and dedication that have led us to this exciting occasion."

Edgetech will commemorate this milestone with celebrations today at its Cambridge, Ohio, headquarters, its UK manufacturing facility and its newest facility in Heinsberg, Germany, where the two-billionth foot came off of the company's newest production line.

"It is only fitting that the two-billionth foot was produced off our newest production line in Germany, which just began production this week," said Andy Jones, managing director of Edgetech Europe. "There's so much to celebrate as we continue to expand Super Spacer's presence globally."

Two safety awards from the Guernsey-Noble Safety Council

Edgetech I.G. has once again been recognized for its ongoing commitment to the health and safety of employees by the Guernsey-Noble Safety Council. The company was presented with the 'Group Award' and 'Special Award' at the council's 14th Annual Awards Luncheon in April.

"It is such an honor to be recognized by the Guernsey-Noble Safety Council once again," said Jeff Hanson, director of human resources for Edgetech I.G. "Safety is a priority at all levels of our organization, and I would like to personally congratulate the entire Edgetech team for achieving more than one million hours without a lost-time injury."

From left: Jeff Hanson, director of Human Resources, and Tom Matthews, CIT/Safety

The Group Award was presented to Edgetech for achieving the lowest incident rate in its group, and the Special Award is for the company's impeccable 1,075,580 hours and counting without a lost-time injury.

Edgetech I.G. Inc., in business since 1989 and with manufacturing facilities in the US, UK and Germany, manufactures Super Spacer® – an insulating glass edge seal product line that provides maximum condensation resistance, durability and energy performance.

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In 1979 the Company started the diamond wheels production reaching top quality level, very high working speed and flexible use. Belfortglass manufactures wheels for bevellers and prismatic mirrors machines, flat edge grinding machines, flat edge double edgers, round edge double edgers, numerical control machines and peripheral edge grinding machines.

belfortglass
FLEXIBLE USE AND DURABILITY SINCE 1971

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TUBELITE distributor for western Pennsylvania named

Tubelite Inc. has named *United Plate Glass Company* (UPG) as a distributor for its architectural aluminium products.

UPG offers daily deliveries to clients in western Pennsylvania, south-western New York, eastern Ohio, northern West Virginia, north-eastern Maryland, the northern D.C. suburbs and specific destinations for large projects.

UPG has been providing architectural glass and aluminium products, as well as in-house fabrication services from its facilities in Butler, Pennsylvania, for more than 25 years and will now also be offering Tubelite's storefront, curtainwall and entrance systems, including custom doors.

Tubelite's architectural products are manufactured using EcoLuminum™, a high recycled-content aluminium billet composition featuring environmentally-friendly finishes.

Tubelite's systems and UPG's technical expertise contribute in helping building project teams pursuing certification through the US Green Building Council's LEED® Rating System™ with regards to daylighting and views, thermal comfort and energy efficiency.

UPG is a member of both *GANA* and *NGA*, and is a certified fabricator with *PPG* and *Guardian Industries SunGuard® Select*, a licensee in the Safety Glazing Certification Council and Insulating Glass Certification Council, as well as an authorized labeller of fire-rated glazing materials for Underwriters Laboratories and Warnock Hershey.

GLASWELD Australian distributor

According to a release on 4 April, **GlasWeld**, Bend, Oregon, has appointed *GlasWeld Australia Pty. Ltd.* as its exclusive distributor for all GlasWeld products in Australia.

GlasWeld Australia Pty. Ltd., a wholly owned subsidiary of Cleveland Tungsten (Aust) Pty. Ltd., will be managed – as far as sales and marketing for the distributorship are concerned – by glass industry veteran Garry Sylvester.

GlasWeld Australia Pty. Ltd. will offer GlasWeld's signature ecoVac and G3fusion windshield repair systems, Gforce glass scratch removal systems, and Gclear headlight restoration products to the Australian market.

Cleveland Tungsten will, thanks to the launch of GlasWeld Australia and the introduction of its innovative windscreen chip repair products, be expanding its ability to provide quality products servicing the automotive market.

The company also plans to enter and service the flat glass industry sector by offering GlasWeld's full line of scratch repair products.

US glass manufacturers accused of price fixing

In a complaint filed 28 March in the US District Court for the District of Oregon, *Jeld-Wen*, an international manufacturer of doors, windows, millwork and speciality wood products, alleged that *AGC Flat Glass North America*; *Guardian Industries*; *Pilkington North America*; and *PPG Industries*; "contracted, conspired or combined to fix, raise, maintain or stabilize prices of, and allocate business for, flat glass they sold in the US during the claim period," from 1 January 2002 until at least 31 December 2006.

As a consequence, Jeld-Wen was obliged to pay 'inflated prices' for approximately USD 100 million in glass products that the company bought directly from the defendants.

According to the complaint from Jeld-Wen: "Beginning at least as early as 1 January 2002, defendants agreed to and did fix, raise and maintain the prices of Flat Glass purchased by Jeld-Wen during the Claim Period by imposing identical surcharges, such as 'energy surcharges' and representing that these surcharges were necessary to offset increased prices of natural gas and electricity, when in fact, defendants' energy costs were not uniform and these 'surcharges' were a ruse to allow them to raise prices.

In addition, defendants announced and implemented a series of price increases during the Claim Period, pursuant to the conspiracy alleged herein".

SOLAGLAS
partnership developments

Solaglas Installation has, the company said, plans to develop partnerships with major players in the construction industry. The company, which has relocated to a 60,000 sq.ft. headquarters in Rotherham, is now more closely aligned with its parent company *Saint-Gobain*.

"Our main competitors are owner-managed and there is a lot of risk around owner managed, whereas Saint-Gobain carries massive financial stability," he said.

"We are finding we are being used a lot more for reassurance and stability, especially in high-profile contracts with governments and so on."

"There are a number of reasons behind the move. We've merged two parts of our business – the old reactive part and our contracting business have been merged together under an installation banner. Also, we've been growing over the last three or four years and outgrew our old facility. We have some ambitious plans for the future, so we wanted better and bigger facilities."

"Even though we are the biggest and the market leader we still have a very small market share. Now we've put three elements of the business together we can offer a one-stop solution for some of the major players. We want to align ourselves a lot closer with the market. Instead of selling to them we want to get into partnerships and start becoming a solution provider."

The process of marketing the business' new offer to the main contractors in the construction industry has already started.

"There's a few we're talked to," said Davy.

"With the opening of the new facility we will be presenting the first draft of our new strategy and then following up on a one-to-one basis."

Solaglas, which is a GBP 55-million-turnover business, has enjoyed a strong start to the year and Davy said he wanted that to continue during 2011.

"On our balance sheet, I would like to think we'd be ahead of budget on sales and revenue. We're heading towards that way after a good start to the year but obviously it's a tough environment."

SOLAR MEETS GLASS
positive results and feedback for conference

As for the previous edition, the conference **Solar Meets Glass** – Second Industry Summit for Quality, Logistics and Material received positive feedback among over 150 delegates from the glass and solar industries on 13 April 2011. The event, which was organized by Messe Düsseldorf GmbH and *Solarpraxis AG*, formed part of the Photovoltaics Thin-Film Week, the world's biggest of its kind, which was held at the Berlin Adlershof Technology Park, from 11 to 15 April. Other modules during this week were the Thin-Film Industry Forum, organized by Solarpraxis AG, the Second International Workshop on CIGS Solar Cell Technology, set up by PVcomB (the Thin-Film and Nanotechnology Competence Centre for Photovoltaics in Berlin), and the *VDMA* Annual Conference for Photovoltaics Production Equipment.

As well as providing an overview of the market and technology, Solar Meets Glass focused on the subjects of quality, logistics and materials – each with the purpose of discussing interfaces between the glass and solar industries.

"This year we consciously decided to put the emphasis on thin-film PV, as glass is a material of absolutely vital importance for a variety of reasons. Thematically, this added up to an excellent event where delegates at the Solar Meets Glass conference also benefited from the added value of other events at the Photovoltaics Thin-Film Week," said Hans Werner Reinhard, deputy managing director at Messe Düsseldorf.

"We are pleased that by bundling various events during the Thin-Film Week this year we could create additional synergies, so that even more delegates came to Adlershof than last year. PVcomB, Messe Düsseldorf and VDMA complemented each other very well in the way in they worked together and addressed various target groups, so that the Photovoltaics Thin-Film Week is now even more widely known in the industry," said Karl-Heinz Remmers, CEO of Solarpraxis AG.

Delegates explicitly praised the "Solar Meets Glass" conference for providing a platform for an exchange between the solar and glass industries where burning issues and solution proposals could be discussed. Glass is one of the key elements for any future increase in efficiency and for cost reductions in photovoltaics.

Messe Düsseldorf and Solarpraxis AG are planning to work together again in 2012, when the next Solar Meets Glass conference will be held as part of the Photovoltaics Thin-Film Week at the Adlershof Technology Park in Berlin.

XINYI GLASS
additional production line

Xinyi Glass has started production at its third low-iron patterned solar glass production line in Wuhu, Anhui, China.

The production line, which has a daily production capacity of 500 tons, is, says the company, designed to produce patterned solar glass with over 91% solar transmittance to meet the increasing market demand from crystalline PV and thin-film PV module manufacturers.

Xinyi Glass also plans to install two additional new lines, each with melting capacity of 500 tons per day for solar glass production in Tianjin and Wuhu, China, scheduled to be commissioned in May and June.

SAINT-GOBAIN
furnace for patterned solar glass inaugurated

Saint-Gobain has inaugurated a new solar glass furnace at its Glass Renedo plant in Spain which will, says the company, double its output of patterned glass for the solar power and interior design markets to an annual capacity of 60,000 tons of *SGG Albarino* glass. The 134 sq.m. furnace has a production capacity of 200 tons per day of extra clear SGG.

The Renedo site supplies a quarter of Saint-Gobain's global capacity in SGG Albarino glass, destined primarily for the domestic Spanish market, and for Europe.

With this EUR 35 million (USD 50.6 million) investment, Saint-Gobain reports that it has completed its patterned glass production network and takes its commitment to solar power and the PV market in particular another step further. In this niche, the Group is aiming to achieve EUR 2 billion (USD 2.8 billion) in sales in 2015, compared to EUR 300 million (USD 434 million) in 2010. According to a statement issued by the company, "PV must become a standard component of new buildings, as it is already the case for double glazing."

SOLARIA
new solar factory & HQ

Solaria inaugurated its new factory and headquarters in Fremont, California on 22 April, where it will have a production capacity of 25 MW per year. The company also has quasi-contract manufacturing operations in Hyderabad, India.

Solaria, one of a number of developers who sought to create alternatives to conventional silicon solar panels, develops solar panels that use lenses to concentrate the sunlight onto silicon solar cells, a process that reduces the need of silicon cells by about 50%. When the solar industry experienced a shortage of silicon around 2005, some companies turned to materials such as copper-indium-gallium-selenide (CIGS), while others began to experiment with materials such as germanium and gallium-arsenide, which are more expensive than silicon but also can obtain far more electricity from sunlight. Solaria continues to use silicon but still adds the concentrating optics to help cut costs.

Silicon prices are now less than USD 100 per kilo, dropping to USD 79 per kilo in March this year, making it more difficult for developers of alternative technologies to compete. Solaria can benefit from the lower price of solar cells, which it buys from other suppliers, but still has to compete with conventional silicon solar panel manufacturers worldwide.

Solaria aims to make its panels for at least a third cheaper than conventional silicon panel manufacturers, but it will need to expand its production beyond the current capacity. The company manufactures framed and frameless solar panels with 13-14% efficiencies. According to the company, frameless panels, which were launched in autumn 2010, means up to 50% more panels can be packed into a box for shipment.

BENEQ
paving the way for sustainable energy solutions in India

During a recent visit to Finland, the Indian Minister for New and Renewable Energy, Farooq Abdullah, met Finnish Minister of the Environment, Paula Lehtomäki, together with *Cleantech Finland* officials and member companies, including **Beneq**.

Minister Farooq Abdullah opened the meeting by emphasizing his interest in solutions that Cleantech Finland member companies have for the most important energy questions facing India. India's consumption of energy is today the fifth largest in the world, exceeding own production by 12.7%. Rapid domestic economic and population growth will keep the need for energy growing in the future, and so the challenge is how to increase both energy production and energy efficiency. Another major challenge is the restricted availability of electrical power; more than 400 million Indians have no access to electricity. The situation is most serious in scarcely populated areas. In addition, there are frequent interruptions in local electricity distribution, due to poor condition of the power grid.

Answering the call, Cleantech Finland member companies offered concrete solutions for India's energy challenges. Sampo Ahonen, CEO of Beneq, advocated solar energy as an energy source in areas where electricity is not available at all. In these areas, access to electricity during the daytime would already be a major improvement, and the solar radiation values in India are among the highest in the world. Beneq delivers coating equipment for improving the efficiency of photovoltaic cells.

According to Matti Rae, director of New Technologies at Ensto, the solution to electricity distribution reliability and electric network functionality is Ensto's smart grid expertise.

Maria Paatero-Kaarnakari from Fortum presented a combined energy and heat production solution and a charging point network for electric cars, which Fortum has implemented in cooperation with the City of Espoo and Ensto.

Vacon CEO Vesa Laisi presented the company's innovations for energy efficiency – a frequency transformer that controls electric motor operation and reduces energy consumption by an average of 10%.

Summing up the gist of the meeting was Santtu Hulkkonen, Cleantech Finland program director: "India, its rapidly growing industry and need for energy, and its interest in renewable energy, represents huge market potential for Finnish cleantech companies, and there is a lot of need for Finnish cleantech expertise. Cleantech Finland (which arranged the meeting with Minister Abdullah) assists Finnish environmentally aware technology companies to market and communicate their competence in India."

PYTHAGORAS SOLAR
top industry honours for sustainable development

Pythagoras Solar was selected as the winner of both the Venture Capitalist's and the DGDW (Doing Good and Doing Well Conference) Viewer's Choice awards at the DGDW 2011 held at the IESE (Instituto de Estudios Superiores de la Empresa) Business School in Barcelona, Spain. Pythagoras Solar was selected for the feasibility and scalability of its business, market potential and size, business model, competitive advantage and strength of its team. It was also considered the most investable technology in the seminar, well positioned for venture capital investment and a fast growth strategy.

The IESE Business School is one of the top European business schools, and has campuses in Barcelona and Madrid, and centres in New York and Munich. The DGDW Conference is the IESE's annual two-day event.

"We are encouraged to see our company's mission supported by industry leaders, as it underscores the potential impact that high performance PVGU technology can have on reducing greenhouse gas emissions, moving us towards a safe, renewable future and making net zero energy buildings a closer reality," said Udi Paret, VP Marketing and Business Development, Pythagoras Solar. "We are honoured to have been recognized amongst world class, responsible businesses focused on sustainable development, social entrepreneurship and social investment."

Founded in 2007, Pythagoras Solar provides building integrated photovoltaic (BIPV) products that enable the architecture, engineering and construction sectors to design buildings with increased energy efficiency, renewable power generation and appealing aesthetics, thereby increasing real estate value. Pythagoras Solar is a privately held company with operations in the US, Israel and China.

GLASTON
senior vice president, software solutions

Glaston Corporation has appointed Dr. Uwe Schmid (Ph.D., Physics), to the position of senior vice president, software solutions. He will start at Glaston in the middle of July and assume the full operational responsibility of the Software Solutions Business Area on 1 September 2011. Schmid will be a member of Glaston Corporation's Executive Management Group and report to Arto Metsänen, President and CEO, Glaston Corporation.

The current SVP, software solutions, Günter Befort, continues at Glaston as senior industrial advisor and as a member of the Executive Management Group and will support the new SVP in his taking on the new duties.

Uwe Schmid (47) has a broad IT and industry experience. He will join Glaston from a position as senior expert at McKinsey & Company, where he is a member of the global leadership team of the Business Technology Office (BTO).

IGA
executive director leaves

Mike Russo, executive director of the Independent Glass Association (**IGA**), left his position at the end of April.

"I feel it's time for me to go off and pursue other interests and those interests are outside the auto glass industry. I expected this to be a transition period. I didn't expect the contract to be renewed," says Russo. "I've been in the industry over 11 years and in my experience I think the focus needs to be placed on consumer harm. I believe the only way that the industry's woes will be corrected is to involve the consumers. I've talked to government officials and legislators and they are fully aware of the interference that shops are experiencing, but they are not hearing a word from the consumers."

ROMAG takeover by property firm Gentoo

Property firm Gentoo Group has bought the trade and assets of fellow North East company **Romag** after the County Durham specialist glassmaker went into administration.

The solar glass and composite supplier called in administrator Deloitte to discuss its options late last month after failing to raise necessary funds to continue.

A deal has subsequently been struck with Ask the Genie Ltd. and Ask Genie Limited, which are newly-incorporated subsidiaries of the Sunderland-based property and construction company.

Gentoo's chief executive Peter Walls confirmed it has secured all 161 jobs at the Leadgate company, and would be encouraging it to continue offering its range of products for the security, architectural and specialist transport markets. He said: "There's no plan to change the number of staff or their terms and conditions. We've been encouraging them to expand and continue with the projects they're involved in, although it is early days."

Romag was established in 1943 and has been one of the region's most active companies in the renewable energy sector, a drive widely credited to the vision of its chief executive Lyn Miles.

However, Miles passed away last June. The company was also hit by the suspension of its shares from AIM in January, after chairman John Kennair disclosed he made a payment of GBP 3.97 million into trading subsidiary Romag Limited without informing the board.

The company identified a short-term requirement of GBP 2.2 million early this year, prompted by a need for inventory investment and a "weaker than forecast sales performance during the winter months". However, it was unable to raise this money and its directors called in Deloitte with a view of arranging a sale.

It added it received 'a number of offers' for Romag, and a team of specialists from Deloitte and Leeds-based lawyers Walker Morris advised on the deal.

Gentoo's Peter Walls said the company had worked alongside Romag over the last few years, and was discussing a possible joint venture with the firm to further improve energy efficiency of its portfolio of 30,000 properties.

Gentoo had already trained a number of employees in its construction division in the installation of solar panels, and was working on retrofitting many of its properties with such features.

Walls said: "I think Romag has an interesting range of products and there are opportunities for those in the housing world. I'd like Romag to remain a business in its own right within Gentoo. It's not as if we're melding it with anything else."

"It's a great company with a great reputation, but the uncertainty has certainly hurt it. We're hoping to lift that off its shoulders and allow it to fulfil its potential. When the Coalition came to power, and even before that, it seemed like the green agenda provided a real opportunity."

"We're all under international targets to make carbon reductions and the Government is constantly reviewing its approach to incentives.

"Housing accounts for about 25% of carbon emissions, so it's a big challenge and a remarkable opportunity."

TAIWAN GLASS return on low-E investment in 2011

Taiwan Glass Corp., Taiwan's largest manufacturer of speciality glass, will gradually see a return from its investments in low-E glass in Changhua Coastal Industrial Park of central Taiwan, and Chengdu of Sichuan Province and Tianjin Municipality of China.

Taiwan Glass said that the production facility of 4.5 million sq.m. in Changhua Coastal Industrial Park will begin mass production by the end of the second quarter of this year. The plants located in Chengdu and Tianjin will start mass production at the end of April and the end of July this year, respectively, with production of low-E glass to grow quarter by quarter.

At present, the company has already set up four production lines for low-E coating glass with combined annual production capacities reaching 7.8 million sq.m., both in Taiwan and China.

The company is therefore expecting to see annual production capacity increase by over 30 million sq.m. by the end of this year.

Taiwan Glass had TWD 39.6 billion in consolidated sales in 2010, up 25% year-on-year from TWD 31.7 billion. The company scored TWD 5.18 billion in after-tax earnings in 2010, marking 292% year-on-year growth. Taiwan Glass is expected to see earnings grow approximately 15% year-on-year this year.

EDGETECH I.G.
Mike Burk to lead IGMA Committee

The Insulating Glass Manufacturers Alliance (**IGMA**) recently announced that Mike Burk, manager of Workplace Learning and Performance for **Edgetech I.G.**, will be overseeing the newly formed 'Glass Safety Awareness Council'. In his industry columns and webinars, Burk regularly focuses on promoting workforce safety.

"In this business, or any business for that matter, it's easy to get to a place of complacency when it comes to safety," Burk said. "When glass crashes to the ground, workers barely flinch. The Glass Safety Awareness Council will focus on bringing safety back to the forefront of our minds. This is a topic that's always been near to me and I look forward to serving IGMA in this capacity."

The Glass Safety Awareness Council was formed

after the success of Burk's recent webinar 'Fatalities and Injuries During Flat Glass Handling', co-sponsored by IGMA and the Glass Association of North America (*GANA*).

Burk has nearly 20 years of experience in the fenestration industry with a strong background in training and development, including Green Belt and ISO training expertise. He holds a bachelor's degree in business from Myers College in Cleveland, Ohio, and has a master's degree in adult learning and development from Cleveland State University.

IGMA board of directors announces new president

Canadian Insulating Glass Manufacturers Alliance (**IGMA**) has announced that David Cooper of *Guardian Industries Corp.* has been elected as president for a two-year term.

"IGMA has demonstrated world-class leadership as a technical adviser in IG certification and as an advocate for the insulating glass manufacturers and their suppliers in North America," Cooper said. "Working at Guardian's Science and Technology Center has provided me a great deal of leadership training, and I am honoured to take over as president of IGMA. I look forward to serving the growing IGMA membership as well as the IG community."

Cooper replaces outgoing president Ray Wakefield, from All Weather Windows, as vice president and Mark Hutchinson, from Intigral, as secretary/treasurer.

Four IGMA members were also elected to the board of directors: Scott Cardwell from *AGC Flat Glass N. America*, Helen Sanders, vice president of Technical Business Development, *Sage Electrochromics*, Frank Caporiccio with *PPG Industries*, and Crystal Archibald of *Kohltech International*.

Two new task groups were also created: the first is led by Mike Burke of *Edgetech I.G.*, and is chartered with improving the focus on safety in the glass industry; the second, chaired by Jennifer Kempf of *Dow Corning*, will promote the extensive value of IGMA to the IG industry.

The following board members were elected as committee chairs:

- Technical Services Committee: Chairman Ray Wakefield, *Trulite Industries*, and Vice Chairman Robert Gilles, senior vice president, *All Weather Windows*;
- Education and Certification Committee: Chair Helen Sanders, Sage Electrochromics and Vice Chair Jim Krahn, advanced research manager, Codes and Regulatory, *Marvin Windows*.

DFI new officers and directors

Diamon-Fusion International, Inc. (**DFI Nanaotechnology**), global developer and exclusive licensor of patented hydrophobic nanotechnologies, has reported that it has a new slate of officers and directors as part of the company's recent re-structure of operations.

A newly formed Executive Committee was announced, constituted by company officers Adam Zax, President & CEO, Guillermo Seta, corporate vice president, and Rubin Turner, corporate counsel.

Other previously appointed key positions include Russ Slaybaugh, vice president and general manager, along with the following positions: Todd Gentry, director of operations and strategic planning; Yasser Elassal, director of research and technology; and Carl Christ as director of on-site services.

GANA Decorative Division chair appointed

Marc Deschamps of *Walker Glass* has become chairman of the Glass Association of North America's (**GANA**) Decorative Division. Deschamps has been involved with the Decorative Division since its creation and has worked on a number of different projects such as creating a document on cleaning guidelines and working on a LEED white paper, among others.

"I am very excited about our new website, decorativeglazing.com. This is a great dynamic tool that requires enhancements and the addition of new features on a continuous basis," says Deschamps, who explains that the website provides information on different types of decorative glass products, a photo gallery highlighting applications using decorative glass products and complete profiles of the division members.

He adds, "We also need to add to our existing educational tools and resources to keep architects and designers up to date. And, there are several decorative glass products for which no standards have been developed yet and our division should be a driving force behind the development of such standards. In addition, we have developed an online AIA presentation on decorative glass products to help architects and designers better understand decorative glass products."

"The decorative glass industry brings together a wide variety of products and businesses, having different needs and concerns. We are not a homogeneous group by nature, to say the least," he says. "Our job at GANA is to get these different glass businesses to work together in the advancement of the industry. I strongly encourage decorative glass companies to get involved in the activities of the Decorative Glass division. We need a creative contribution from more players in the industry."

Glass handling equipment for forklift trucks

Italcarrelli has recently developed a new glass handling system. The *ABV* (Italian Patent Pending), can be installed on normal forklift trucks enabling the operator to handle and transport packed and unpacked glass.

The ABV is made up of a frame where the glass is positioned, two overhead clamps with videocamera and two forks. The thickness of the packs to be transported can be changed, through the glass supporting frame, along with the size of the glass, thanks to the overhead clamps. The movements of the frame and overhead clamps are hydraulic and exploit the hydraulic power of the forklift trucks. The operator can easily adjust the thickness and height of the pack of glass from his seat without needing assistance from other operators.

Moreover, thanks to the videocamera on the overhead clamps, the operator can control loading and unloading operations of the glass.

The machine is also equipped with a system to enable +/-4.5° horizontal tilting and therefore to line up with the pack of glass to be loaded. The clamps, forks and frame are covered with a special material that does not damage the glass.

ABV is a system that enables the handling of glass from the glass processing lines to the warehouse and shipping area thanks to the possibility of loading and unloading the packs of glass directly onto and from the trucks.

With ABV, Italcarrelli provides a solution to handle glass quickly and in complete safety, with affordable costs, and therefore ideal for small- and medium-sized companies, as well as developing countries.

As all Italcarrelli products, ABV is made following the highest quality standards and according to the safety norms in force.

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Processed and coated sapphire glass in large formats

Schott will be presenting new forms of delivery for sapphire material at *LASER 2011*. Large format polished and coated panes of up to 300mm in diameter were qualified only recently. In the future, these products will also be put to use in security applications under extreme environmental conditions.

Sapphire glass is the second hardest transparent material next to diamonds. It is made of high purity aluminium oxide that is produced synthetically. This extremely scratch-proof and heat-resistant material offers high transmission in the wavelength range of 0.5 up to approximately 6.25 µm.

By introducing new forms of delivery, Schott is now also expanding the range of applications. The company manufactures sapphire glass panes that are up to 300mm in diameter. These are then individually polished and coated to meet specific customer requirements.

The formats can be designed rather freely, from round to square, and feature either a curved or a flat surface. The processing quality ranges from standard to optical quality. Sapphire glass is used in high-quality watches, but also in optical, chemical, analytical, medical and security technologies.

Schott is an international technology group with more than 125 years of experience in the areas of special glass, speciality materials and state-of-the-art technologies.

Schott has manufacturing facilities and sales offices in more than 40 countries, and a workforce of around 17,500 employees generated total revenue of approx. EUR 2.9 billion for the 2009/2010 fiscal year.

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FIERA MILANO

Hegla: ultimate float glass cutting

Machinery manufacturer Hegla has three production facilities in Germany, and international sales and service companies in the United States, France, the United Kingdom and Russia, as well as a worldwide agency network. The company offers complete solutions for handling, loading, cutting, breaking and sorting of float and laminated glass. In this article, we get an idea of just what this company's machinery can do.

Galactic Econ for the utmost cutting precision

Hegla: ultimate float glass cutting

SETTING THE STANDARD FOR DYNAMISM AND PRECISION PROCESSING

Under this theme, specialist for glass cutting and handling Hegla has consistently presented innovations and has set enduring trends over the course of the past few years. The most recent innovation is the new range of the *Galactic Econ* glass cutting machines.

The Galactic product range was first released in 2005, and was a groundbreaking development at that time. Visitors at *glasstec 2008* had the possibility of seeing the machine at work: in fact, Hegla had on show a cutting table for glass sizes of 7,000 x 3,300 millimetres combining impressive acceleration and unsurpassed cutting speed.

With the new range of the Galactic Econ, Hegla has cumulated its experience with linear drive technology. Glassmakers can benefit from the dynamic movement as a result of high acceleration, also utmost cutting precision, guaranteed for the entire machine working life thanks to its sturdy design.

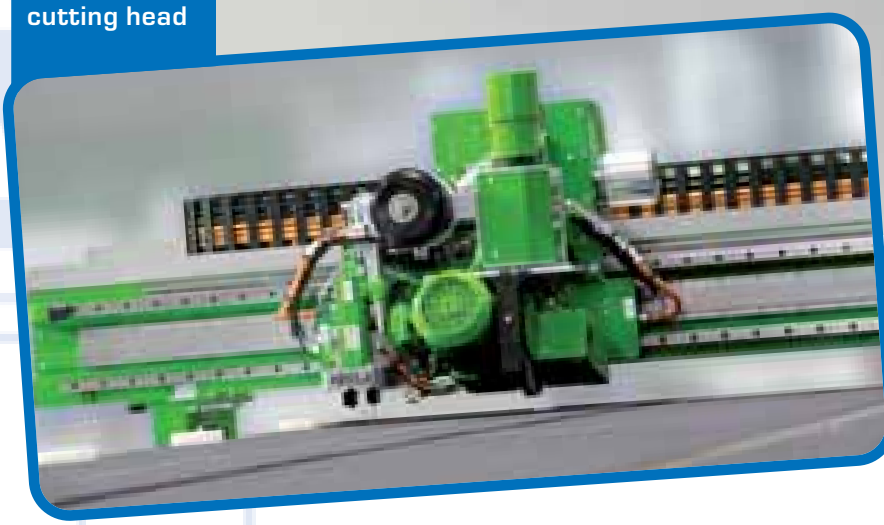
Lower energy consumption too

Lower energy consumption is a further key feature of the latest drive technology. Because of the contact-free power transmission of the linear drives – no mechanical gears – the maintenance requirement of the entire cutting table is reduced to a minimum. A cooling system for the linear drives, as well as a self-lubrication system for the linear bearings, improve the durability of the entire system even further.

All these features result into a very smooth running machine with an impressive cutting tolerance of +/- 0.1 millimetres.

Double cutting head

The double cutting head system *TwinCut* improves the utilization of the cutting table for flexible use with various glass thicknesses. Both cutting heads are equipped with different cutting wheel angle as well as pre-settings for cutting pressure and different cutting fluids. The suitable cutting head will be automatically activated accordingly to the glass thickness chosen, thus ensuring optimum edge quality. Downtimes for exchanging cutting wheels are reduced with this system and, therefore, utilization of the cutting table is increased.



Galactic Econ Twin-Cut double cutting head

Double edge deletion system

Trims can be eliminated with the patented *TwinEdge* double edge deletion system for Soft-coat low-E. A second, narrower edge deletion wheel carried out the edge deletion of the outer area of the entire sheet first, before the second,

Galactic Econ

normal wide edge deletion wheel, executes edge deletion inside the sheet. Glass usage can therefore be reduced; along with savings on the usage of soft-coat low-E glass.

An automatic height adjustment for the cutting head and/or edge deletion system can be incorporated if requested. This device synchronizes the distance of the tooling accordingly to the glass thickness chosen, with the benefit of reduced cycle time.

Other machinery

Hegla is also a well-known manufacturer of efficient and highly automated cutting tables for annealed laminated glass. The company manufactures various types of automated loaders and warehouse equipment, automatic breakout systems for float, dynamic off-cut handling systems (*ReMaster*) as well as sorting systems (*SortJet*). ■

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R.C.N. Engineering: longer just a

Lamination and its diverse needs and demands in the glass sector are the specialization of the company presented in this article – R.C.N. Engineering. PowerLam, its flagship product for laminating with EVA and PVB film, continuously undergoes development to keep pace with the complex shapes and types of glass used.

THE COMPANY AND ITS PRODUCTION

R.C.N. Engineering is a family-owned and run company with considerable experience in the glass sector.

Renovation regarding company structure, premises and - of course - its production, have enabled the company to grow continuously, even in crisis periods. This ability to renew and adapt, keeping pace with the technological developments of the sector, has enabled R.C.N. to remain in the forefront with regards to hot processing of glass.

R.C.N.'s main production is made up of three complete lines of furnaces for diverse needs:

- laminating furnaces;
- fusion furnaces; and
- kilns for transparent washbasins.

FURNACES

Thanks to its experience in the glass sector, R.C.N. offers avant-garde solutions and technologies for the production of sophisticated glass furnishings and customized applications, combined with the most original shapes and sizes.

lamination – no trend but a real need

R.C.N.'s new premises at Albairate, south of Milan, northern Italy

The details and results of the finished products, processed with R.C.N.'s furnaces, feature high accuracy for each and every process, so as to guarantee clients the best possible quality and level of safety as per the norms in force.

PowerLam – PVB lamination

The new *PowerLam* laminating line has been created to significantly reduce process times using EVA film. This innovative patented technology now enables to laminate also using PVB, thus providing operators the possibility of using two alternative products.

Until now, the traditional system of lamination with EVA involved the use of vacuum bags, with long process times which included loading, pre-vacuum, processing, post-vacuum cooling, and unloading. PowerLam can reduce processing times of some thicknesses by up to 70 per cent.

The PowerLam laminating line is made up of three fundamental elements:

- the motorized loading rollers, which enable the automatic transport of the glass into the chamber;
- the furnace, heated with upper and lower heating elements, controlled by plc-connected thermo-couples;
- a vacuum chamber with oil-pump and cooling systems with ventilators above and below. The opening and closing of the furnace is carried out by pistons, which guarantee the perfect closure of the furnace. All processes are controlled by an E1070 plc – with the possibility of memorizing processing cycles;
- unloading of the glass is carried out by means of motorized rollers.

The line can also be equipped with only one set of rollers for loading and unloading in the case of reduced available space.

ACCESSORIES

Silicon bags

R.C.N. also manufactures silicon bags for the lamination of flat or curved glass. Called *Silikosoft*, these bags have a patented 'pressure' closure system, which can be repaired without difficulty.

Silikosoft bags are suitable for lamination in both autoclaves as well as autoclave-free lines. Moreover, they are highly flexibly and adhere perfectly to the most complicated shapes and sized without difficulty.

A further important feature of Silikosoft bags is their considerable resistance to high temperatures and pressure.

SPEAKING TO R.C.N. ENGINEERING

Glass-Technology International went to visit R.C.N. at its new premises near Abbiategrasso, south of Milan, northern Italy, to speak to Stefano Ricchi, owner and Managing Director of the company, which now has 13 employees, divided between workshop and offices.

R.C.N. Engineering can, thanks to the larger workshop area – 2,300 square metres instead of the previous 1,000 square metres – ensure delivery of its finished machines in half the time. Not only, there is so much space that the company can work on and assemble four machines at the same time – finishing them in two months instead of the previous six.

In the new workshop area, there is also a special area that will soon be dedicated to a cold room for the storage of PVB film, ensur-

R.C.N. Engineering: lamination – no longer just a trend but a real need

OTHER FURNACES FROM R.C.N.

Lammy
The continuous search for beauty, variety, the wish to have 'not only glass', have led to the creation of vacuum system furnaces for lamination using Ethylene Vinyl Acetate (EVA). For the first time, glass can be combined with other materials such as PET or Polycarbonate, and much more: textiles, wood laminates, leaves and marble, as per the requests and imagination of glassmakers and their clients.

The Lammy line has a wide range of furnaces suitable for all production needs:

- Lammy Basic
- Lammy Basic Medium
- Lammy Basic Large
- Lammy 170/180
- Lammy 210
- Lammy 450
- Lammy System
- Lammy System 2
- Lammy System 4+4

A Lammy furnace in the workshop

Fusion and bending line
Fusion and bending furnaces are the historical products of R.C.N. and are the proof of the development of the company:

- Pony
- Mini
- Mini Double
- Eco 2000
- Eco 2500/4000
- Eco 3000/3500

Top Line
Created at the end of the 1990s, this series was an important step in the innovations of glass processing. It is a patented system, which enables to produce glass washbasins that are perfect with regards to thermo-forming, transparency and shape:

- Top 1600 Variant
- Multiplo 2000/2500
- Top Re-Firing 2000/2500

ing clients the delivery of the same film in about 24 hours.

Everything the company makes is done entirely in-house.

This means starting with the design, metalwork - structure, and assembly before delivery to the client. The only items that are manufactured out by third party companies are the metal sheets to go onto the structure.

Ricchi gave us an idea of the developments that have been carried out on the flagship product of the company: the PowerLam.

In-house metalwork

Loading section of the PowerLam with roll of EVA film to the left side

"Since the first example of this laminating furnace in 2008, there have been many changes and new patented parts and components developed.

PowerLam can process 16 furnace loads over an eight-hour work shift – the equivalent of 130 metres of glass, also operating 24/7.

Ten of these furnaces have already been sold.

And, because the new version of PowerLam is so complex, the company prefers to do everything in-house.

"In our new premises, we have a dedicated storage area for EVA film and we will, in the future, also have an area for PVB, which will ensure fast delivery times – 24 hours from order to delivery – all sizes, not only small pieces.

A view of the PowerLam under construction at R.C.N.

How are thing going with your furnaces?

Very well at the moment, because PowerLam is the furnace of the future. We have increased the production of a normal machine fourfold, using EVA film, thanks to the possibility of continuous production.

From four furnace loads of a normal machine to 16 with PowerLam – in an eight-hour shift. This is equivalent to – if we are speaking about glass measuring 2.10 x 4.50 millimetres – 10 square metres, all together about 130 metres per day (including loading and unloading time).

We have already sold 10 of these new machines.

And, at these new premises, we have groups of potential clients coming to see us and the machine up and running for trials each and every single day.

These visitors have already seen the previous versions of the machine and now want to see the most recent one. If necessary, we can also take visitors to see a previous version of the machine in real production at a client's premises about 10 kilometres from here.

Now, at these new premises, other than the storage area for EVA and PVB, we will also be setting up a laboratory and testing area for lami-nation. These tests will help eliminate problems regarding adherence, yellowing, and so on, which can occur when more economic films are used.

R.C.N. is ready to respond to all market requests, not with standard machines, but with made-to-measure solutions for both large and small glassmakers.

Silikosoft silicon bags

What are your thoughts about the present situation of the market?

I'm sure that when this crisis finally ends we will enter a period of economic boom. The world – and Italy – cannot stand still. And thanks to the inventive of Italian people, we will probably be among the first countries to come out of the crisis.

R.C.N. Engineering: **lamination – no longer just a trend but a real need**

And with economic development in mind, tempering furnaces are becoming a real need for glassmakers. Those who want to keep up with the market will, in the near future, need to have a laminating furnace – in-line if possible.

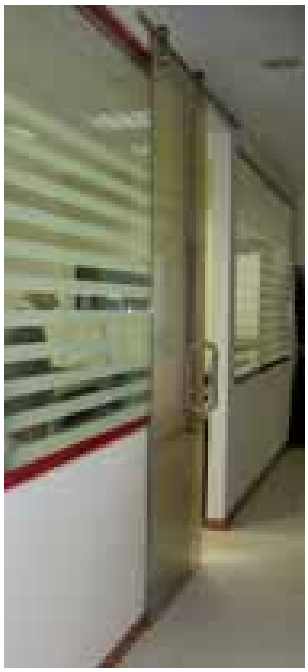
And 2011?

In my opinion, 2011 is the year of preparation for the post-crisis.

In fact, we at R.C.N. have already seen an increase in turnover, even if we are still not back to the previous levels of before the crisis. The market is still quite slow but this is mainly due to the global financial situation.

What about your silicon bags for laminating?

Our silicon bags were developed following on from bags with zip closures. On the contrary to zip-closure bags, Silikosoft bags do not deform as they have a silicon closure, which we have patented, of course, with regards to their closure. They are guaranteed for at least 5,000 hours of work. We also manufacture bags for the size requested by glassmakers and not just a standard size. Using our bags, glassmakers can also laminate curved glass items too.



PowerLam undergoing work at R.C.N.

The new offices at R.C.N.

What will be the future developments of the glass industry?

I think that the main development of the glass industry will be tempering and laminating, which is quite easy to understand, considering the present safety norm in force. We are moving more and more towards large areas of glass, special types of glass and the need for more and more insulation. ■

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Interpane: lively cultural centre made of glass

Interpane Glas Industrie AG is one of Europe's most important flat glass processors in Europe, where it manufactures high-quality glazing products. The company also has a joint venture with the Scheuten group in Osterweddingen, under the company name f | glass GmbH. Started up in 2009, this facility produces float glass, high-quality clear glass as well as semi-finished products for the solar industry.

Interpane is a medium-sized corporate group and one of the major European glass processors with a product range including high-quality coated insulating glass, sound-proofing glass, solar-control glass, safety glass and all-glass doors and panels.

Today, the Interpane group, with headquarters in Lauenförde, Germany, comprises 11 production facilities at 10 locations in Germany, Austria, and France. Interpane also produces float glass at Seingbouse in France.

THE NEED FOR ALL-YEAR ROUND PROTECTION

Helsinki is located at the same latitude as the southern tip of Greenland, on the coast of the Gulf of Finland. Here, temperatures below minus 15° Celsius are nothing unusual, and the

Photo: Interpane

In wintry Helsinki, the modern "Musiikkitalo" under construction. The façade provides effective heat insulation and solar control

Photo: LPR Arkkitehdit Oy

The spacious foyer of the Helsinki Music Hall is flooded with daylight. 3,600 sq.m. of triple-pane heat insulation glass (iplus neutral E) prevents heat losses in the winter. In the summer, ipasol (70/39) keeps air-conditioning costs down

average annual temperature of 5°C does not pamper the city's 600,000 residents with a lot of heat. This is the climate in which the new Helsinki Music Hall is currently being built – as a highly transparent glass cube. From the point of view of heat insulation this may seem daring, but LPR Architects and the façade construction specialist Normek Oy are making it possible – using triple-pane heat insulation glass from Interpane. A total of 3,600 square metres of *iplus neutral E* effectively protects the hall from the cold. Since the thermometer can also rise to above 30° in the short summer, protection from overheating plays a role as well. The planners met this challenge using *ipasol neutral (70/39)*.

The old cultural heart of Helsinki, the Finlandia Hall from the 1970s, is no longer up-to-date – it has considerable acoustic flaws. Therefore, the city and the Helsinki Music Centre Foundation jointly opted for a modern new building and started the EUR 140-million Helsinki Music Hall project. From the summer of 2011, it will accommodate 1,700 music lovers in its large concert hall and up to 400 in each of the five additional halls. Furthermore, the building will be home to the Helsinki Philharmonic Orchestra and the Finish Radio Symphony Orchestra, as well as the Sibelius Academy, a music university with around 1,500 students and 400 teachers. There is also an extensive library as well as cafés and restaurants.

CONSTRUCTION SITE BOARD

Helsinki Music Hall

Address: Musiikkitalo, Mannerheimintie 13a, FI-00100 Helsinki, Finland
Owner: City of Helsinki, Senate Properties, Yleisradio
Façade construction: Normek Oy, Finland
Architect: Laiho-Pulkkinen-Raunio Architects, Finland
Glass products: ipasol neutral 70/39, iplus neutral E
Glass processing: Interpane Glasgesellschaft, Lauenförde, Germany

GLASS ARCHITECTURE: OPEN, TRANSPARENT AND ATTRACTIVE

The basic concept of the multi-functional hall is that its openness and transparency will make it a lively cultural meeting-point for everybody. This is one of the reasons why it was erected in the popular district of Töölönlahti, close to the city centre, directly on the way from the station to "Mannerheimintie", the 5.5-kilometre magnificent main street of Helsinki. The concert halls are completely surrounded by a spacious foyer in a brightly lit cube made of triple-pane insulation glass (iplus neutral E). The clear glass and the neutral functional coatings used ensure a true-colour view from the inside outwards and protect the building from losing heat at low ambient temperatures. Large parts of the western, southern and eastern side of the glass façade are additionally equipped with an ipasol neutral (70/39) solar control coating, which prevents the hall from turning into a sauna in the summer – even though these are particularly popular in Finland.

Interpane: **lively cultural centre made of glass**

HIGH REQUIREMENTS ON CONSTRUCTION PLANNING

Planning the construction of the Helsinki Music Hall was a particularly challenging task. On the one hand, the large concert hall reaches a depth of 14 metres under the ground in order not to interrupt important existing lines of sight – the hall is located between the old Finlandia Hall and the Kiasma Museum of Contemporary Art, directly facing the Parliament of Finland. On the other hand, the ground water level near the shore of the Töölö Bay is very high, so that the underground part of the building had to be constructed as a completely waterproof 'white tank'. The busy nearby streets increased the requirements on soundproofing – vibrations and shaking of the building also had to be absorbed. Therefore, all the concert halls were 'hung' into the building by means of supporting vibration dampers – right in the middle of the large all-glass façade, which is additionally stabilized by massive 'glass fins' 60 centimetres wide and up to 6 metres high.

POINT-FIXED AND STRUCTURAL GLAZING

Visitors enter the building with its total useable floor space of 36,000 square metres via the circumferential foyer. This provides a view in all directions, even into the sky through the glass roof. Plenty of light, protection from the cold and the sun, a minimum use of steel and a stable structure nevertheless – these were the requirements on construction. Therefore, the bulk of the façade glazing is point-fixed and stabilized by large glass fins made from laminated safety glass: two thermally-toughened glass panes, 15 millimetres thick, 60 centimetres wide and up to 6 metres long (heat soak tested according to EN 14179) made of low iron clear glass and laminated with a 1.52 millimetres thin PVB film. At the entrance and in the central area of the roof, the point fixing of the glazing gives way to structural glazing because of the appearance and for functional reasons.

The structure of the façade glazing varies depending on its spatial orientation. Fourteen variants are used in total. The ground floor, for example, has the following structure on the southern, eastern and western sides of the cube:

- outer pane: 10-millimetre thermally-toughened, clear single-pane safety glass with ipasol neutral 70/39 solar control coating;
- space between the panes: 15 millimetres;
- intermediate pane: 8-millimetre thermally-toughened, clear single-pane safety glass;
- space between the panes: 15 millimetres;
- inner pane: 6.6.4-millimetre laminated clear safety glass with iplus neutral E thermal insulation coating.

Photo: Interpane

In detail: the point fixing used for the all-glass façade

In the higher sections of the façade, the inner panes consist of thermally toughened single-pane safety glass. On the northern side, the ipasol solar control coating gives way to an additional heat insulation coating (iplus neutral E). Due to the use of clear glass and the efficient functional coatings, the interior of the hall benefits from a neutral view to the outside ($R_{a,D}$ up to 97 per cent) and high daylight transmittance (T_L up to 74 per cent), as well as excellent heat insulation and solar control. In the building envelope, the solar factor varies from 34 per cent (central roof glazing) to 52 per cent (northern face of the ground floor). The thermal insulation (U_g value) reaches 0.7 W/m²K in almost all parts of the façade, which provides the building with excellent protection against heat losses. In addition, the sophisticated triple glazing absorbs noise very efficiently – up to 43 dB (R_W). ■

Creative architects need an innovative partner they can rely on. Interpane provides glass technologies with intelligent functions, clearly defined aesthetics, and the highest possible quality. ipasol is our solar control glazing; in summer it prevents overheating indoors and cuts air-conditioning costs. At the same time ipasol lets as much natural visible light as possible penetrate inside the building, bringing a better quality of life to residential, commercial, and industrial interiors.

- A broad spectrum of neutral glazing types
- A range of discreet nuances in color and tone
- Insulating glass panes up to 3210 x 6000 mm
- Product variants each ideally adapted for a particular energy transmission class
- Many possibilities for individual design, e.g. in combination with screen printing, digital printing, or "ipachrome Design" coating
- Highly efficient production of standard dimensions (coated single panes of normal glass) for further processing as insulating glass
- Excellent references from all over the world

ipasol sky 30/17

Light transmittance 30%

Solar factor 17%

Shading coefficient 0.21/0.20*

*** acc. EN / ASHRAE / NFRC**

ipasol

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Bystronic glass: revolutionary production technology

The Bystronic glass Technology Center Bystronic Armatec has launched a revolutionary pre-nip system for the manufacture of high quality laminated glasses of all kinds: the *eco'convect* - a completely new heating and press system that works with significantly reduced cycle times while being suitable also for shaped formats and multifunctional glass types.

"Our innovative technology enables a homogeneous heat input, which is clear to see in the quality of the end product," explains Rupert Wellner, Product Manager at Bystronic Armatec, who was heavily involved in the development of the plant.

The eco'convect allows highly-reflective, coated glasses to be processed together with float glass as with strengthened glass and tempered glasses. The new core of the laminated glass production processes all common film types such as PVB, EVA and SentryGlas® plus (SGP) and easily creates complex glass constructions. At the end of January, a number of exclusively invited medium-sized and international glass processors were given the chance to be convinced about the innovative technology and its crystal clear results on-site in Gunzenhausen.

"The response from the interested parties was unanimously positive," reports Bystronic Armatec Managing Director Bernd Bedner, who is overjoyed that he was able to inspire

potential customers with the new concept. The visitors were particularly impressed by the dual-circuit control of the convectional heating and the simple operation of the eco'convect which they described as "the future of laminated glass production".

UP TO 50 PER CENT ENERGY SAVINGS

Product Manager Rupert Wellner explains the basis of the immense technological superiority: "The eco'convect is part of a modular concept that offers individual, customer-specific solutions in various stages. In all cases, a dynamic high performance convection system takes care of the homogeneous glass heating." The most differing glass constructions are quickly and effectively heated through the dynamic heat transfer during the heating process. "Thanks to our innovative radiant heater technology, the eco'convect consumes up to 50 per cent less energy than comparable machines," explains Wellner. After heating, the press system creates an equally high, uniform pressure which therefore ensures an ideal ventilation of the glass-film-glass packages. The new profile of the presses is especially suitable for shaped formats and multifunctional glasses. Complex glass constructions can easily be reproduced via the Laminoptic formulation management system. "As a result, things that pose a challenge to other machines can be carried out quickly and easily on the eco'convect," says Wellner. ■

ECO'CONVECT

NEW PRODUCTION TECHNOLOGY FOR THE MANUFACTURE OF HIGH QUALITY LAMINATED GLASS TYPES

- Significantly reduced cycle times
- Processing of shaped formats and multifunctional glasses
- Efficient laminating of highly reflective, coated glasses together with float glass, heat strengthened glass and tempered glass
- Processing of all common film types
- Easy design of complex glass constructions
- Simple reproduction of all glass constructions through formulaic database (Laminoptic)
- Individual, tailor-made customer solutions thanks to modular concept
- Very well suitable also for the laminating of photovoltaics thin-film modules

REVOLUTIONARY HEATING AND PRESS SYSTEM

DYNAMIC HEATING SYSTEM

- High performance convection system for a homogeneous glass heating
- New radiant heater technology for a significantly reduced energy consumption
- Optimal heat transfer during warm through for effective and fast heating of different glass constructions

EFFECTIVE PRESS SYSTEM

- High and constant pressure generation for optimum ventilation of glass constructions
- Precise electromechanical pressing
- New press profile especially designed for shaped formats and multifunctional glasses
- Improvement in energy efficiency due to release of compressed air

Bystronic glass

Bystronic glass
www.bystronic-glass.com

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PV TECHNOLOGY

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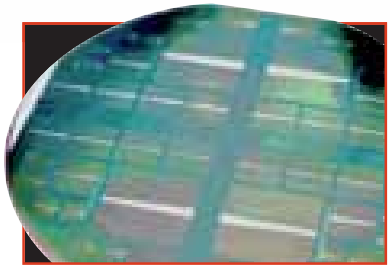
Il prototipo di radiometro Dcr realizzato all'Enea di Portici

TERMO FOTOVOLTAICO
Come sfruttare i fotoni emessi da una sorgente di calore



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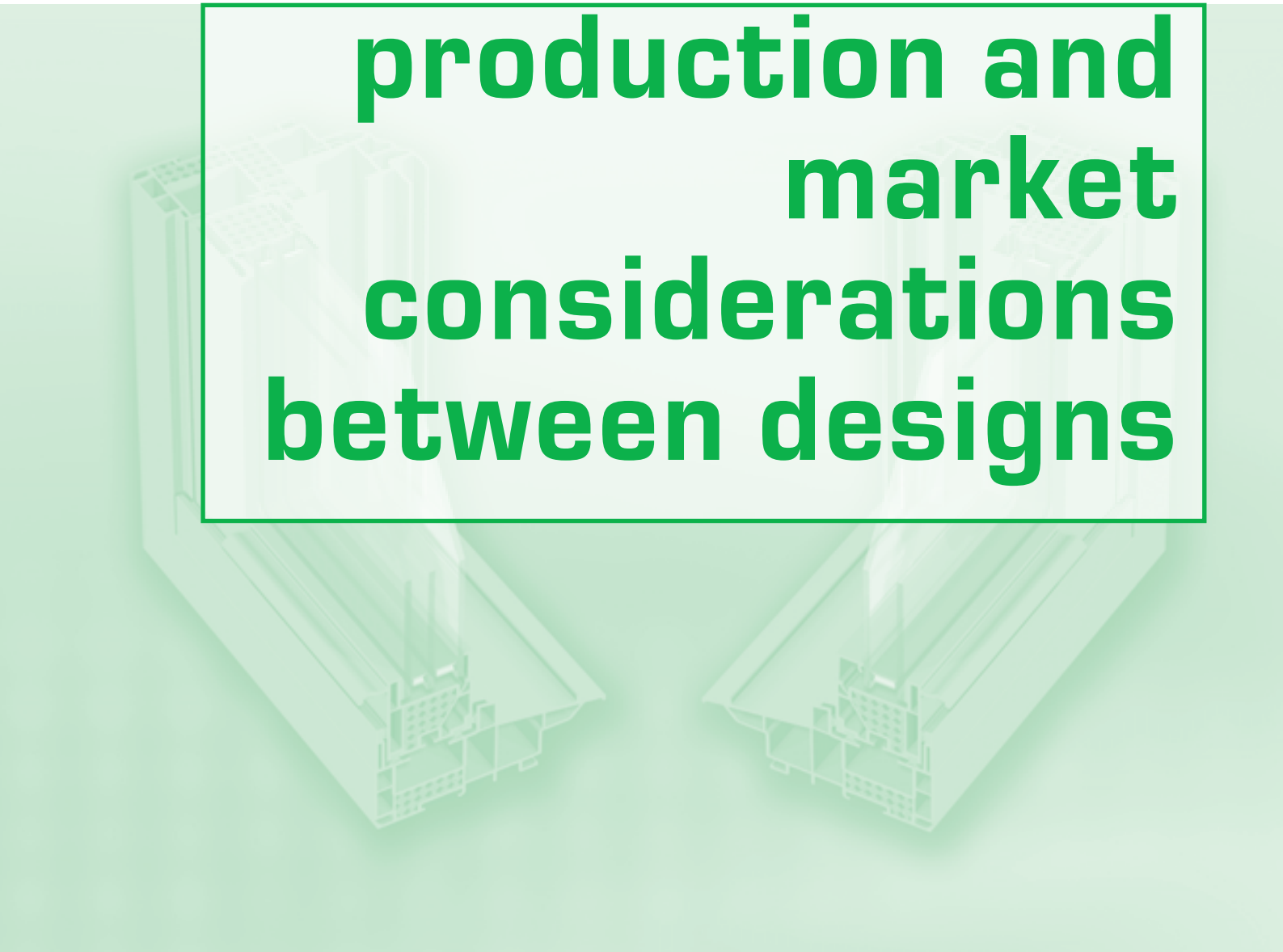
I.G. Units

Quanex Building Products: production and market considerations between designs



Ric Jackson - Director of Marketing
QUANEX BUILDING PRODUCTS ENGINEERED PRODUCTS GROUP

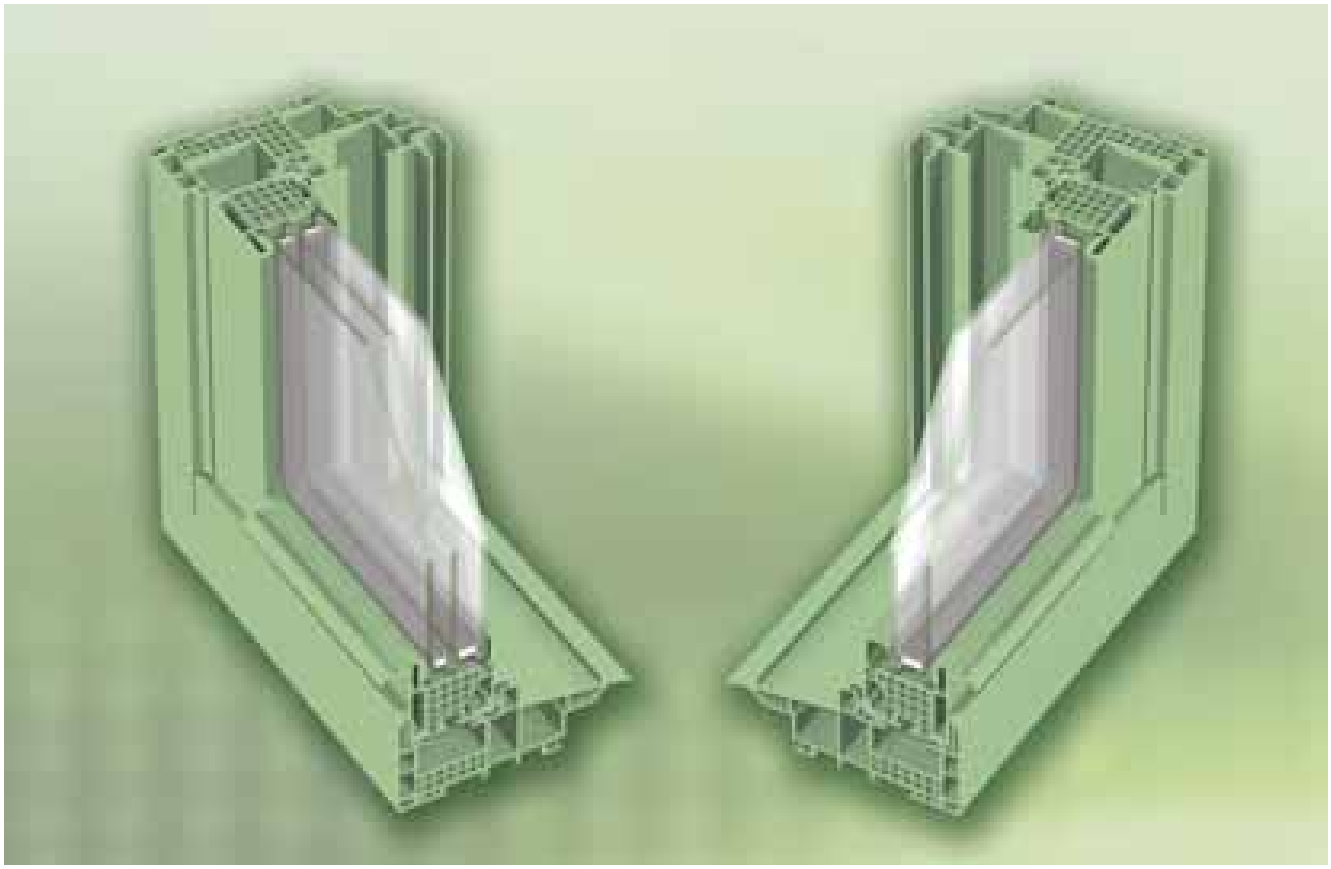
Quanex Building Products: **production and market considerations between designs**

Energy efficiency – an ever more important and continuously developing request for homeowners and builders. Present demands are moving toward R-5 thermal resistance values and, therefore, manufacturers of windows need to have the technologies required to reach these high standards. In this article, Quanex shows us how R-5 values can be obtained without the need for additional materials, but by using a combination of low-E coating and thermally efficient components.

The global window industry is on a charted path toward improved energy efficiency. In the United States, for example, both new construction and remodel and replacement markets are moving toward common efficiency standards. These markets are converging near a future recommended R-5 rating – or U-values of 0.22 for operable windows and 0.20 for non-operable windows. This convergence and other market factors are driving manufacturers to embrace high-performance technologies that provide more efficient windows for consumers.

The growing demand for R-5 windows has initiated a surge in triple-pane window designs

Increasingly stringent energy efficiency standards are forcing window manufacturers to consider the best way to achieve high-performance ratings between triple- and double-pane designs



(triples) coming to market. However, contrary to popular thought, manufacturers are able to meet R-5 demands without investing in the additional raw materials and production reconfigurations required to add triples to their manufacturing operations. Instead, they can achieve R-5 values in double-pane windows (doubles) by using a combination of low-emissivity (low-E) coatings and thermally efficient components.

Therein lies a dilemma between which R-5 design to produce. This article will examine the logistical inputs manufacturers need to contemplate when making that decision.

DESIGN CONSIDERATIONS

With new and shifting standards pushing window performance ratings higher, insulating glass unit (IGU) fabricators and window manufacturers need to determine how to best meet market demands. That process may involve rethinking their selection of window components to include more advanced technologies that offer higher thermal performance. When making component and design decisions, these manufacturers ultimately have one goal in mind: to build units in the most efficient manner possible to achieve a desired performance rating, such as R-5.

That's a tall order, considering the wide array of component options – spacers, glass, framing systems, gas filling and more – and how they interact to affect total window performance. Manufacturers can produce R-5 triples using a mixture of performance-rated components, scaling back the efficiency of certain components in favour of others that provide maximum U-value improvements. Alternatively, they may employ a combination of high-performance components to achieve R-5 ratings in a double. Doing so may be more economical in the long run compared to retooling traditional manufacturing operations to accommodate triples. However, manufacturers also need to consider the likelihood that future energy efficiency standards and consumer demand will go beyond R-5, including ratings that are harder to achieve economically in a double, if at all. Therefore, manufacturers opting to meet today's requirements in a double may be delaying an inevitable transition to triples production in the future.

Let's examine what goes into each design to achieve R-5 ratings.

Triples

Reaching the R-5 target for triples is relatively easy. The extra airspace alone creates an additional barrier to heat transfer and enables improved thermal performance. It also gives manufacturers another option for gas filling. In addition, the extra glass lite provides additional surfaces for low-E coatings.

By specifying low-conductivity spacers, gas filling, thermally enhanced frames and two lites of very low-E glass, manufacturers can produce triples with U-values as low as 0.15 (R-7). Each component adds cost, but choosing the optimal combination can reduce the total manufactured cost.

For example, a triple with high-performance spacer and frame systems can meet the 0.22 U-value target without using krypton, as long as manufacturers adhere to the 3-millimetre grid proximity rule. Triples should have a minimum air space of 3 millimetres between internal muntin bars and the glass to minimize heat transfer from one lite through the grid to the opposite lite. Because of frame width limitations, manufacturers may need to employ an offset triple design in which one glazing cavity is wider than the other. Neglecting the 3-millimetre grid proximity rule may force manufacturers to use krypton to achieve R-5 values, which significantly increases costs.

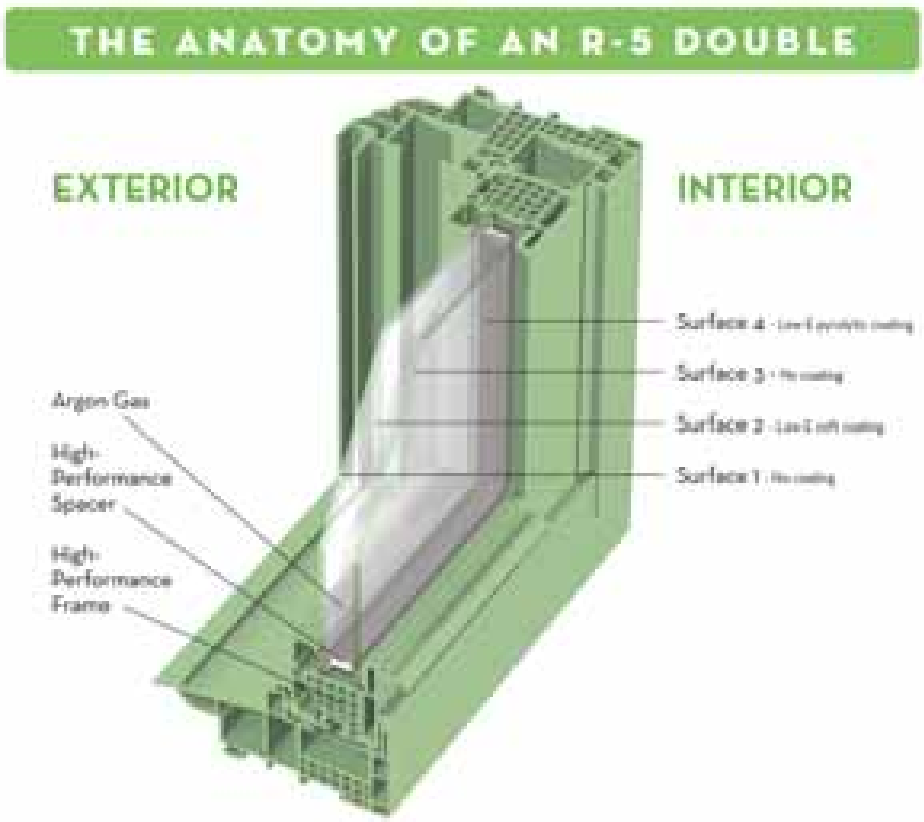
Doubles

Even when using krypton, manufacturers are not able to realize R-5 values in a traditional double. Figure 1 shows that the best possible centre-of-glass (COG) U-value is just above 0.20 in a double featuring a 0.018 low-E coating on glass Surface 2, krypton gas filling and high-performance spacer and frame systems. That COG U-value results in a total window U-value of 0.23 – or R-4.

However, by applying low-E coatings to two of the glass surfaces in a double (the same 0.018 low-E coating on Surface 2 and a pyrolytic low-E coating on Surface 4), manufacturers are able to achieve R-5 values using lesser expensive argon gas.

The design reduces COG U-values to 0.20,

Quanex Building Products: **production and market considerations between designs**



The Anatomy of an R-5 Double Source: Quanex Building Products

resulting in an R-5 (0.22 U-value) window. Applying this same concept to argon-filled triples – with 0.018 low-E coatings on Surfaces 2 and 4 and a pyrolytic coating on Surface 6 – drops COG U-values to 0.10, yielding an R-7 (0.15 U-value) window. Naturally, krypton provides further COG U-value reductions, but with added cost.

One potential trade-off in this design relates to surface temperature. The coating on Surface 4 reflects heat back into the home, minimizing the amount of radiant heat passing through to warm the interior glass surface. The cooler interior surface may increase the potential for condensation inside the home.

LOGISTICAL CONSIDERATIONS

The anatomy differences between R-5 triples and doubles introduce a variety of factors manufacturers must consider when determining which design will work best for their operations. They need to compare the cumulative costs of added material and processing requirements between the two designs, some of which include:

Glass

Obviously, triples require an extra lite of glass compared to doubles. That means extra raw materials, storage, handling, washing and processing, each of which represents potential cost increases. Manufacturing R-5 doubles also adds cost in terms of coatings. Therefore, a manufacturer needs to compare the cost differential between the two options. Another consideration with triples is that the extra lite gives manufacturers two additional coating surfaces, which enables room for further improved thermal efficiency – although, at an added expense.

Spacers

With triples, manufacturers essentially double their spacer costs compared to double-pane windows. In addition, the extra spacer profile in

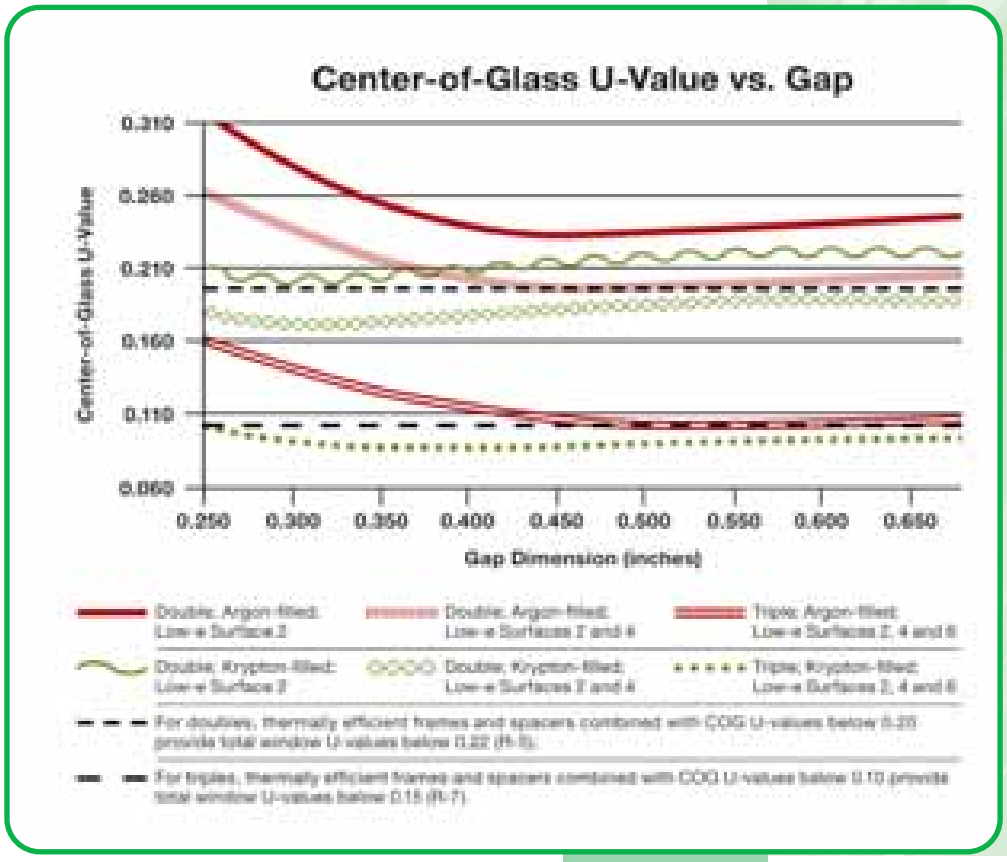


Figure 1. Centre of Glass U-value vs. Gap Source: Quanex Building Products (Simulations performed ... per NFRC 100)

a triple creates an extra moisture vapour transmission path, which is an additional point of potential failure in each window. Whether producing doubles or triples, manufacturers should consider the thermal efficiency advantages of using spacer systems that do not contain metal. Moving from the least efficient metal spacer to the most efficient spacer in a double can yield about a 0.04 U-value improvement.

Gas filling

Filling airspaces with gas is a necessity in a double to push it over the R-5 threshold, but not necessarily in a triple. However, the low cost-to-thermal-benefit ratio of argon makes it a desirable addition to most production lines. Argon may enable a 0.04 U-value improvement in a double for as little as one per cent of the total raw material cost of a window. Krypton and xenon offer even greater U-value improvements, but their high cost makes them harder to justify. An advantage of gas filling in a triple is that manufacturers can fill both airspaces for optimal thermal performance.

Framing system

High-performance vinyl framing systems, including those with integral insulated air-cell cores or foam filling, offer potential U-value savings up to 0.04 at a price premium. However, with vinyl windows, producing a double with a high-performance frame may be less expensive than manufacturing a triple hollow-framed window due to potential retooling costs associated with redesigning the frame glazing pocket to accommodate a thicker IGU. Triples may also require additional frame material and reinforcements to support the extra weight of the heavier IGU. In wood frames, hybrid technologies that combine wood with higher-performing foam-filled PVC or pultruded fiberglass help to improve thermal performance. However, it remains to be seen if R-5 values can be achieved in a wood double.

Hardware

Because of their added weight, triples often require heavier-grade hardware compared to doubles. For example, manufacturers may need to specify heavier-duty spring balances for double-hung triples and stronger arms and hinges for triple casement windows.

Transportation

Manufacturers must also consider any extra packaging and shipping costs associated with the heavier weight of triples. Heavier units may require more robust packaging, and manufacturers may endure higher fuel costs due to the added weight and the potential to fit fewer units on a truck.

Production

Finally, manufacturers may need to reconfigure their operations to accommodate triples production as the added raw materials create

Quanex Building Products: production and market considerations between designs

AUTHOR BIO

Ric Jackson is director of marketing for Quanex Building Products Engineered Products Group. Ric is responsible for the company's global marketing efforts, and he directs all brand planning, product positioning and marketing of the company's flexible spacer systems and other insulating glass products and accessories. He is a member of the National Fenestration Rating Council (NFRC) and the Canadian Window and Door Manufacturers Association (CWDMA). Ric can be reached at Ric.Jackson@QuanexEPG.com.

new staging and workflow challenges.

For example, the extra glass inventory required at the beginning of the line and the reduction in the number of IGUs that fit on a cart may require additional carts and storage space throughout a facility.

FINAL CONSIDERATIONS

It may take years for R-5 windows to become the standard for energy-efficient windows. However, their growing acceptance in the marketplace is driving more manufacturers to add these high-performance designs to their product lines. Doing so creates a point of differentiation that could potentially increase one's success rate and market share.

Today's homeowners are realizing that high-performance windows are a worthwhile investment to ensure energy savings and reduced utility bills. Some may have the perception that a triple is necessary to achieve high efficiency, and manufacturers and retailers may be able to use that opinion to their advantage when developing marketing programs. However, sellers should primarily focus on a window's performance rating.

How manufacturers arrive at the best performance ratings in the most efficient manner possible is up for debate. Both R-5 triples and R-5 doubles are viable options. It's up to manufacturers to determine which design – or both – is right for their operations. ■

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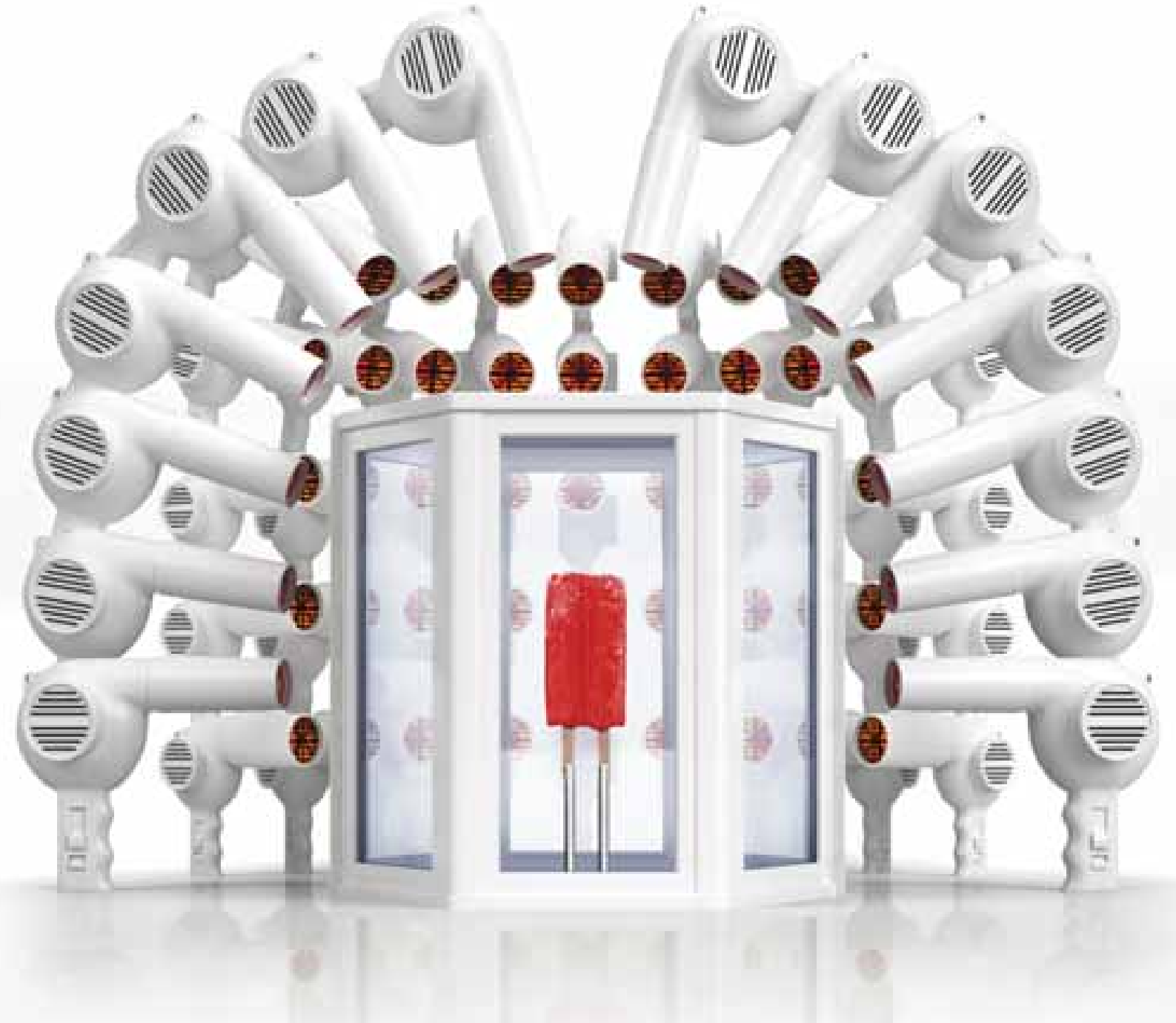

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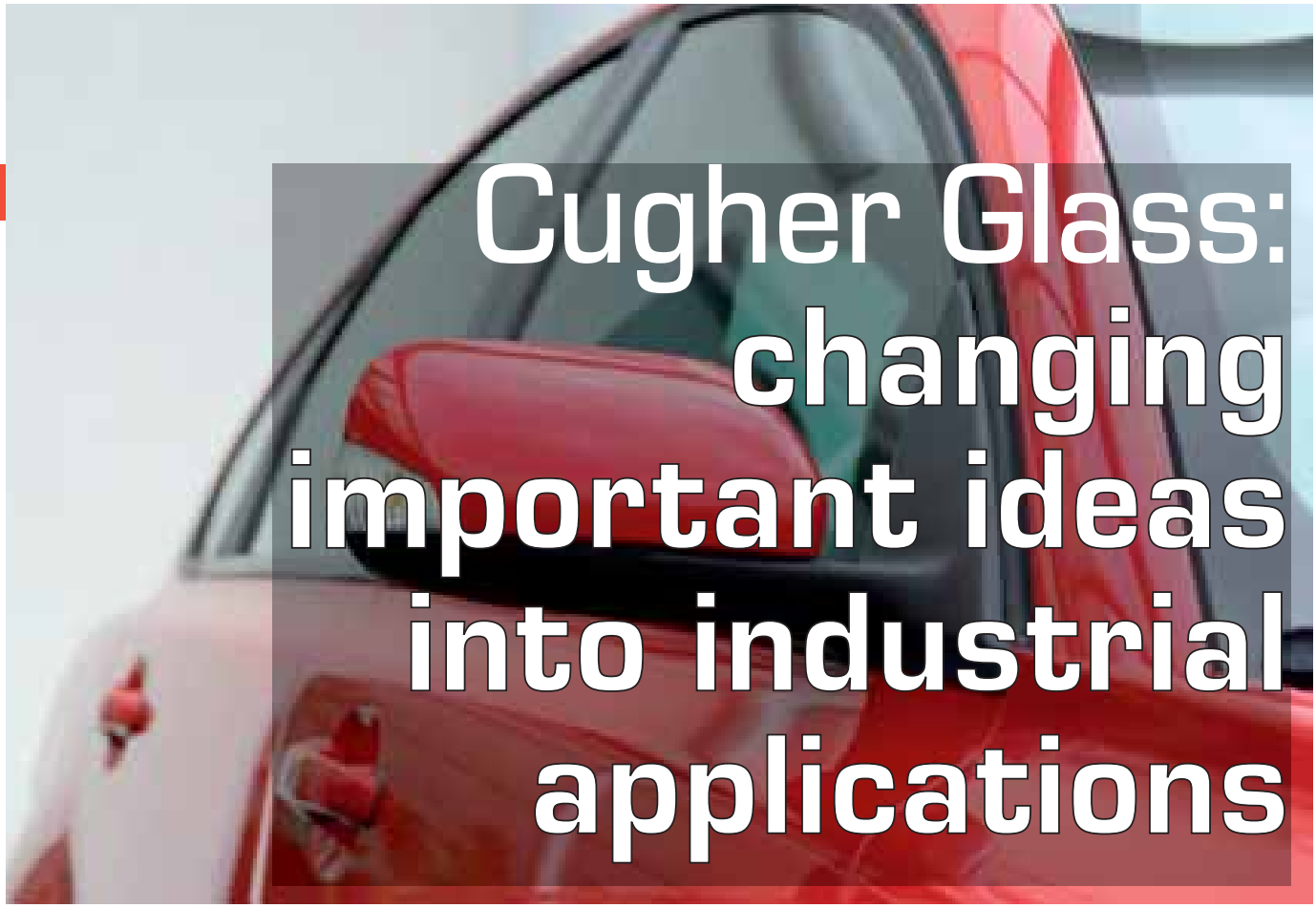


Cugher Glass: changing important ideas into industrial applications

TODAY'S MARKET AND REQUESTS

The present market is influenced by demand and, therefore, manufacturing companies have had to change their way of promoting themselves and their activities, adapting their processes and technologies. This phenomenon has also had a strong influence in industries supporting the automotive sector which, as of the 1990s, has been, and is, continuously moving more and more towards just-in-time support technologies. These technologies, in fact, enable to produce small and diversified batches, supporting processes that are ever more independent from specialized personnel.

"The reasons behind these changes in processes," says Cugher Glass' Marketing Manager Marco Dal Monte, "are to be seen first of all in the need to reduce fixed assets in a much faster moving market, and companies must therefore try to produce only what is needed, to avoid obsolescence and waste products and material, maintaining a correct ratio between the risk costs and advantages of serial production. Another aspect that is pushing towards automation is the continuously increasing cost of labour in Europe, as well as the difficulty in finding qualified personnel in emerging areas, where production is often delocalized. Investment outlooks are also changing: in the past, machines were needed to carry out the same type of processing for at least 10 years, whereas now they must be able to adapt to the production changes imposed by the automotive market, which aims at important aesthetic innovations, such as panoramic glazing and antennas integrated in the glass, to re-gain market shares."

HIGH AUTOMATION

High levels of automation of production lines mean integration and communication between complex systems, manufactured and supplied by different companies, often based on different continents. "One of the biggest worries of our clients of the industrial sector regards the risk of delays in start-up and possible down times. Even a single defected element could compromise the entire manufacturing line, causing a hold-up in production, with

Being and remaining competitive in today's fast moving glass market is never easy, and even more so if we speak about the special glass types and sizes requested by the automotive sector. Time – needed for production and maintenance – and levels of automation becoming more and more complex, are the basic features that machinery manufacturers have to deal with. Cugher Glass is no exception!

consequent disastrous economic effects. On complex automatic lines the real problem is, in fact, not represented by the breakdown, which is contemplated and foreseeable, but by the difficulty of identifying it, and therefore to enable the correct supplier and company to intervene. If a glass conveyor is not working it will block the entire line. And if the conveyor is not working, it may not communicating correctly with the line, or is it the following machine that is not accepting the glass? In this hypothetical situation, there are two different types of hardware, as well as network and management software – four elements probably from four different suppliers. This multiple-responsibility aspect can cause delays of many hours in intervention, with direct and secondary damage to production, and the consequent lack of delivery to clients. Many important glassmakers for the automotive sector who come to Cugher Glass have already assessed the advantages of having only one person to work and deal with, knowing that we have the technical responsibility of coordinating the start-up and control of the entire production line, together with the client's staff."

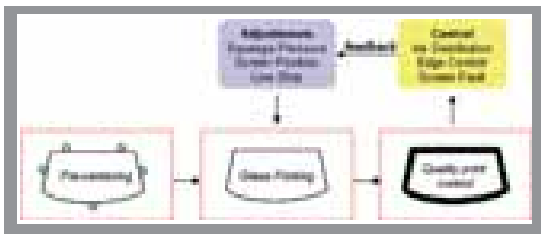
BEING AND REMAINING COMPETITIVE

"The competitiveness of a company today is calculated mainly on its gross EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization). This is closely connected to the capability of manufacturing while containing costs, which, in European countries, is greatly affected by the cost of labour, and which, on the other hand, has very little effect in some Asian countries. Diverse distribution of costs can cause differences in the organization of production and, therefore, the level of automation needed by glassmakers today."

To make production efficient and effective we must have the right technologies and, where possible, obtain the highest levels of automation and integration of production lines.

A Cugher Glass screen printing machine of the 1970s

Cugher Glass: changing important ideas into industrial applications



IMPORTANT IDEAS AND INDUSTRIAL APPLICATIONS

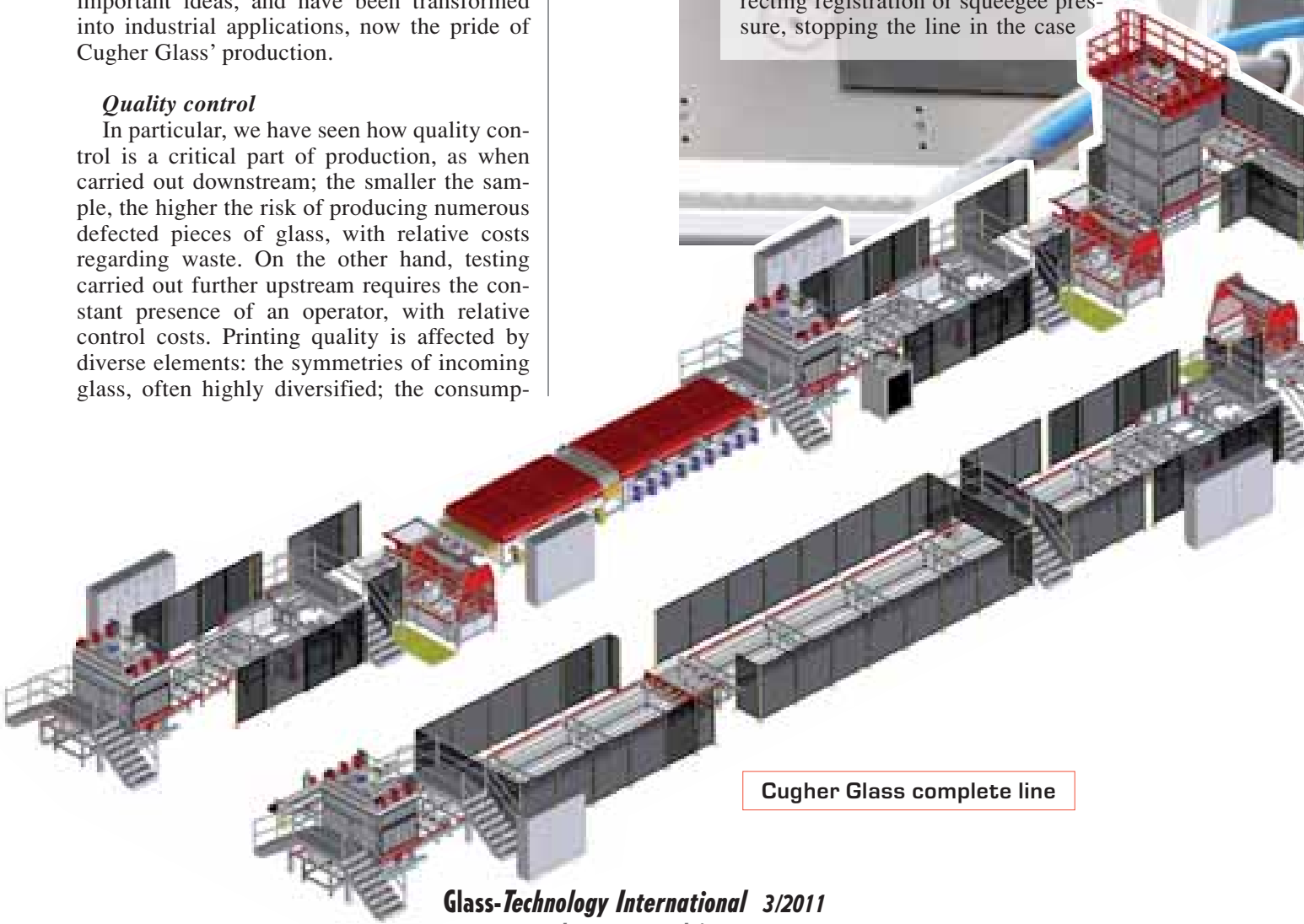
"For the last six years, at Cugher Glass, we have been working in close contact with the main manufacturers of glass for the automotive market, observing the difficulties that operators have to deal with on the production line, and with production managers with regards to the planning and organization of activities. This has enabled us to identify essential details, some of which have led to important ideas, and have been transformed into industrial applications, now the pride of Cugher Glass' production.

Quality control

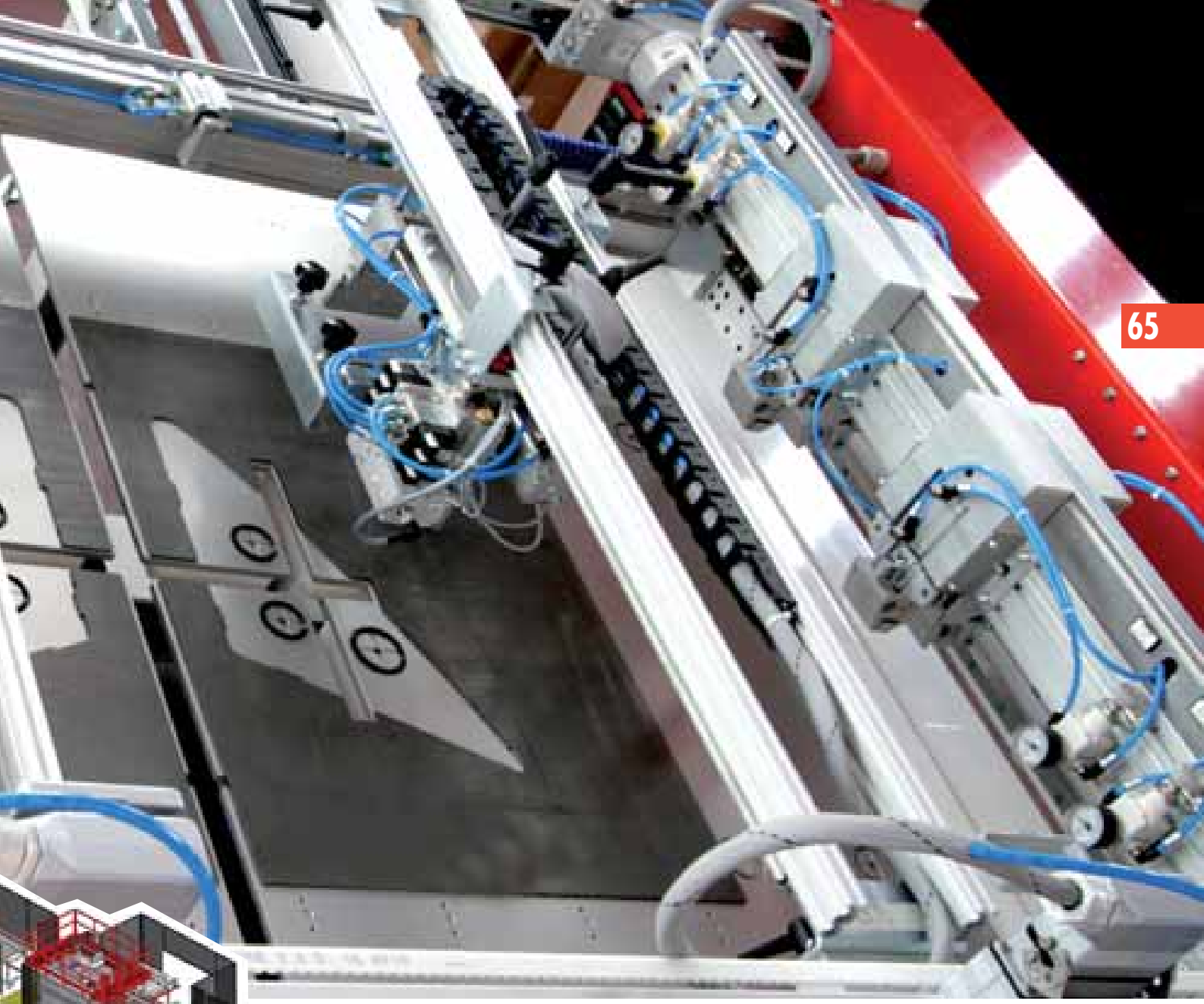
In particular, we have seen how quality control is a critical part of production, as when carried out downstream; the smaller the sample, the higher the risk of producing numerous defected pieces of glass, with relative costs regarding waste. On the other hand, testing carried out further upstream requires the constant presence of an operator, with relative control costs. Printing quality is affected by diverse elements: the symmetries of incoming glass, often highly diversified; the consumption of the printing screen, which is subject to high mechanical stress; the correct supply of ink, a well as cleanliness of the screen.

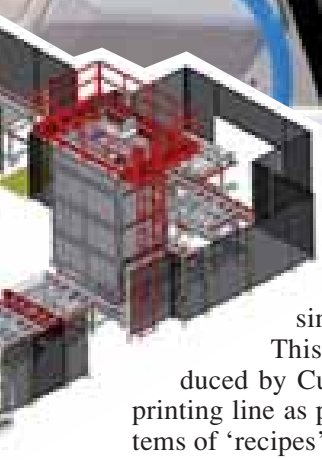
Edge to Edge technology

After the introduction of Edge to Edge technology, for in-line cleaning of the edge of the image to be printed, with the optimized use of high-resolution optical vision technologies, we have developed an application able to observe the printed glass comparing it to a reference image. The system can identify and assess different parameters, such as the thickness of the ink, position compared to the centre and edges and the presence of ink from the opposite side of the glass, which is a indication of a defect in the screen. By means of the detection of all the parameters of each printed glass, we are able to instruct the machine to react automatically and intelligently in correcting registration or squeegee pressure, stopping the line in the case



Cugher Glass complete line





of breakage of the screen, so as to limit the damage to a single defected glass.

This level of automation introduced by Cugher, enables to organize the printing line as per a highly sophisticated systems of 'recipes', which memorizes all parameters connected to the type and quality of glass requested. This means, in the future, that even operators without particular skills will be able to carry out a complete changeover of production and start-up in less that 15 minutes, with guaranteed printing qua-lity and without the need for on-line controls.

ONGOING STUDIES AND DEVELOPMENT

A further element under study is the effect of energy costs on the diverse production phases, which has convinced us to develop a new line of high-efficiency drying furnaces, both for IR and UV paints, able to exploit to the utmost the speed of production lines, also with low applied power, and even with outgoing glass with temperatures suitable for consequent in-line printing, for multi-colour applications. ■

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Technoform: improving insulating performace and saving energy by creating 'warm edges'

FROM THE 1990s TO THE PRESENT DAY

In 1995, working in cooperation with a plate glass manufacturer, *Technoform Caprano + Brunnhofer GmbH & Co. KG* started to develop a spacer for the so-called 'warm edge', a decisive element in the production of laminated insulating glass. This development work included the construction of production technology as well as market analysis of the insulating glass industry. The result was a new marketable Technoform product: the *TGI®-Spacer*, which has really established a name for itself as a spacer for the warm edge in this growing market segment.

In 1998, Technoform Glass Insulation Systems GmbH (TGI®) was founded as an independent company within the global Technoform Group, initially purely as a sales office. It forms part of the Technoform Group, which has been among the world's most renowned producers in

At the beginning of the 1990s, continuous observation of the market and analysis of the window and façade sector provided the decisive impetus to develop thermally optimized spacers. And during these years, the company presented in this article – Technoform – was set up – and has since developed into a globally-present company supplying a complete range of spacers and muntin bars.

the field of plastics extrusion for many years. With numerous production sites and sales offices, it has an international presence.

In 2001, the first production lines for TGI®-Spacers were put into operation at the premises of an affiliate company within the Technoform Group.

In 2003, the facilities were moved from Fuldabrück to their own premises in Kassel, uniting sales and production.

In 2004, the company name was changed to Technoform Glass Insulation GmbH.

In 2005, international sales structures were established and expanded. In the meantime, TGI® is represented by its own sales offices and sales partners all over Europe, as well as in Russia, the Middle East, China, Asia and the United States.

In 2006, the TGI® Group opened its second US production facility in Twinsburg, Ohio.

In 2008, the new, more workable generation of TGI®-Spacers and thermally optimized TGI®-Muntin bars were introduced onto the market.

Technoform: improving insulating performace and saving energy by creating 'warm edges'

Worldwide connections - worldwide networking

- Besides TGI®, the following companies belong to the Technoform Group:
- *Technoform Bautec* corporations with 17 branch offices worldwide - profile solutions
- *Technoform Kunststoffprofile GmbH* (TKP), Lohfelden, Germany - targeted solutions, maximum precision and speed
- *Technoform Extrusion Tooling GmbH* (TET), Fuldabrück, Germany - maximum precision and maximum speed of delivery

As a manufacturer and supplier of thermally optimized spacers and muntin bar systems, Technoform Glass Insulation GmbH is a global development partner and the company to contact for architects, planners, and insulated glazing and window manufacturers. TGI® is constantly expanding its international sales and distribution structures. Since the most recent phase of expansion, the company is now represented in Finland, Estonia, Lithuania and Latvia.

TGI®-SPACERS - GIVING GLASS BETTER INSULATION

"What is a warm edge?"

The term warm edge is used to describe the thermal interaction between the pane of glass, window frame and spacer at the sealed edge of a window made of laminated insulating glass. At northern latitudes, if

TGI® PRESENTS NEW SPACERS

Since its launch in 2001, the TGI®-Spacer has been a never-ending story of success. And, at the 2010 edition of *glasstec*, Technoform Glass Insulation GmbH presented its new warm edge TGI®-Spacer.

IMPROVED PRODUCT PROPERTIES

The new TGI®-Spacer features numerous improved and highly convincing product properties. The use of a newly formulated stainless steel, for instance, ensures lower thermal conductivity and higher stability. This plays a decisive role in the further improvement of the energy efficiency of windowpanes – an important aspect in an age of rapidly dwindling resources. Other factors such as improved forming properties and an optimized memory effect ensure that the new TGI®-Spacers are even easier to use in the manufacturing process.

INNOVATIVE COMBINATION OF MATERIALS

In addition to new stainless steel, the construction also includes a polypropylene plastic that is well known for its low thermal conductivity, both as a reinforcing material and to provide better thermal insulation. This ideal symbiosis of stainless steel and polypropylene simultaneously enables extremely low heat transmission at the warm edge of insulating glass panes. With the combination of these two materials, Technoform Glass Insulation GmbH has realized a spacer for thermal insulation that shows low, warm-edge Psi values for a wide range of frame materials and, in turn, outstanding U w values. The UV resistance of the TGI®-Spacers has been tested and fulfils the requirements of EN 1279-2, -3 and -6 standards, and therefore offers the greatest-possible quality and security in the production of multiple-pane insulating glass.

THERMALLY OPTIMIZED ALL-ROUND SYSTEMS

The TGI®-System is complemented by a comprehensive muntin bar system precisely harmonized with the spacers. The appearance of all visible elements of the muntin bar system known as the 'Wiener Sprosse' perfectly matches the TGI®-Spacers. At the same time, the polypropylene profile of the TGI®-muntin bar, reinforced by glass fibre, does not react with sealants and can be seamlessly integrated into the manufacturing process. A connecting system perfectly matched to the profile width of the spacers is also available for connecting profiles. The force-fitted connection with the TGI®-Spacer in the composite edge is effected by press-in plugs inserted and fixed with industry-typical methods (impact or screw insertion). TGI® currently offers muntin bars in six different sizes. The thermally optimized "Wiener Sprosse" bars from TGI® are available in the colours light grey (RAL 7035), dark grey (RAL 7040) and black (RAL 9005).

the energy losses between the inside and outside of the window remain low, this is referred to as a warm edge due to the outdoor temperature, which is usually low.

Regulation of the interior temperature independent of the exterior temperature generally contributes significantly towards the energy savings to be made from window and glazing bar systems. The insulating quality of the spacer used plays an important role here. The TGI®-Spacer is classified as a warm edge in accordance with DIN V 4108-4.

What are the benefits of a warm edge?

Warm edges significantly reduce the circulation of air in the vicinity of the window.

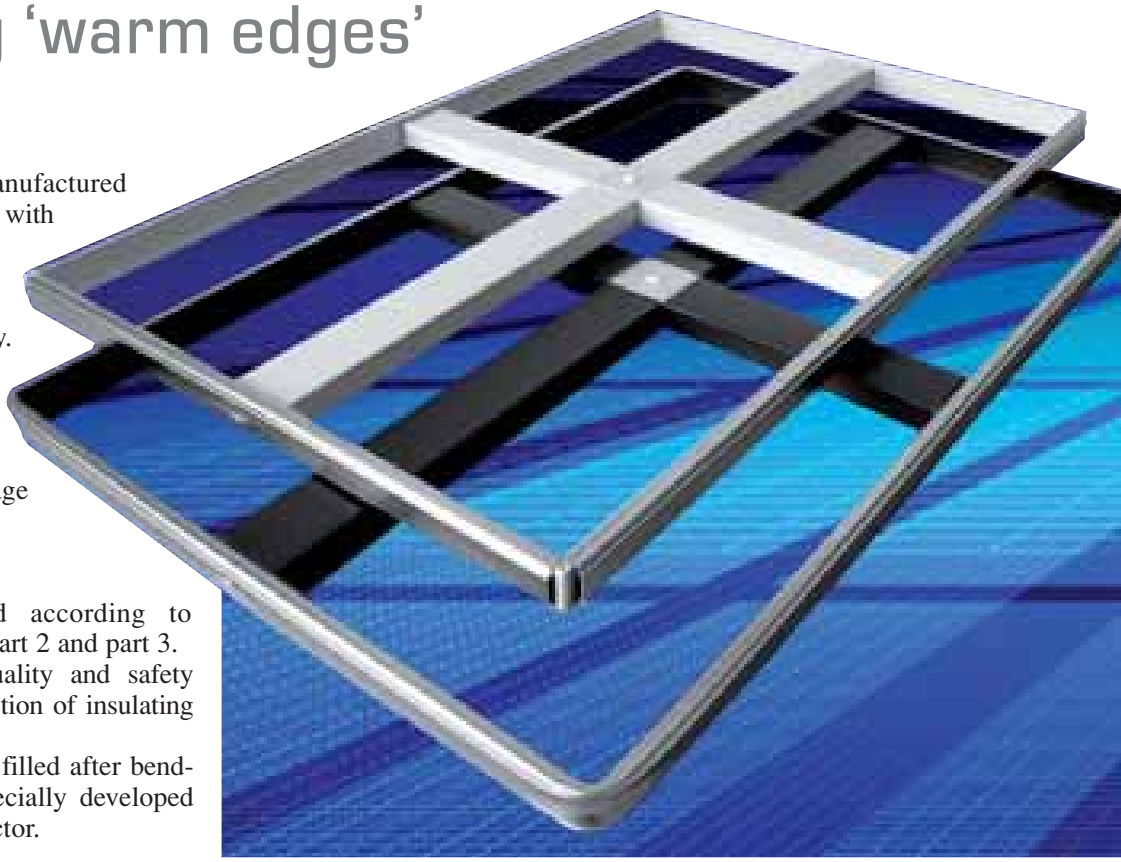
The directly visible advantage of a warm edge is the reduction in condensation, which forms at the edge of the window. The improved insulating performance of the spacer reduces the amount of condensation water forming on the inside edge of the window frame thereby preventing the formation of mould, changes in colour and water spots on the window frame.

These advantages are reflected in the increased life of the window. At the same time, opportunities to save energy are utilized which means that heating costs are reduced.

The TGI®-Spacer is a spacer for the warm edge which offers extremely low Psi values for the glass edge and thus excellent Uw values, whatever frame material is used.

In addition to the thermal advantages of the TGI®-Spacer, its high level of workability is another criterion which should not be underestimated. You can switch from conventional spacers to the TGI®-Spacer at any time without having to make any significant modifications to your bending and filling equipment. An advantage which favours the use of TGI®-Spacers because the good price/performance ratio remains unaffected.

Technoform: improving insulating performace and saving energy by creating 'warm edges'



TGI®-Spacers are manufactured using stainless steel combined with a high quality plastic polypropylene as a strengthening and insulating material due to its low heat conductivity.

The perfect symbiosis of both materials allows only a very low heat transfer while guaranteeing high tightness against gas leakage and humidity.

Quality and safety

TGI®-Spacers are tested according to European standard EN1279 part 2 and part 3.

This means that high quality and safety are guaranteed for the production of insulating glass units.

The desiccant needs to be filled after bending. TGI® offers its own specially developed and optimally adapted connector.

The advantages:

- low heat conductivity resulting in very good insulation properties;
- distinctly improved Uw values;
- higher surface temperatures of the inside glass edge;
- large reduction of condensation and mould;
- significant reduction in air circulation near the window;
- good adhesion for butyl wire and sealant material due to the mineral surface of the metal film;
- excellent optical characteristics.

Versatility

TGI®-Spacers are bendable and processable on all standard bending machines. Whether angular or round, any shape is possible, with the following widths: 8, 10, 12, 14, 15, 16, 18, 20, 22 and 24 mm, and different colours (RAL 8003, RAL 8016, RAL 9005, RAL 7035, RAL 7040, RAL 9016) are available.

Spacers and muntin bars from TGI®

The *TGI®-Muntin bar* - which can be positioned in the space within the insulating glass unit without any direct contact with the glass - is identical to the TGI®-Spacer in terms of its external appearance. This will give insulating glass manufacturers a complete thermally optimized system, which will satisfy the rigorous requirements regarding thermal insulation which apply both today and in the future. The thermal bond between TGI®-Muntin bar and TGI®-Spacer in the window system is guaranteed.

Just like the TGI®-Spacer, polypropylene ensures outstanding thermal insulation as with the muntin bar on account of its low thermal conductivity. The lambda value of the innovative TGI®-Muntin bar - a value which is of definitive importance to the thermal conductivity of materials - is an impressive 0.25 W/mK. The thermally optimized TGI®-Muntin bar is available in the most popular colours: light grey (RAL 7035), dark grey (RAL 7040) and black (RAL 9005). ■

TECHNOFORM GLASSINSULATION

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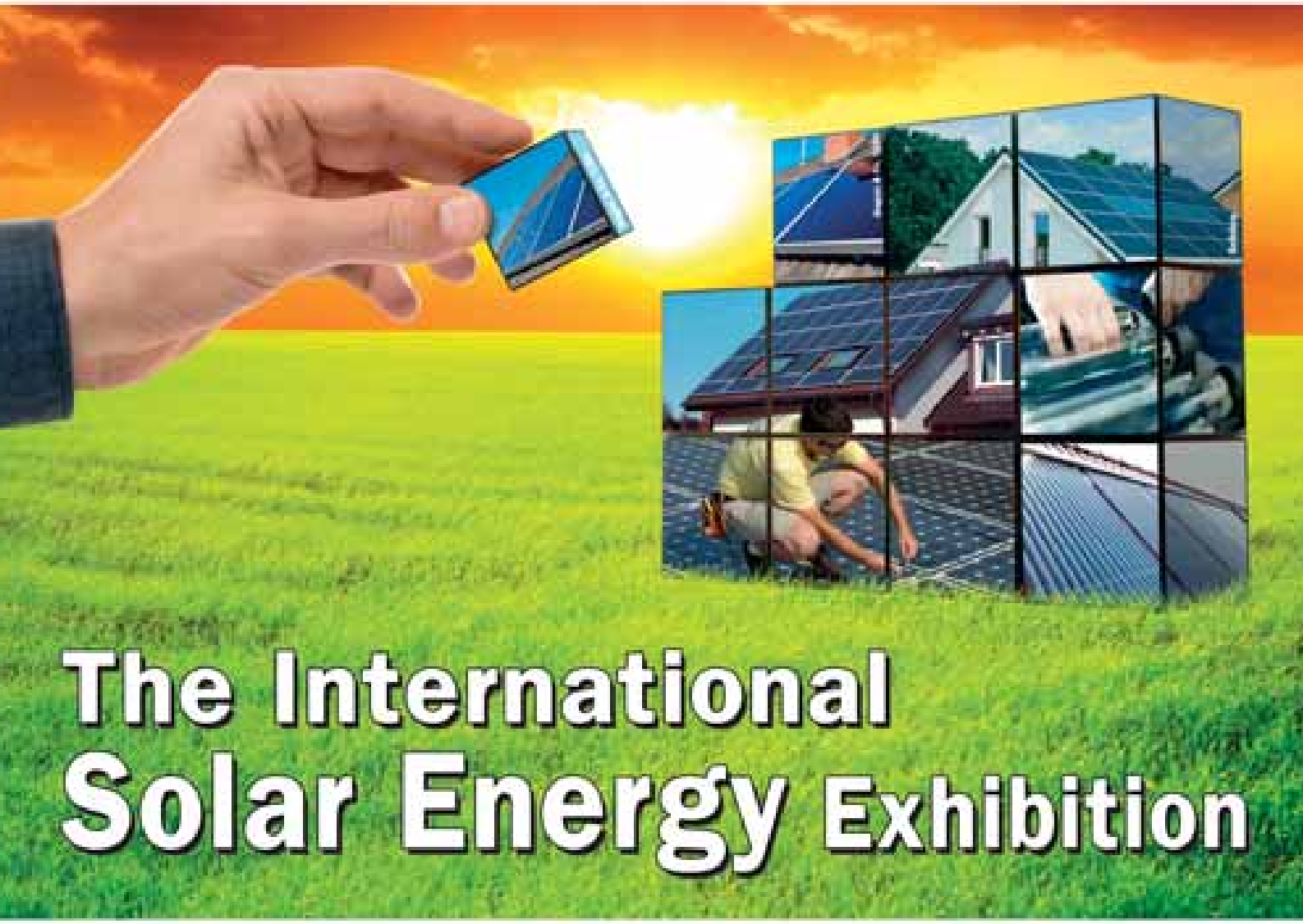

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PRODUCCIÓN Y TRABAJO DEL VIDRIO
ПРОИЗВОДСТВО И ОБРАБОТКА СТЕКЛА

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Interpane

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Hojas de vidrio trabajadas
ОБРАБОТКА СТЕКЛА

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Hersteller von Spezial-Borosilikatglasscheiben
Productores de vidrio plano borosilicato especial
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OCS Glass

➤ COMPLETE HANDLING AND MOVEMENT LINES

Lignes complètes de mouvement et manipulation
Komplette Transport- und Hantierungsanlagen
Líneas completas de movimiento y manipulación
ЛИНИИ ЗАГРУЗКИ И ПЕРЕМЕЩЕНИЯ

Alwayse Eng.
APB - Antonio Piazza Brevetti
Bando Kiko
B.H.T.
Bystronic glass
Cugher Glass
CMS Brembana
Forvet
Hegla
Keraglass
Lisec Group
Lovati F.lli
Mistrello Officine
OCS Glass

➤ MACHINES FOR HANDLING GLASS SHEETS

Machines pour la translation de feuilles
Maschinen zur Scheibenbewegung
Máquinas para el movimiento de las hojas
УСТРОЙСТВА ДЛЯ ЗАГРУЗКИ СТЕКЛА

Alwayse Eng.
Bando Kiko
B.H.T.
Bystronic glass
CMS Brembana
For.El.
Hegla
Keraglass
Lisec Group
Lovati F.lli
Mistrello Officine
OCS Glass

➤ HANDLING ROBOTS

Robot de mouvement
Handling-Roboter
Robot de movimiento
ЗАГРУЗОЧНЫЕ РОБОТЫ

CMS Brembana
Hegla
Lisec Group
Lovati F.lli
OCS Glass

➤ HANDLING EQUIPMENT FOR FLOAT GLASS

Équipements de manipulation pour verre mobile
Vorschub-Anlage für Flachglas
Equipos de transporte de cristales móviles

Suppliers guide

Поставщики - Желтые страницы

Yellow Pages

ЗАГРУЗОЧНОЕ ОБОРУДОВАНИЕ ДЛЯ ФЛОАТ СТЕКЛА

Alwayse Eng.
Bovone Elett.
Bystronic glass
Hegla
Lisec Group
OCS Glass

➤ Trolleys and classifiers

Chariots de transport et classeurs
Rollkarren und Sortierer
Carros y clasificadores

СИСТЕМЫ ПЕРЕМЕЩЕНИЯ И СОРТИРОВКИ

Alwayse Eng.
APB - Antonio Piazza Brevetti
CMS Brembana
For.El.
Hegla
Lisec Group
OCS Glass

➤ Transportation systems/trucks

Systèmes de transport/ cammionage
Transportwesen/ Lastkraftwagen
Sistemas para el trasporte/ camiónes

ТРАНСПОРТНЫЕ СИСТЕМЫ/ГРУЗОВИКИ

APB - Antonio Piazza Brevetti
Hegla
Lisec Group
OCS Glass

➤ Vacuum lifting equipment

Ventouses pour ponts roulants pour grandes feuilles
Brückenkräne mit Vakuumsauger für große Scheiben
Puente grúa a ventosas para hojas grandes

ГРУЗОПОДЪЕМНОЕ ОБОРУДОВАНИЕ С ВАКУУМНЫМИ ПРИСОСКАМИ

Bystronic glass
C.M.B. - Besana
CMS Brembana
For.El.
Hegla
Lisec Group
OCS Glass

➤ Crane suction cups for large sheets

Ventouses de soulèvement pour grandes plaques
Laufkran-Saugköpfe für grosse Platten
Ventosas en puente-grúa para grandes hojas de vidrio

РАМЫ С ПРИСОСКАМИ ДЛЯ БОЛЬШИХ ЛИСТОВ СТЕКЛА

Bystronic glass
C.M.B. - Besana
Hegla
Lisec Group
OCS Glass

➤ Transportation tongs

Griffes pour transport
Transportzangen
Pinzas para el trasporte

ЩИПЦЫ ДЛЯ ПЕРЕНОСА СТЕКЛА

C.M.B. - Besana
OCS Glass

➤ Suction cups

Ventouses
Vakuumsauger
Ventosas

ПРИСОСКИ

Bystronic glass
C.M.B. - Besana
CMS Brembana
Hegla
OCS Glass

➤ Conveyor belts

Ceintures de convoyeur
Beforderer.Bander
Cinturones de transportador

ЛЕНТОЧНЫЕ КОНВЕЙЕРЫ

Alwayse Eng.
Bystronic glass
Cugher Glass
OCS Glass

➤ Packaging materials and systems

Matériales et systemes de imballage
Verpackung-Materialen und Anlagen
Material y installaciones de embalaje

СИСТЕМЫ И МАТЕРИАЛЫ ДЛЯ УПАКОВКИ

Hegla
OCS Glass

➤ Accessories

Accessoires divers
Sonstiges Zubehör
Accessorios varios

АКСЕССУАРЫ

CMS Brembana
Hegla
Helios Italquartz
Mole Moreschi
OCS Glass

STRAIGHT-EDGE AND SHAPE CUTTING

DÉCOUPE RECTILIGNE ET EN FORME
GERADLINIGES UND FASSONSCHNEIDENCORTE
RECTILÍNEO Y PERFILADO
ОБРАБОТКА ПРЯМОЛИНЕЙНОЙ КРОМКИ И ФИГУРНАЯ РЕЗКА

➤ Complete straight-edge lines

Lignes completes rectiligne
Geradeanlagen
Líneas completas corte rectilíneo

ЛИНИИ ОБРАБОТКИ ПРЯМОЛИНЕЙНОЙ КРОМКИ

Bando Kiko
Bystronic glass
CMS Brembana
Forvet
Fushan
Hegla
Lisec Group
OCS Glass

➤ Complete shape cutting lines

Lignes complètes de découpe en forme
Formschneideanlagen
Líneas completas para corte perfilado

ЛИНИИ ФИГУРНОЙ РЕЗКИ

Bando Kiko
Bystronic glass
CMS Brembana
Fushan
Hegla
Lisec Group
OCS Glass

➤ Automatic cutting machines for automotive glass

Machines automatiques de découpe pour verres automobiles
Automatische Autoglas-Schneidemaschinen
Máquinas automáticas de corte para vidrios de automóvil

АВТОМАТИЧЕСКИЕ ЛИНИИ РЕЗКИ АВТОМОБИЛЬНОГО СТЕКЛА

Bando Kiko
B.H.T.
Bystronic glass
CMS Brembana
Lisec Group
OCS Glass

➤ Loading and tilting machines

Chargeuses et basculeuses
Beschickungs- und Kippmaschinen
Cargadoras y volcadoras

ОБОРУДОВАНИЕ ДЛЯ ЗАГРУЗКИ И КАНТОВАНИЯ СТЕКЛА

Bando Kiko
B.H.T.
Bystronic glass
C.M.B. - Besana
CMS Brembana
For.El.
Fushan
Hegla
Intermac
Lisec Group
OCS Glass

Flat and bent glass industry suppliers

Промышленные поставщики листового и гнутого стекла

➤ Cutting tables

Tables de découpe
Schneidetische
Mesas de corte
СТОЛЫ РЕЗКИ

Bando Kiko
Bystronic glass
CMS Brembana
For.El.
Fushan
Hegla
Lisec Group
OCS Glass

➤ Cutting optimizers

Optimisation de découpe
Schnittoptimalisierung
Optimizadores de corte
СИСТЕМЫ ОПТИМИЗАЦИИ РЕЗКИ

Bando Kiko
Bystronic glass
CMS Brembana
For.El.
Hegla
Lisec Group
OCS Glass
Optima

➤ Cutting path optimizers

Optimisation de la découpe
Schnittoptimalisierung
Sistemas de optimización del corte
ОПТИМИЗАЦИЯ РАСКРОЯ

Bando Kiko
Bystronic glass
CMS Brembana
Lisec Group
OCS Glass
Optima

➤ CAD systems

CAD systemes
CAD Systemen
CAD sistemas
СИСТЕМЫ АВТОМАТИЗИРОВАННОГО ПРОЕКТИРОВАНИЯ

CMS Brembana
Lisec Group
OCS Glass

➤ Armoured and laminated glass cutting machines

Machines pour découpe de verres blindés et feuilletés
Schneidemaschinen für Panzer- und Verbundglas
Máquinas de corte para vidrio blindado y estratificado
СТАНКИ ДЛЯ РЕЗКИ АРМИРОВАННОГО И СТЕКЛА И ТРИПЛЕКСА

Bando Kiko
Bystronic glass
C.M.B. - Besana
CMS Brembana
Hegla
Lisec Group
OCS Glass

➤ Round or shape cutting machines

Machines pour découpe ronde et façonnage
Rund- und Formschneidemaschinen
Máquinas para corte redondo y perfilado
СТАНКИ ДЛЯ РЕЗКИ КРУГОВ И ФИГУРНОЙ РЕЗКИ

Bando Kiko
Bystronic glass
CMS Brembana
Hegla
Lisec Group
OCS Glass

➤ Cutting accessories

Accessoires pour découpe
Schneidezubehör
Accesorios para el corte
АКСЕССУАРЫ

Ayrox
Bando Kiko
OCS Glass
Softeco

➤ Saw machines

Scieuse pour le verre
Glassägemaschinen
Maquinas de sierra para vidrio
ПИЛЫ

OCS Glass
RCN Engineering

➤ 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
АВТОМАТИЧЕСКИЕ ПИЛЫ ДЛЯ РЕЗКИ ЛАМИНИРОВАННОГО И ПУЛЕНЕПРОБИВАЕМОГО СТЕКЛА

CMS Brembana
OCS Glass

➤ Breaking systems

Systèmes de brisure
Bruch-Systeme
Sistemas de troncado
СИСТЕМЫ ЛОМКИ

Bando Kiko
Bystronic glass
Fushan
Hegla
Lisec Group
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
СТАНКИ ДЛЯ РЕЗКИ И ЛОМКИ СТЕКЛА СО СНЯТИЕМ НИЗКОЭМИССИОННОГО ПОКРЫТИЯ

Bando Kiko
Bystronic glass
CMS Brembana
Hegla
Lisec Group
OCS Glass

➤ Glass cutting fluids

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

OCS Glass

➤ Accessories

Accessoires
Sonstiges Zubehör
Accessorios varios
АКСЕССУАРЫ

OCS Glass

EDGING AND BEVELLING

FAÇONNAGE DES BORDS ET BISEAUTAGE
KANTENBEARBEITUNG UND FACETTIERUNG
CANTEADORAS Y BISELADORAS
ОБРАБОТКА КРОМКИ И ФАЦЕТА

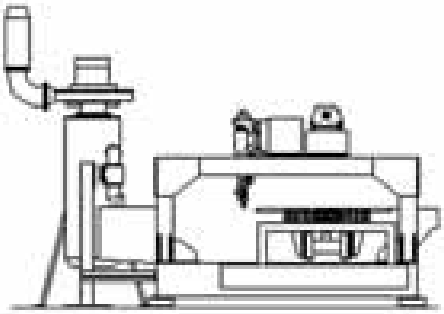
➤ Complete edging lines

Installations complètes pour le façonnages des bords
Komplette Kantenbearbeitungsanlagen
Línea canteadora completa
ЛИНИИ ДЛЯ ОБРАБОТКИ КРОМКИ

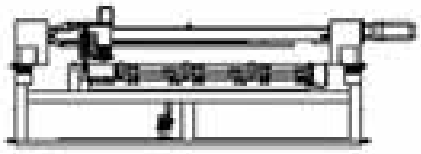
Bando Kiko
C.M.B. - Besana
CMS Brembana
For.El.
Forvet
Fushan
Lovati F.lli
OCS Glass
SKG - Skill Glass

TOTAL SOLUTIONS FOR GLASS INDUSTRIES!

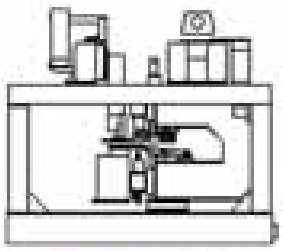
AUTOMOTIVE AND ARCHITECTURAL
LOADING SYSTEM
UNLOADING SYSTEM



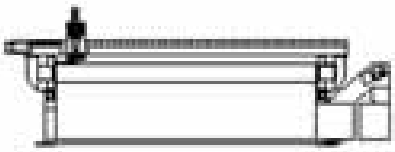
AUTOMOTIVE AND ARCHITECTURAL
CUTTING/BREAKOUT/GRINDING MACHINE
BEVELLING MACHINE



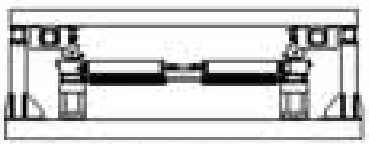
AUTOMOTIVE AND ARCHITECTURAL
STRAIGHT CUTTING MACHINE
SHAPE CUTTING MACHINE WITH EDGE DELETION DEVICE
WITH BREAKOUT DEVICE
DIAGONAL CUTTING MACHINE
LAMINATED GLASS CUTTING MACHINE



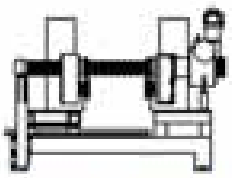
AUTOMOTIVE AND ARCHITECTURAL
DRILLING MACHINE



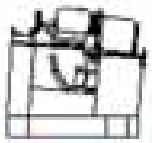
AUTOMOTIVE AND ARCHITECTURAL
WATERJET CUTTING MACHINE



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

ISO 9001 Certified

Bando

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Fax: +81-88-664-5282
2-4-60 Kanazawa, Tokushima 770-0871 - Japan
E-mail: global@bandoj.com
www.bandoj.com

Flat and bent glass industry suppliers

Промышленные поставщики листового и гнутого стекла

➤ Complete bevelling lines

Installations complètes pour le biseautage
Komplette Facettieranlagen
Línea completa para biselado
ЛИНИИ ДЛЯ ОБРАБОТКИ ФАЦЕТА

Bando Kiko
C.M.B. - Besana
CMS Brembana
Fushan
Lovati F.lli
OCS Glass
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
ЛИНИИ ДЛЯ ОБРАБОТКИ КРОМКИ И СНЯТИЯ ФАСКИ АВТОМОБИЛЬНОГО СТЕКЛА

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

➤ Double edge grinding machines

Rectilignes bilaterales
Doppelseitige geradlinige Kanten-schleifmaschinen
Rectilíneas bilaterales
СТАНКИ ДЛЯ ДВУСТОРОННЕЙ ОБРАБОТКИ КРОМКИ

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

➤ Vertical edge grinding machines

Rectilignes verticales
Vertikale Kantenschleifmaschinen
Rectilíneas verticales
ВЕРТИКАЛЬНЫЕ СТАНКИ ДЛЯ ОБРАБОТКИ КРОМКИ

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

➤ Grinding spindles

Mandrin pour le rodage du verre
Schleifspindel
Tala dradoras para el pulido de vidrios
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
СТАНКИ ДЛЯ ОБРАБОТКИ ФИГУРНОГО ФАЦЕТА

Alwayse Eng.
Bando Kiko
CMS Brembana
Fushan
Glassman Glass Machinery Technology
Intermac
Lovati F.lli
OCS Glass
RCN Engineering

➤ Straight-edge bevelling machines

Biseauteuses rectilignes
Geradlinige Facettenschleifmaschinen
Biseladoras rectilíneas
СТАНКИ ДЛЯ ОБРАБОТКИ ПРЯМОЛИНЕЙНОГО ФАЦЕТА

Bando Kiko
Bovone Elett.
CMS Brembana
Fushan
OCS Glass
RCN Engineering
Zafferani Glas

➤ Bevel polishing machines

Polisseuses pour biseaux
Facettenpoliermaschinen
Lustradoras para corte a bisel
СТАНКИ ДЛЯ ПОЛИРОВКИ ФАЦЕТА

Alwayse Eng.
Bando Kiko
Bovone Elett.
CMS Brembana
Intermac
Lovati F.lli
RCN Engineering
Zafferani Glas

➤ Straight-edge engraving machines

Machines pour gravures rectilignes
Geradlinige Gravurmaschinen
Máquinas para incisiones rectilíneas
СТАНКИ ДЛЯ ПРЯМОЛИНЕЙНОГО ГРАВИРОВАНИЯ

CMS Brembana
Intermac
SKG - Skill Glass

➤ 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
СТАНКИ ДЛЯ ФИГУРНОГО ГРАВИРОВАНИЯ

CMS Brembana
Glassman Glass Machinery Technology
Intermac
Lovati F.lli

➤ Corner grinding machines

Machines pour le rodage des angles
Winkelschleifmaschinen
Máquinas para el pulido de ángulos
СТАНКИ ДЛЯ ОБРАБОТКИ УГЛОВ СТЕКЛА

CMS Brembana
Fushan
Intermac
SKG - Skill Glass

➤ Shaped glass grinding machines

Machines pour le rodage de verres en forme
Formschleifmaschinen
Máquinas para el pulido de vidrios en forma
СТАНКИ ДЛЯ ОБРАБОТКИ ФИГУРНОЙ КРОМКИ

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

➤ Belt grinding machines

Machines a bande
Bandmaschinen
Máquinas a cinta
ЛЕНТОЧНЫЕ ШЛИФОВАЛЬНЫЕ СТАНКИ

C.M.B. - Besana
Fushan

➤ Lathes - vertical and horizontal

Tours horizontaux et verticaux
Horizontale und vertikale Schleifböcke
Tornos horizontales y verticales
ГОРИЗОНТАЛЬНЫЕ И ВЕРТИКАЛЬНЫЕ ПРОТОЧНЫЕ СТАНКИ

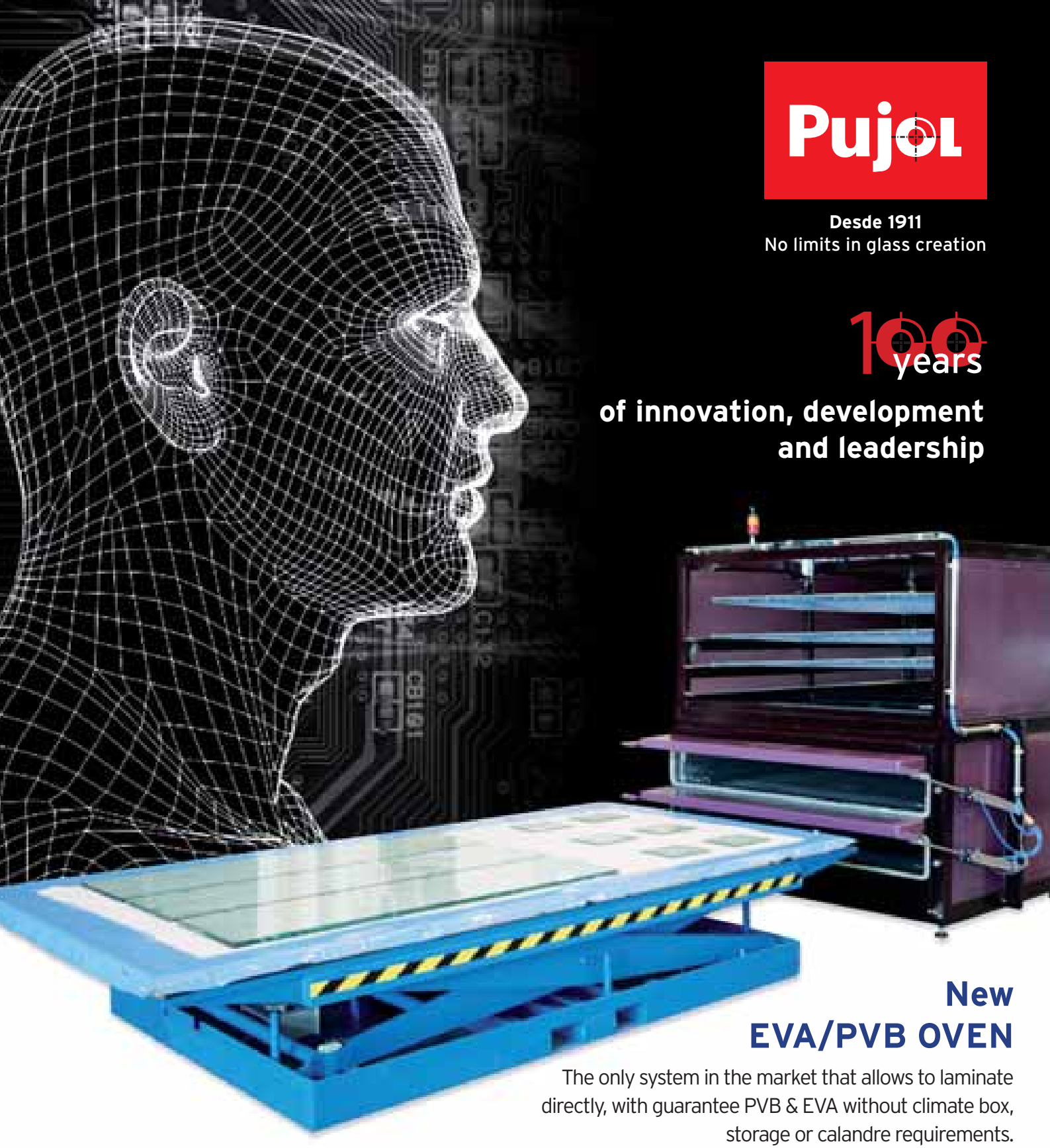
C.M.B. - Besana
CMS Brembana

Pujol

Desde 1911
No limits in glass creation

100 years

of innovation, development and leadership



New EVA/PVB OVEN

The only system in the market that allows to laminate directly, with guarantee PVB & EVA without climate box, storage or calandre requirements.

Evalam

Transparent Eva with certifications, UV Filtering >97%, Re-covering of defects and double range of work 80/130ºC.

Evalam COLOR

Range of 14 basic colours that can be mixed between them.

AB-AR

Film that increases the resistance to the flexion and glass breakage compared with PVB

INSERTIONS

Technical insertions such as LCD, LED and organics, providing a catalogue with more than 3000 textile references.

ACCESORIES & TOOLS

All the necessary tools to laminate such as tapes, thermocutter, sealing guns for EVA, adhesion enhan-cer....

HST + LAM OVENS

Vertical and Horizontal furnaces, laminating plants, HST Certifications.

---

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Flat and bent glass industry suppliers

Промышленные поставщики листового и гнутого стекла

➤ Embossing machines

Machines pour échancrures
Hohlschliffmaschinen
Máquinas para muescas
СТАНКИ ДЛЯ РЕЛЬЕФНОЙ ГРАВИРОВКИ

C.M.B. - Besana
CMS Brembana

➤ Portable machines

Machines portatives
Tragbare Maschinen
Máquinas portátiles
ПОРТАТИВНЫЕ СТАНКИ

Helios Italquartz

➤ Diamond Tools

Outils diamantés
Diamantwerkzeuge
Utiles de diamante
АЛМАЗНЫЕ ИНСТРУМЕНТЫ

Bando Kiko
Belfortglass
Lovati F.lli
Mole Moreschi
OCS Glass
RCN Engineering

➤ Polishing wheels

Meules de polissage
Polierscheiben
Muelas de brillo
ПОЛИРОВАЛЬНЫЕ КРУГИ

Bando Kiko
Belfortglass
Lovati F.lli
Mole Moreschi
OCS Glass
RBM Italia
RCN Engineering

➤ Polishing agents and oxides

Agents de polissage
Poliermittel und -oxyde
Abrasivos y oxidos limpiadores
ПОЛИРОВАЛЬНЫЕ МАТЕРИАЛЫ

OCS Glass
RCN Engineering

➤ Polishing belts

Bandes abrasives
Polierbänder
Cintas abrasivas
ПОЛИРОВАЛЬНЫЕ ЛЕНТЫ

OCS Glass

➤ Coolants

Liquides réfrigérants
Kühlflüssigkeiten
Líquidos refrigerantes
ОХЛАЖДАЮЩИЕ ЖИДКОСТИ

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
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
сепараторы для стекла твердых

OCS Glass

➤ Accessories

Accessoires divers
Sonstiges Zubehör
Accessorios varios
АКСЕССУАРЫ

Belfortglass
CMS Brembana
Helios Italquartz
Mole Moreschi
OCS Glass
RCN Engineering

WASHING

MACHINES À LAVER
WASCHMASCHINEN
MÁQUINA LAVADORAS
ОБОРУДОВАНИЕ ДЛЯ МОЙКИ

➤ Horizontal washing machines

Machines a laver horizontales
Waagerechte Waschmaschinen
Lavadoras horizontales
ГОРИЗОНТАЛЬНЫЕ МОЕЧНЫЕ МАШИНЫ

Bando Kiko
B.H.T.
Bovone Elett.
Bystronic glass
For.El.
Fushan
Lisec Group
OCS Glass
Yuntong Glass
Mech-Electro Technology

➤ Vertical washing machines

Machines à laver verticales
Senkrechte Waschmaschinen
Lavadoras verticales
ВЕРТИКАЛЬНЫЕ МОЕЧНЫЕ МАШИНЫ

Bystronic glass
For.El.
Lisec Group
OCS Glass
Yuntong Glass
Mech-Electro Technology
Zafferani Glas

➤ Washing machines for automotive glass

Machines à laver pour verres automobiles
Waschmaschinen für Automobilgläser
Lavadoras para vidrios de automóvil
МОЕЧНЫЕ МАШИНЫ ДЛЯ АВТОМОБИЛЬНОГО СТЕКЛА

Bando Kiko
B.H.T.
Bystronic glass

➤ Washing purification systems

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

Bystronic glass
For.El.
OCS Glass

➤ Liquid washing concentrates

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

OCS Glass

➤ Accessories

Accessoires
Sonstiges Zubehör
Accessorios varios
АКСЕССУАРЫ

Helios Italquartz
OCS Glass

MIRROR PRODUCTION

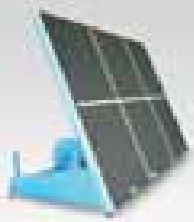
INSTALLATIONS POUR MIROIRS
SPIEGELBELEGANLAGEN
INSTALACIONES PARA ESPEJOS
ПРОИЗВОДСТВО ЗЕРКАЛ

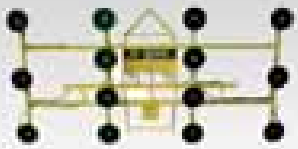
➤ Complete plants & conveyors for mirror production

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

STRENGTH. PRECISION. SECURITY.

TECHNOLOGIC MACHINES FOR THE CUT, HANDLING AND STOCKING OF FLAT GLASS



Solutions for glass handling: automatic loaders and downloaders, pinza, manual and special vacuum devices, vacuum devices with rechargeable batteries, manipulators, cranes and bridge cranes

Solutions for glass stocking: glass storage systems, motorized and manual glass racks

Solutions for cutting: braking tables, tables for transport with belts, semi-automatic cutting tables, automatic tables for straight and shape cut, and for the cut of laminated glass

Solutions for processing: straight edging machines, automatic sandblasting machines

OCS GLASS
innovation and technology

www.ocsglass.it

O.C.S. Glass srl
via Cavo Ticino, snc - 20020 Robecchetto con Induno (MI), Italy • tel. +39 0331 897904 - fax: +39 0331 890645 - mobile: +39 3319876992 • info@ocsglass.it

Flat and bent glass industry suppliers

Промышленные поставщики листового и гнутого стекла

para la producción de espejos
УСТАНОВКИ ДЛЯ ПРОИЗВОДСТВА ЗЕРКАЛ

Bovone Elett.
Fushan

➤ Drying ovens
Fours de séchage
Trockenöfen
Hornos desecadores
ПЕЧИ ДЛЯ СУШКИ

Bovone Elett.

➤ 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
ПЕЧИ ДЛЯ МОЛЛИРОВАНИЯ АВТОМОБИЛЬНЫХ ЗЕРКАЛ

B.H.T.

➤ Accessories
Accessoires
Zubehör
Accessorios
АКСЕССУАРЫ

Helios Italquartz

INSULATING GLASS

MACHINES ET INSTALLATIONS POUR VERRES ISOLANTS
ISOLIERGLASMASCHINEN UND ANLAGEN
MÁQUINAS E INSTALACIONES PARA VIDRIO - CÁMARA
ОБОРУДОВАНИЕ ДЛЯ ПРОИЗВОДСТВА СТЕКЛОПАКЕТОВ

➤ Complete insulating glass lines
Installations complètes pour verres isolants
Komplette Fertigungslinien für Isolierglas
Líneas completas para vidrio cámara
ЛИНИИ ДЛЯ ПРОИЗВОДСТВА СТЕКЛОПАКЕТОВ

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

➤ Automatic sealing lines
Installations automatiques pour le scellage
Automatische Versiegelungsanlagen
Líneas automáticas para sellado
АВТОМАТИЧЕСКИЕ ЛИНИИ ГЕРМЕТИЗАЦИИ

Bystronic glass
For.El.
Lisec Group

➤ Automatic spacer bending machines
Plieuses automatiques pour entretoises
Automatische Faltmaschine für Abstandhalter
Plegadoras automáticas para separadores
АВТОМАТИЧЕСКИЕ СТАНКИ ДЛЯ ИЗГИБАНИЯ ДИСТАНЦИОННОЙ РАМКИ

Bystronic glass
For.El.
Lisec Group
OCS Glass

➤ Desiccant salt filling machines
Remplisseuses pour sels déshydratants
Trockensalzeinfüller
Embudos para llenado con deshidratantes
СТАНКИ ДЛЯ ЗАСЫПКИ МОЛЕКУЛЯРНОГО СИТА

Bystronic glass
For.El.
Lisec Group
OCS Glass

➤ Spacer cutting saws
Scies pour la coupe d'entretoises
Spezialsägen für Abstandhalter
Sierras para el corte de los separadores
ПИЛЫ ДЛЯ РЕЗКИ ДИСТАНЦИОННОЙ РАМКИ

For.El.
Lisec Group
OCS Glass

➤ Butyl extruders
Extrudeuse de Butyl
Butilextruder
Extrusores de butilo
БУТИЛОВЫЕ ЭКСТРУДЕРЫ

Belfortglass
Bystronic glass
For.El.
Lisec Group
OCS Glass

➤ Hot-melt extruders
Extrudeuse de Hot-Melt
Hot-Melt-Extruder
Extrusores de fusión en caliente
ЭКСТРУДЕРЫ ДЛЯ HOT MELT

Belfortglass
For.El.
Lisec Group
OCS Glass

➤ Polyurethane extruders
Extrudeuse de polyurethanes
Polyurethanextruder
Extrusor de poliuretanos
ЭКСТРУДЕРЫ ДЛЯ ПОЛИУРЕТАНА

Bystronic glass
For.El.
Lisec Group
OCS Glass

➤ Polyurethane encapsulation
Capsulage de polyurethanes
Polyurethaneinkapselung
Encapsulado de poliuretano
ГЕРМЕТИЗАЦИЯ ПОЛИУРЕТАНОМ

Bystronic glass
Lisec Group
OCS Glass

➤ Silicone extruders
Extrudeuse de silicone
Silikonextruder
Extrusores de siliconas
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
ЭКСТРУДЕРЫ ДЛЯ ПОЛИСУЛЬФИДА

Belfortglass
Bystronic glass
For.El.
Lisec Group
OCS Glass

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

Bystronic glass
For.El.
Lisec Group
OCS Glass

➤ Desiccant salts
Sels déshydratants
Trockenmittel
Sales deshidratantes
МОЛЕКУЛЯРНЫЕ СИТА

OCS Glass

YUNTONG

In safety glass production technology,

We are pioneering.

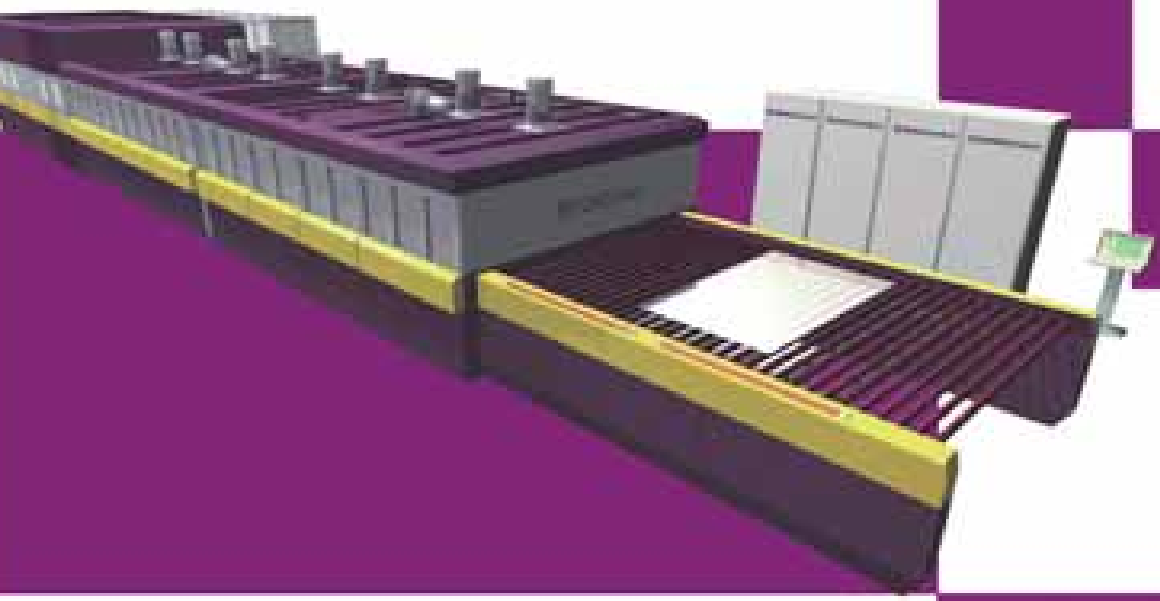
e=0.019 ?

Yes, you can!

if you have

Yuntong CRS forced

convection heating system.



* **High accuracy bending and tempering**
* **ACE quench for very thin glass tempering**
* **Float glass production line**
* **Washing machine, laminate line and autoclave.**
* Высококачественная закалка и точное моллирование.
* Система охлаждения ACE при закалке супер тонкого стекла.
* Производство оборудования для получения стекла методом флоат.
* Моечные машины, линии для производства ламинированного стекла и автоклавы.

"Мир Стекла 2011"

Павильон "Форум"

FD028

e = 0.019?

Да, это возможно!

если у Вас есть система усиленной конвекции от компании Юньтонг.

Представительство в России:
Название компании:"Стекло и стеклоизделия"
Тел: (495) 941 40 41, 941 40 42, 941 43 02, 940 20 60,
Факс:(499) 195 13 31 (499) 195 14 13
Email: dolpo@rambler.ru

Yuntong Glass
Qinhuangdao, China
Tel: +86 335 8501081,5310560
Fax +86 335 8501071, 5910799
http://www.yuntongglass.com
email: exp@yuntongglass.com

Приглашаем региональных агентов к сотрудничеству по продаже оборудования на Украине, в Белоруссии, Казахстане, на дальневосточной части России

Flat and bent glass industry suppliers

Промышленные поставщики листового и гнутого стекла

➤ Spacers/profiles

Entretoises
Abstandhalter
Separadores
ДИСТАНЦИОННЫЕ РАМКИ

Belfortglass
OCS Glass
Quanex Building Products

➤ Georgian bars

Croisillons de vitrages isolants
Sprossen
Barrotillos para vidrios aislantes
ДЕКОРАТИВНЫЕ РАСКЛАДКИ

Hegla

➤ Hot Melt

Hot Melt
Hot Melt
Hot Melt
ХОТ-МЕЛТ

Quanex Building Products

➤ Other sealants

Produits de scellage divers
Dichtungsmittel
Sellantes varios
ДРУГИЕ ГЕРМЕТИКИ

Quanex Building Products

➤ Pantographs

Pantographes
Pantographen
Pantógrafos
ПАНТОГРАФЫ

Fratelli Pezza

➤ Accessories

Accessoires
Zubehör
Accessorios
АКСЕССУАРЫ

Belfortglass
For.El.
Helios Italquartz
OCS Glass
Quanex Building Products

TEMPERING

TREMPE
TEMPERTECHNIK
TEMPLADO
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
ПЕЧИ ДЛЯ ЗАКАЛКИ (АРХИТЕКТУРНОЕ СТЕКЛО)

B.H.T.
Fushan
Keraglass
Landglass Technology
Lisec Group
Mappi International
OCS Glass
Pujol Hornos Industriales
Yuntong Glass
Mech-Electro Technology

➤ 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
ПЕЧИ ДЛЯ ЗАКАЛКИ (АВТОМОБИЛЬНОЕ СТЕКЛО)

B.H.T.
Keraglass
Landglass Technology
Mappi International
Yuntong Glass
Mech-Electro Technology

➤ Accessories

Accessoires
Zubehör
Accessorios
АКСЕССУАРЫ

Helios Italquartz
Keraglass
Landglass Technology
Mappi International
RCN Engineering
Yuntong Glass
Mech-Electro Technology

BENDING

BOMBAGE
BIEGEN
CURVADO
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
ПЕЧИ ДЛЯ МОЛЛИРОВАНИЯ (АРХИТЕКТУРНОЕ СТЕКЛО)

B.H.T.
Fushan
Keraglass
Mappi International
RCN Engineering
Yuntong Glass
Mech-Electro Technology

➤ 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
Hornos para curvar el vidrio para la industria automovilística
ПЕЧИ ДЛЯ МОЛЛИРОВАНИЯ (АВТОМОБИЛЬНОЕ СТЕКЛО)

B.H.T.
Keraglass
Mappi International
Yuntong Glass
Mech-Electro Technology

➤ Accessories

Accessoires
Zubehör
Accessorios
АКСЕССУАРЫ

Ayrox
Keraglass
Mappi International
RCN Engineering
Softeco

LAMINATED GLASS PRODUCTION

INSTALLATIONS POUR VERRES FEUILLETÉS
VERBUNDGLASANLAGEN
INSTALACIONES PARA VIDRIO ESTRATIFICADO
ИЗДЕЛИЯ ИЗ ЛАМИНИРОВАННОГО СТЕКЛА

➤ Complete plants

Installations complètes
Komplette Fertigungslinien
Instalaciones completas
КОМПЛЕКТНЫЕ УСТАНОВКИ

B.H.T.
Bovone Elett.
Bystronic glass
For.El.
Fushan
Pujol Hornos Industriales
Yuntong Glass
Mech-Electro Technology

➤ Laminated windscreen bending furnaces

Four de bombage pour pare-brise feuilletés
Ofen zur Biegung von Sicherheitswindschutzscheiben
Horno de curvado para parabrisas de vidrio estratificado
ПЕЧИ МОЛЛИРОВАНИЯ ЛОБОВЫХ АВТОМОБИЛЬНЫХ СТЕКОЛ

B.H.T.
Keraglass
Mappi International

Suppliers guide

Поставщики - Желтые страницы

Yellow Pages

➤ Autoclaves

Autoclaves
Autoklaven
Autoclaves
АВТОКЛАВЫ

Bystronic glass
Yuntong Glass
Mech-Electro Technology

➤ Climatic cabins

Cabines climatiques
Klimazellen
Cabina climática
КЛИМАТИЧЕСКИЕ КАБИНЫ

Bystronic glass
For.El.
Yuntong Glass
Mech-Electro Technology

➤ Infrared ovens

Four à radiations infrarouges
Infrarotöfen
Hornos a rayos infrarrojos
ПЕЧИ ИНФРАКРАСНОЙ СУШКИ

B.H.T.
Bystronic glass
For.El.
Yuntong Glass
Mech-Electro Technology

➤ Mangles

Calandres (presses)
Kalander (Pressen)
Prensas
КАЛАНДЕРЫ

For.El.

➤ 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
ОБОРУДОВАНИЕ ДЛЯ ОБРАБОТКИ И РЕЗКИ ПВБ-ПЛЕНОК

Ayrox
Bystronic glass
For.El.
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
ТЕХНОЛОГИИ ПРОИЗВОДСТВА ОБОГРЕВАЕМОЙ ПВБ-ПЛЕНКИ ДЛЯ ТРИПЛЕКСА

Ayrox
Softeco

➤ Accessories

Accessoires
Zubehör
Accessorios
АКСЕССУАРЫ

Ayrox
Helios Italquartz
Softeco

DRILLING

PERÇAGES
BOHRTECHNIK
TALADROS
СВЕРЛЕНИЕ

➤ Automatic drilling lines

Installations automatiques de perçage
Automatische Bohranlagen
Líneas automáticas de taladro
АВТОМАТИЧЕСКИЕ ЛИНИИ СВЕРЛЕНИЯ

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

➤ Multi-spindle drilling machines

Perceuses multiples
Reihenbohrmaschinen
Taladradores múltiples
МНОГОШПИНДЕЛЬНЫЕ СВЕРЛИЛЬНЫЕ СТАНКИ

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

➤ Drilling machines with opposite drilling heads

Perceuses à pointes oposées
Bohrmaschinen mit entgegengesetzten Bohrern
Taladradores a puntas contrapuestas
СТАНКИ ДЛЯ ДВУСТОРОННЕГО СВЕРЛЕНИЯ

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

➤ Column drilling machines

Perceuses à colonne
Säulenbohrmaschinen
Taladradores a columna
КОЛОНОЧНЫЕ СВЕРЛИЛЬНЫЕ СТАНКИ

OCS Glass

➤ Portable drilling machines

Perceuses portatives
Tragbare Bohrmaschinen
Taladradores portátiles
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
СВЕРЛИЛЬНЫЕ И ФРЕЗЕРНЫЕ СТАНКИ

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

➤ Diamond drills

Forets diamantes
Diamantbohrer
Pequeños agujeros diamantados
АЛМАЗНЫЕ СВЕРЛА

Mole Moreschi
OCS Glass

➤ Accessories

Accessoires divers
Sonstiges Zubehör
Accessorios varios
АКСЕССУАРЫ

CMS Brembana
OCS Glass

OTHER EQUIPMENT AND PLANTS

INSTALLATIONS DIVERSES
SONTIGE ANLAGEN
INSTALACIONES VARIAS
ДРУГОЕ ОБОРУДОВАНИЕ И УСТАНОВКИ

➤ Turnkey plants / Engineering - for building glass

Istallations clefs à la main - Engineering - verre plat pour constructions

Flat and bent glass industry suppliers

Промышленные поставщики листового и гнутого стекла

Schlüsselfertige Anlagen - Engineering - für Bauflachglas
Instalacíones llave en mano - Engineering - para vidrio plano para la construcción
ИНЖИНИРИНГ ДЛЯ ПРОИЗВОДСТВА АРХИТЕКТУРНОГО СТЕКЛА

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

➤ 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
ИНЖИНИРИНГ ДЛЯ ПРОИЗВОДСТВА АВТОМОБИЛЬНОГО СТЕКЛА

Bando Kiko
B.H.T.
Bystronic glass
Cugher 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
ИНЖИНИРИНГ ДЛЯ ПРОИЗВОДСТВА ДИСПЛЕЕВ И ИНДИКАТОРОВ

Bando Kiko
Cugher Glass

➤ Working centres - CNC controlled

Centre de travail à control numérique
Arbeitszentrum mit Zahlenkontrolle
Centro de trabajo de control numérico
ОБРАБАТЫВАЮЩИЕ ЦЕНТРЫ С ЧПУ

Bando Kiko
Bystronic glass
C.M.B. - Besana
Fushan
Glassman Glass Machinery Technology
Hegla
Intermac
Lovati F.lli
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)
ФЛОАТ ПРОЦЕСС (ОБОРУДОВАНИЕ И АКСЕССУАРЫ)

Alwayse Eng.
Bovone Elett.

➤ Fiberglass/ Glasswool production lines, equipment and products

Installations pour la production du fibre de verre (systèmes & produits)
Glasfaser - Anlagen (Systeme und Produkte)
Instalacíones para la producción de fibra de vidrio (máquinas & productos)
ЛИНИИ ДЛЯ ПРОИЗВОДСТВА СТЕКЛОВОЛОКНА / СТЕКЛОВАТЫ - ОБОРУДОВАНИЕ И ПРОДУКЦИЯ

Lipex

➤ Vacuum coating equipment and plants

Systèmes et installations pour le revêtement sous vide
Systeme und Anlagen für die Vakuumbeschichtung von Glasplatten
Sistemas e instalacíones para el revestimiento en vacío
вакуумного оборудования покрытием

Interpane

➤ 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
ОБОРУДОВАНИЕ ДЛЯ ЭМАЛИРОВАНИЯ

Rollmac

➤ 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
ОБОРУДОВАНИЕ И УСТАНОВКИ ДЛЯ ПЕСКОСТРУЙНОЙ ОБРАБОТКИ

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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

ОПТИМИЗАТОРЫ ДЛЯ ПЕСКОСТРУЙНЫХ УСТАНОВОК

Ayrox
Cugher Glass
Keraglass
Rollmac
Softeco

➤ Screen printing drying systems

Systèmes de séchage pour la sérigraphie
Siebdruck-Trockensysteme
Sistemas de secado para la serigrafía
ПЕЧИ СУШКИ ДЛЯ ШЕЛКОТРАФАРЕТНОЙ ПЕЧАТИ

Cugher Glass
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
ОБОРУДОВАНИЕ ДЛЯ КИСЛОТНОГО ТРАВЛЕНИЯ

Rollmac

ARTISTIC GLASS PRODUCTION

FABRICATION DE VERRE ARTISTIQUE
PRODUKTION VON KÜNSTLERISCH GESTALTETEM GLAS
PRODUCCIÓN VÍDRIO ARTISTICO
ПРОИЗВОДСТВО ХУДОЖЕСТВЕННОГО СТЕКЛА

➤ Ceramic fiber panels

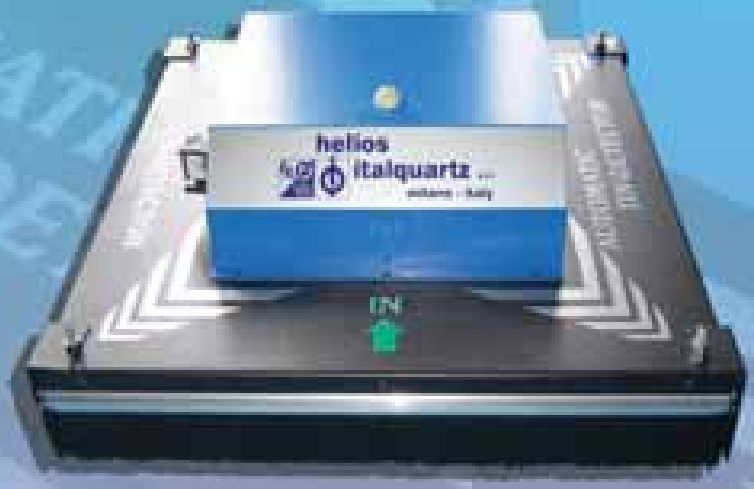
Panneau en fibro-céramique
Paneele aus Keramikfaser
Paneles de fibrocerámica
ПАНЕЛИ ИЗ КЕРАМИЧЕСКОГО ВОЛОКНА

RCN Engineering

HELIOS ITALQUARTZ FOR THE GLASS INDUSTRY

QUARTZ IR EMITTERS

Short and medium wave, mono and twin tube, with or without gold-coated reflector. Utilized for: glass tempering, annealing, bending, plastic film coupling and screen printing, float glass and mirror processing for any oven range.



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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Flat and bent glass industry suppliers

Промышленные поставщики листового и гнутого стекла

➤ Chamber electric kilns

Fours électriques à chambre
Elektrische Kammeröfen
Hornos eléctricos de cámara
ЭЛЕКТРИЧЕСКИЕ ОБЖИГОВЫЕ ПЕЧИ

Keraglass
Pujol Hornos Industriales
RCN Engineering

➤ Decorating enamels and colours - precious metals

Peintures et couleurs pour la decoration - materiels precieux
Emaille und Farben fur die Dekoration - kostbare Materialien
Esmaltes y colores para la decoracion - metales preciosos
ДЕКОРАТИВНЫЕ ЭМАЛИ И КРАСКИ С БЛАГОРОДНЫМИ МЕТАЛЛАМИ

RCN Engineering

➤ Detaching materials and equipment

Matériel et installations pour séparer le verre du support
Material und Anlagen zur Trennung des Glases von der Halterung
Material y installaciones para separar el vidrio del soporte
МАТЕРИАЛЫ И ОБОРУДОВАНИЕ ДЛЯ ОТСЛАИВАНИЯ

RCN Engineering

➤ Accessories

Accessoires divers
Sonstiges Zubehör
Accessorios varios
АКСЕССУАРЫ

Helios Italquartz
RCN Engineering

MISCELLANEOUS

MELANGE
SONSTIGES
VARIOS
РАЗНОЕ

➤ Automotive glass approval services

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

Ayrox
Bando Kiko
Bystronic glass
Cugher Glass
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
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
СИСТЕМЫ ПОДГОТОВКИ ВОДЫ

For.El.
Lisec Group

➤ Electric foilers for copper ribbons

Système d'étirage électrique
Elektrische Vorrichtung zum Kupferauftragen
Aplicadores electricos de hojas de cobre
Электрические foilers для медных лент

RCN Engineering

➤ 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
СИСТЕМЫ КОНТРОЛЯ КАЧЕСТВА ЛИСТОВОГО СТЕКЛА

Ayrox
For.El.
Softeco

➤ Heating equipment - standard (gas firing, burners, air gas mixers, safety devices, electrical resistors)

Equipements pour le réchauffement (brûleurs, mélangeurs d'air et de gaz, mécanismes de sécurité, résistances électriques)
Heizungsausrüstung (Brenner, Luft-Gasmischer, Sicherheitsvorrichtungen, elektrische Widerstände)
Equipos de calefaccion (Quemadores, mezcladores de aire y gas, mecanismos de seguridad, resistencias elecricas)
ОБОРУДОВАНИЕ ДЛЯ НАГРЕВА (ГАЗОВЫЙ НАГРЕВ, ГОРЕЛКИ, СМЕСИТЕЛИ, СИСТЕМЫ ЗАЩИТЫ, ТЭНЫ)

Keraglass

➤ Infrared tubes

Tubes à infrarouge
Infrarot Rohren
Tubos infrarrojos
ИНФРАКРАСНЫЕ ТЕРМОМЕТРЫ

Helios Italquartz

➤ Kilns

Fours
Kammeröfen
Hornos
ПЕЧИ ДЛЯ ОБЖИГА И СУШКИ

Keraglass
Pujol Hornos Industriales
RCN Engineering

➤ Optical distortion analysers for automotive glass

Analyseurs optiques de distorsion pour verre destiné à l'industrie automobile
Optische Verzugs-Analysatoren für Glas für die Automobilindustrie
Analizadores ópticos de distorsión para vidrio para la industria automovilística
АНАЛИЗАТОРЫ ОПТИЧЕСКОГО ИСКАЖЕНИЯ ДЛЯ АВТОМОБИЛЬНОГО СТЕКЛА

Keraglass

➤ Powder or liquid application systems for protecting float glass

Systèmes d'application en poudre ou liquide pour la protection du verre
Puder-Flußigkeitauftragsgeräte zum Schutz von Flachglas
Sistema de protección del vidrio "float" mediante polvos o líquidos
ПУДРЫ И ЖИДКОСТИ ДЛЯ ЗАЩИТЫ СТЕКЛА

Cugher Glass

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Flat and bent glass industry suppliers

Промышленные поставщики листового и гнутого стекла

➤ Quartz equipment

Quartz machines
Quartz Maschinen
Equipos de cuarzo
КВАРЦЕВОЕ ОБОРУДОВАНИЕ

Helios Italquartz

➤ SIC heaters

SIC appareils de chauffage
SIC Heizgeräte
SIC Calentadores
SIC-НАГРЕВАТЕЛИ

Helios Italquartz

➤ Software systems for production control

Systèmes de logiciels pour le contrôle de la production
Software-Systeme für die Kontrolle der Produktion
Sistemas de software para el control de la producción
ПРОГРАММНОЕ ОБЕСПЕЧЕНИЕ ДЛЯ УПРАВЛЕНИЯ ПРОИЗВОДСТВОМ

Cugher Glass
For.El.
Lisec Group
Optima

➤ Soldering equipment for electrical connectors for windscreens and backlites

Systèmes pour le contrôle du gabarit
Systeme für die Verschweissung der elektrischen Leiter in Windschutzscheiben und Heckfenstern
Sistemas para soldar los conectores eléctricos en los parabrisas y cristales traseros
ОБОРУДОВАНИЕ ДЛЯ ПАЙКИ КОНТАКТОВ ДЛЯ ВЕТРОВЫХ И ЗАДНИХ АВТОМОБИЛЬНЫХ СТЕКОЛ

Ayrox
Softeco

➤ Sorting systems

Systèmes de classification
Klassifizierung (für Glasplatten)
Clasificadores
СИСТЕМЫ СОРТИРОВКИ

Bystronic glass
Lisec Group

➤ Testing for solderings

Tests des soudures
Prüfung der Schweissnähte
Prueba para las soldaduras
ПРОВЕРКА ПАЙКИ

Ayrox
Softeco

➤ Testing devices of backlites electrical heating

Systèmes de contrôle du chauffage électrique des vitres arrières
Kontrollsysteme für die elektrische Heckfensterbeheizung
Sistemas de control para el calentamiento eléctrico de los cristales traseros
УСТРОЙСТВА ПРОВЕРКИ НАГРЕВА ЗАДНИХ СТЕКОЛ АВТОМОБИЛЯ

Ayrox
Softeco

➤ UV lamps

UV lampes
UV Lampen
Bombillas U.V.
УФ-ЛАМПЫ

Helios Italquartz

➤ UV Portable machines

Machines portables aux rayons U.V.
Tragbare U.V. - Strahlen Maschinen
Máquinas portátiles U.V.
ПЕРЕНОСНЫЕ УСТАНОВКИ ДЛЯ УФ-ОБЛУЧЕНИЯ

Helios Italquartz

Bekaert: rotatable technology at its best – for LAGC and PV too

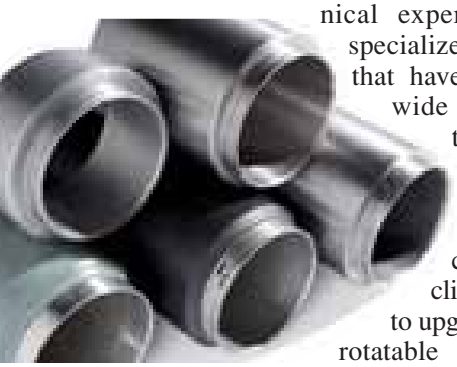
Wilmert De Bosscher
Manager Strategic Projects

BEKAERT ADVANCED COATINGS

Bekaert's extensive research and development capabilities, combined with a strong partnership approach, has enabled it to set the standards for rotatable magnetron sputtering. The company has earned the reputation of being the only one-stop supplier worldwide for custom-made rotatable magnetron solutions.

CORPORATE OVERVIEW

Headquartered in Belgium, Bekaert generates revenues of EUR 4.5 billion (2010) a year and maintains facilities in 120 countries with a global workforce of 27,000 people. The company's core competencies are advanced metal transformation and advanced materials and coatings. This unique development focus has enabled Bekaert to create specialized solutions in three closely aligned business units: Advanced Wire, Advanced Materials and Advanced Coatings. The professionals within these three business units work together to leverage the company's deep technical expertise and deliver specialized metal products that have achieved worldwide recognition for their excellent quality and reliability.



Portfolio of target materials

Bekaert works closely with its clients to enable them to upgrade from planar to rotatable technology and offers lower cost of ownership through longer production runs, faster coating deposition and a more complete use of coating material.

Bekaert has built its experience in the sputtering technology field through its own plastic foil coating for window film and industrial applications. Bekaert was the first to bring rotatable targets to market and has successfully partnered with customers to develop the most advanced and complete line of sputter equipment to effectively use these targets for coating lines worldwide.

Industrial clients who apply a sputter process for applications such as architectural and automotive glass (including low-E and solar control stacks, and anti-reflective coatings), display glass and photovoltaic glass, web-coating, electrochromic applications, can benefit significantly from adopting Bekaert's rotatable

THE ROTATING AND CYLINDRICAL SPUTTERING WORLD FOR PV SOLAR CELLS

Cylindric target of ceramic material

Wilmert De Bosscher, Manager Strategic Projects, Bekaert

In 2008, the total worldwide energy consumption was estimated close to 500 EJ (ExaJoules = 10^{18} Joules). This is equivalent to an average annual power consumption of close to 16 TW (TeraWatts = 10^{12} Watts), with approximately 87% coming from the combustion of fossil fuels – mainly oil, natural gas and coal. Aside from exhausting our natural resources, it is important to remember that the associated release of millions of tons of carbon dioxide is contributing significantly to global warming. And things might get even worse in the future: the global energy consumption is expected to grow to 1000 EJ by 2050, and to 1500 EJ by the end of this century.

Harnessing the sun

Fortunately, there has been a global acknowledgement that we have to invest heavily in clean and renewable energy generation. Our sun happens to be the ideal partner for this to happen: the influx solar energy rate at our earth's surface is close to 90 PW (PetaWatts = 10^{15} Watts); which means that 2 hours of solar radiation is more than sufficient to cover the global power consumption of a whole year.

As a result, capturing and converting radiation of the sun may prove a viable option for meeting a substantial part of our energy requirements in the future. Many renewable energy sources indirectly exploit the power of the sun; such as wind, hydro and biofuel energy. However, the highest efficiency of energy conversion per surface area are realized by two distinct groups of solar cell technologies. Both have been developed during the last decades and they rely heavily on innovative glass solutions. Thermal solar systems typically bundle sun light radiation towards a blackened absorber body to generate heat that is then transferred to a fluid and to a heat exchanger to extract the energy. Although coating of flat and concave glass to make high-quality mirrors plays an important role in the functionality of such a system, it will not be discussed further in this context. Instead, we'll focus on photovoltaic (PV) solar cells: systems that can convert solar radiation directly into electrical power.

Energy-generating PV cells

Although PV cells have existed for more than half a century, it is only in the last few years that this approach has been considered as a serious solution for tackling the energy issue. The core of a PV solar cell consists of semiconductor material that absorbs light in order to generate electron-hole pairs, which are separated to opposite electrodes. Although the majority of PV cells uses crystalline Si wafers as semiconductor material (typically between 150 and 200 µm thick); a new trend of thin film PV cells - in which the semiconductor material is deposited in a vacuum process (typically a few µm thick) - is growing rapidly. For both types, intelligent glass solutions may play an important role, though in a totally different context. For the crystalline Si solar cells, glass is being used as a front cover of a module to protect the cells from environmental impact; and for the thin film solar cells, glass is being used as the most common substrate on to which the thin film solar cell layers can be deposited.

Thin film layer deposition

Thin film layer deposition is a crucial aspect for the fabrication of efficient solar cells: most layers are deposited by vacuum processes. Crystalline Si solar cells, however, may also benefit from these technologies as well. A crystalline Si wafer typically has a greyish colour, meaning that an important part of the incident light is reflected and cannot contribute to the energy generation process. Because of this, a passivation and anti-reflective layer is deposited onto the wafer, giving it its typical dark blue appearance and improving the light capturing capabilities enormously. Such a layer typically consists of Si_3N_4:H and is deposited most frequently by LPCVD (Low Pressure Chemical Vapor Deposition). More recently, sputtering Al for the backside metallization of crystalline solar cells has proven to improve cell performance as a result of better diffusion properties.

The front cover glass of a solar cell module may equally benefit from an anti-reflective layer to reduce bouncing off sun rays. Especially at low-angle incidence, an important gain in module efficiency can be realized.

Thin film solar cells rely even more on the deposition of thin layers (from a few tens of nm to a few µm). Besides thin film deposition of the absorbing semiconductor, the layer stack also consists of two thin film electrodes at both sides of the absorber layer: a transparent conductive oxide (TCO) layer at one side, allowing light to enter; and a back reflector metal contact at the other side. Each of these layers has to be deposited with tight control of composition, morphology and thickness in a uniform way, over ever-increasing substrate sizes. While a crystalline solar cell has a typical dimension of 156 x 156 mm^2, thin film solar cells are deposited on glass plates with an area up to 5.7 m^2 or even on continuous rolls of flexible substrates.

Historically, sputtering from planar magnetrons has proven to be a viable solution for all of the above requirements. However, planar technology does have a number of significant shortcomings. The limited target utilization of approximately 25% means that more than half of the high-quality material is wasted or has to be recycled. Plus, as the planar target plates or tiles have a limited volume, exchange of targets must be frequent, resulting in considerable downtime of

the vacuum deposition system. Furthermore, the potential for higher-performing and more critical sputter processes to increase the deposition rate and coater system throughput is limited with planar magnetrons.

The introduction of rotating cylindrical magnetron technology

Since the Nineties, Bekaert has successfully introduced rotating cylindrical magnetron technology in the large-area glass coating for architectural and automotive applications. Increasing the target material utilization to more than 80% (three times higher) and having triple the target material inventory available on a tube has improved the coater efficiency enormously, with substantially longer production campaigns. Plus, as higher power levels can be applied and more stable reactive processes can be sustained, a higher throughput in a reliable process and with reproducible layer properties can be achieved. It is no surprise, therefore, that in a period of about 10 years cylindrical magnetron technology has become the standard for producing high-quality and low-cost coating stacks on large glass plates, typically used for architectural applications.

A similar trend is anticipated for the photovoltaic industry. While 10 to 20 years ago solar cell fabrication was focused on achieving acceptable energy conversion efficiencies on a limited production scale, the current pull to high-volume production at the lowest cost is changing the rules of the game. This means that the existing thin film coating technologies of LPCVD and planar magnetron sputtering must also evolve. Sputtering from appropriate cylindrical targets and with adequate rotatable magnetrons may realize an important breakthrough in this area. Below, we give just one example of new rotatable magnetron solutions, which achieve the same or better solar cell performance while reducing the cost of ownership considerably. The same added value counts for other cylindrical target materials; giving improved layer properties and performance at lower costs.

For thin film PV solar cells, deposition of good TCO layers remain a significant challenge. High transparency must be combined with a low sheet resistance, while maintaining high stability over the lifetime of the solar cells.

One material of choice is aluminum Doped zinc oxide (AZO), which can be deposited by LPCVD or by sputtering. Sputtering from planar AZO targets is gradually being replaced by cylindrical targets while maintaining a dynamic deposition rate of up to 140 nm.m/min. Although this is one of the first successes of cylindrical sputtering technology within the PV production environment, Bekaert tries to push the limits even further. A newly developed AZO target has doubled the deposition rate while at the same time lowering the sheet resistance and maintaining similar optical properties. Again, this creates huge opportunities to increase the throughput, lower the production costs and improve solar cell performance all at the same time.

Developing rotatable magnetrons – and beyond

Bekaert's commitment to making better and cheaper solar cells doesn't stop here. Apart from working towards a complete portfolio of cylindrical target materials to cope with the requirements of the different solar cell technologies, Bekaert has a proven track record developing rotatable magnetrons. The success in the 1990s was based on combining the right target materials with the appropriate magnetrons so these targets could be mounted into the coating systems. Reliability in rotating seals has proven crucial and has allowed Bekaert to sell several thousands of three-to-four meter magnetrons worldwide.

During the past years, the accent has been developing new magnetron concepts to allow cylindrical technology in smaller coater designs than can be found today for flat panel display and solar cell fabrication. Different rotatable magnetron types have been commercialized and were introduced successfully in new coater designs, or as a retrofit solution to replace existing planar cathodes. Recently, a lot of progress has been made in realizing improved magnetic systems. The ability to tune the magnetic field strength locally and allowing achieving well-controlled uniformity was further enhanced. In addition, the target cooling efficiency has been improved while using less water in the target tube. Finally, the layer growth can be controlled in some way as well: bombardment of high energetic particles may be reduced and resulting in higher performing layer stacks.

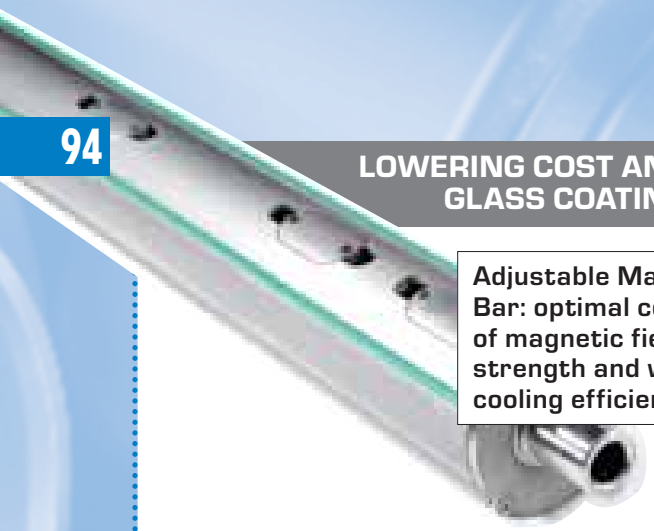
Experience and many larger projects allowed Bekaert to extend the scope of the offering. Complete sputter modules, consisting of rotatable magnetrons and cylindrical targets – but also including power supplies, gas distribution, control and automation – allow for a fit-for-use total sputter solution for both new and experienced customers.

Expanding application areas, anticipating capacity increase and innovative technological approaches are just a few key aspects boosting the world of photovoltaics forward. Various technologies have a good chance to contribute to future energy needs while preserving our environment. Success or failure may depend on the quality and performance of thin films being deposited at the lowest possible cost. Sputtering of cylindrical targets from rotatable magnetrons may play an essential role in making this happen.

Bekaert Axial Magnetron for new generation coaters

Bekaert: rotatable technology at its best – for LAGC and PV too

LOWERING COST AND INCREASING QUALITY IN LARGE AREA GLASS COATING (LAGC) AND PHOTOVOLTAIC (PV)



Adjustable Magnet Bar: optimal control of magnetic field strength and water cooling efficiency

Technological innovation from planar to rotatable

Over the last 20 years, Bekaert has worked hand-in-hand with the glass industry to develop a range of advanced coating technologies to meet the growing demand for improved aesthetics and functional comfort. Today, Bekaert's innovative rotatable sputtering technology is used around the globe to coat a wide range of large area glass applications including architectural (low-emissivity, solar control etc.) and automotive glass (hydrophobic glass, anti-reflective glass etc.).

"Since we first introduced the cylindrical magnetron technology in the large-area glass markets, material utilization has improved threefold, and both throughput and layer repeatability have increased significantly," says Koen Staelens, Product Market Manager at Bekaert Sputter Products. "It's no surprise the technology has become the standard for producing high quality and low cost coating stacks on large glass plates. A similar trend is anticipated for the fabrication of efficient photovoltaic (PV) solar cells (mainly thin-film, but also c-Si)," continues Staelens.

"In the early days of solar cell fabrication, the focus was on achieving acceptable energy conversion efficiencies. The traditional approach of using a planar magnetron cathode for depositing a thin film on the substrate offered good performance but targets became exhausted very quickly in large production runs. With the current trend towards high volumes, rotatable sputtering solutions will achieve the same or better cell performance while reducing the cost of ownership considerably."

The benefits of rotating magnetron technology over traditional planar technology are now well known and accepted in the marketplace. Higher target material inventory and utilization rates, higher deposition rates, increased process stability, higher sputter efficiency and reduced coater down time all contribute to a lower total cost of ownership.

With over 4,500 magnetrons operating around the globe, Bekaert takes a leadership role in this market. Its success has been based on combining the right target materials with the appropriate magnetrons. Today, Bekaert offers complete sputter solutions consisting of the magnetrons and the cylindrical targets – but also the magnet bars, power supplies, gas distribution, control and automation systems.

Bekaert's recently released products are the Compact End Block (CEB), which is ideal for medium-powered applications and is renowned for its reliability and outstanding performance. Also on display will be the Adjustable Magnet Bar (AMB), which enables optimization of layer thickness uniformity and improves target utilization efficiency.

Along with the CEB and AMB, Bekaert is also the manufacturer of the standard End Block, trimline End Block – and the Bekaert Axial Magnetron (BAM) which is ideally suited for webcoating lines as it occupies no space inside the coater.

Compact End Block: ideal solution for limited space coaters

sputter solutions and technology. Clients can also rely on Bekaert's world-class local customer support and leading research and development.

DIVERSIFIED PRODUCT PORTFOLIO FOR SUPERIOR LARGE AREA COATING

Bekaert's Advanced Coatings product range is comprised of industrial coatings that are applied by vacuum technologies. Sputtering is a vacuum coating process and one of the core methods for depositing thin films on glass. Application fields include architectural/automotive glass, display glass, photovoltaic cells and glass, webcoating, electrochromic applications. Bekaert's comprehensive product line offers solutions for all large area sputtering solutions: Bekaert Rotatable Sputter Targets, Bekaert Sputter Hardware and Bekaert Drop-in Cathodes, in other word, a unique combination between rotatable targets and magnetrons.

In the early 1990s, Bekaert was a pioneer in developing innovative and technically superior rotatable sputter products. Over the years, the company has continually invested in its R&D capabilities to produce leading edge thermal sprayed sputter targets and enabling sputter mechanics for large coating applications. Today Bekaert is recognized as the premier developer of rotatable magnetron technology and rotatable sputter targets worldwide.

THE BEKAERT DIFFERENCE: 'BETTER TOGETHER'

Beyond its technology, what makes Bekaert unique is its corporate commitment to building strong client relationships – based on careful listening, mutual trust and win-win cooperation. Bekaert places a major emphasis on customer relations. This dedication goes all the way back to Bekaert's origins, when Leo Leander Bekaert founded the company in 1880. Bekaert quickly grew from an ambitious start-up into an international entity, but never lost its focus on people, service, and outstanding quality. The company's solutions are highly technical, yet Bekaert positions itself as a reliable partner ready to assist customers through all phases of planning, implementation and after-support.

One-stop supplier for custom solutions

A team of highly trained technical experts can work directly with customers to enable them to easily upgrade from planar to rotatable technology. By using the optimal combination of Bekaert sputter hardware and Bekaert sputter targets, clients gain a competitive edge by setting the standard for superior glass coating, in terms of quality of the stacks and overall sputter efficiency.

Global presence, personalized service

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Safety Glass Experts: improving tempered glass production efficiency

Arto Jantunen - Senior Tempering Specialist
SAFETY GLASS EXPERTS INTERNATIONAL

This article takes a look at the most important task of companies operating in glass tempering - delivering correct glass in correct time to their clients, exactly according to the order. This requires that glass type, thickness, dimensions, edge finishing, tempering quality, optical quality and the glass amount be correct and delivery be correctly packed. To achieve all this, the entire production line has to operate in the best way possible from start to end. Moreover, in order to ensure adequate profit, the operational efficiency of production must be well adjusted and tuned, especially in these times when market competition is tougher than ever.

Producing tempered glass consists of many different phases and it is important to master them all in order to ensure a good final result. Improving efficiency even a little can be an important part of the total final result. One can quite easily calculate the total impact of the enhancement of each phase by a per cent or two on a yearly basis. The results may be surprising and certainly motivate deploying the small but important steps towards improvement.

In this article I will treat this subject from three different points of view: production flow and control, machinery, and people. In order to ensure the best possible results, all these details need to be in order as they all have an effect on each other. As an example, even the very best production control system is useless if the machinery does not work correctly.

PRODUCTION

It is important to choose a good and suitable production control system, which allows easy control and follow-up of the production flow. However, one must not forget that instead of selecting the best IT-system, it is much more vital to arrange the conditions on the factory floor in such a manner that efficient and flexible production is possible on the whole.

The factory layout should be designed in a way that pendent products can travel easily in

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one direction without any obstacles, avoiding moving back and forth or even crosswise. This minimizes the time needed to move the products and also eliminates the possibility of misplacing or losing the goods. A good practice is to always bring the goods from the previous process to the same area, a kind of 'parking place' close to the next process, where they are easy to find and collect. This routine allows the operator to easily check what kind and how much work needs to be processed. The passageway of the glass racks must be kept free so that time is not wasted clearing the way.

If paperwork is travelling with the glass, it is important that it stays with the glass on the racks all the time. In paperless production, attention must be paid to mark the rack and the glass correctly and clearly so that the operator can find the correct material at a glance.

Arranging flexible and trouble-free production requires that the right number of the correct products be in the correct place at a correct time and that production personnel can find it easily and quickly. My own experience from many glassworks is that quite often missing glass is hunted by several people around the factory. It is hard to believe how common this is. The time of all these people is taken from productive activities and can prove costly in long run. This scenario is usually a good indication that 'mid-storages' are getting too big. Production planning has an essential role here and it is certainly essential when it comes to efficiency. It is not simple to schedule production in the typical glass factory where there are usually 'bottlenecks' due to the differences in equipment production capacity. Typically, when the bottleneck problem is solved somewhere it will re-create itself at another processing stage – balance of variables here is the key to performance and starts from small things such as glass rack loading practices.

One of the best examples of good arrangements in production is that of a company where the glass was delivered to the tempering furnace on racks in a way that the racks were arranged in a queue close to the loading conveyor of the furnace. The length of the waiting queue changed continuously all the time and at its worst was about 30 meters. I noticed that the length of the waiting queue had become an exciting, but playful competition between pre-processing and tempering staff; some wanted it to be as long as possible and others as short as possible. The winners were many, but the real winner was the company itself as the production arrangement at this spot was fine tuned to the best possible level.

When quality standards or a quality system is implemented, operations usually run easier - not always but usually. In any case, one must notice that the system itself does not make production

easier or flow easier; it is the people in the production who do it. It is vital to train and motivate the entire personnel to understand and follow mutually agreed rules of the game and practices, only this will guarantee results. Training new personnel to follow the rules and practices must not be forgotten - well documented processes naturally help with new employee introduction work.

A system to arrange reserve personnel to each workstation needs to be planned if not in use already. Backups to secure the main operators of the most important machines need to be arranged. It is a good idea to give these backups the possibility of operating the machines every now and then; this ensures that they can maintain their skills, even improving when used regularly. This arrangement also enables to start temporary night shift easily if necessary.

It is very important that the whole factory is kept clean at all times. All unnecessary goods need to be moved away in order to free the floor space for production goods. The floors and the machines need to be cleaned regularly in order to minimize possible problems due to dust. This also makes working conditions more comfortable.

MACHINERY

It is self-evident that all the machines in the production line must be in good condition at all times and perform as planned and expected. Furthermore, the machines must be used properly and safely only by operators with appropriate training.

The maintenance of production machinery needs to be arranged according to instructions of the equipment manufacturer regularly and following planned timetables. Machines running over two or three shifts naturally need more maintenance than those running during daytime only. Well-designed and performed proactive maintenance and service improve machinery reliability significantly. This has a very clear connection to the productivity and yield of the machinery. Unpredicted production stops will be minimized and the reliability of the delivery times is also improved.

It is very important that a company running a number of complicated machines has its own internal or subcontracted service organization, at minimum an electrician and a mechanic. This type of service organization is the most effective solution, as the organization will learn to know the machinery a lot better and more closely;

Safety Glass Experts: improving tempered glass production efficiency

while the response time in emergency situations is also fast.

The spare part stock of machinery must be checked and updated regularly so that the down time in case of a problem will be as short as possible. It is vital to have parts in stock, which can, if they are not available, cause a complete production stop. The availability of important spares should be verified beforehand from the original suppliers or from local suppliers; this must be carried out prior to any major problem.

As machine operators use their equipment daily, they are very often the best experts to know the condition of the machines, as well as probable problems that may occur in the near future. Certainly, correct training concerning machine operations, as well as the initial quality problems of produced glass are essential, so that it will be possible and easy to follow the conditions of the machine and also predict any rising problems.

It is good practice that machine operators themselves carry out daily and weekly checking and small maintenance tasks, and keep records of them. It is also justifiable to pay attention to the cleanliness of the machines and their surrounding environment and carry out adequate weekly cleaning. Doing this guarantees that the weekly checking and maintenance tasks will be carried out routinely.

PEOPLE

Even if it is an old cliché, people are the most valuable resource of a company. Their well-being and working motivation directly affect the efficiency of production and the quality of finished products.

When considering company operator training requirements, the overall situation is often overlooked. The real reason causing scrap quality is not identified, whereas, in the worst case scenario, successful production operations rely entirely on few key-persons.

Sometimes training requirements are considered as non-existent since there is a key-person in the production with decades of experience. But how will the production perform in a situation where the key-person(s) is not present due to illness or new employment?

Good results will be achieved by correct training, where all personnel understand how the company operates. Understanding the operations of the entire company will help to find better motivation. The importance of good cooperation between all players in the company must be emphasized, as all phases of production effect each other.

As an example, the operator of a grinding machine must understand, and even better, witness with his own eyes, what kind of problems bad quality of grinding can cause in tempering.

It will be rewarding to maintain the skills and even improve them by appropriate and frequent training. Training operators for several processes is an investment; this will improve team spirit, general interest in different working methods and also facilitate sustaining the reserves for each machine type/process stage.

As mentioned earlier in this article, people

THE AUTHOR

Senior Tempering Specialist Arto Jantunen is a real black belt tempering specialist with over 24 years of experience from design, commissioning, and maintenance of tempering plants, as well as training and consulting customers in tempering process. His professional background includes various managerial positions working for the leading western tempering equipment manufacturers, such as Tamglass, Uniglass, Glamec, and Ianua. During his long career in glass industry Arto has acquired extensive international experience working with hundreds of different projects around the world and running local operations being relocated to France and Italy.
Arto has a degree of B.Sc in Engineering and in addition to English, he also speaks French. His expertise in the tempering process, tempering plant design and maintenance enable Safety Glass Experts to provide complete services for the improvement of tempering plant operations, including new product tempering introduction, defect diagnostics, tempering process training, present state evaluations, to name a few.

tend to react quite positively to different competitions, even if playful and not very 'serious'. This highlights that they are organized properly and with care. According to my experience they have a clear and direct impact on the efficiency of production and productivity. It is profitable to think about a good reason for a competition and introduce it in such a manner that all personnel have the possibility to participate in some way. It is clear that the winner(s) will be rewarded pretentiously but with moderation, the honour is very often the most important award in these kinds of competitions. The 'losers' must not be forgotten either, they have certainly done their best and probably even improved their performance, so it is very important to reward them as well. This kind of activity is good in improving team spirit and will certainly pay back later on.

CONCLUSIONS

In this article I have brought out some aspects, which affect the performance and productivity of any company. It is self-evident that this article is very general and only scratches the surface of the subject. My purpose has been to enable readers to find the idea and the end of the yarn that leads to good results. Just by adopting the common rules of the game, and good practices among production personnel, will start good development towards better performance. To get a kick-off towards this

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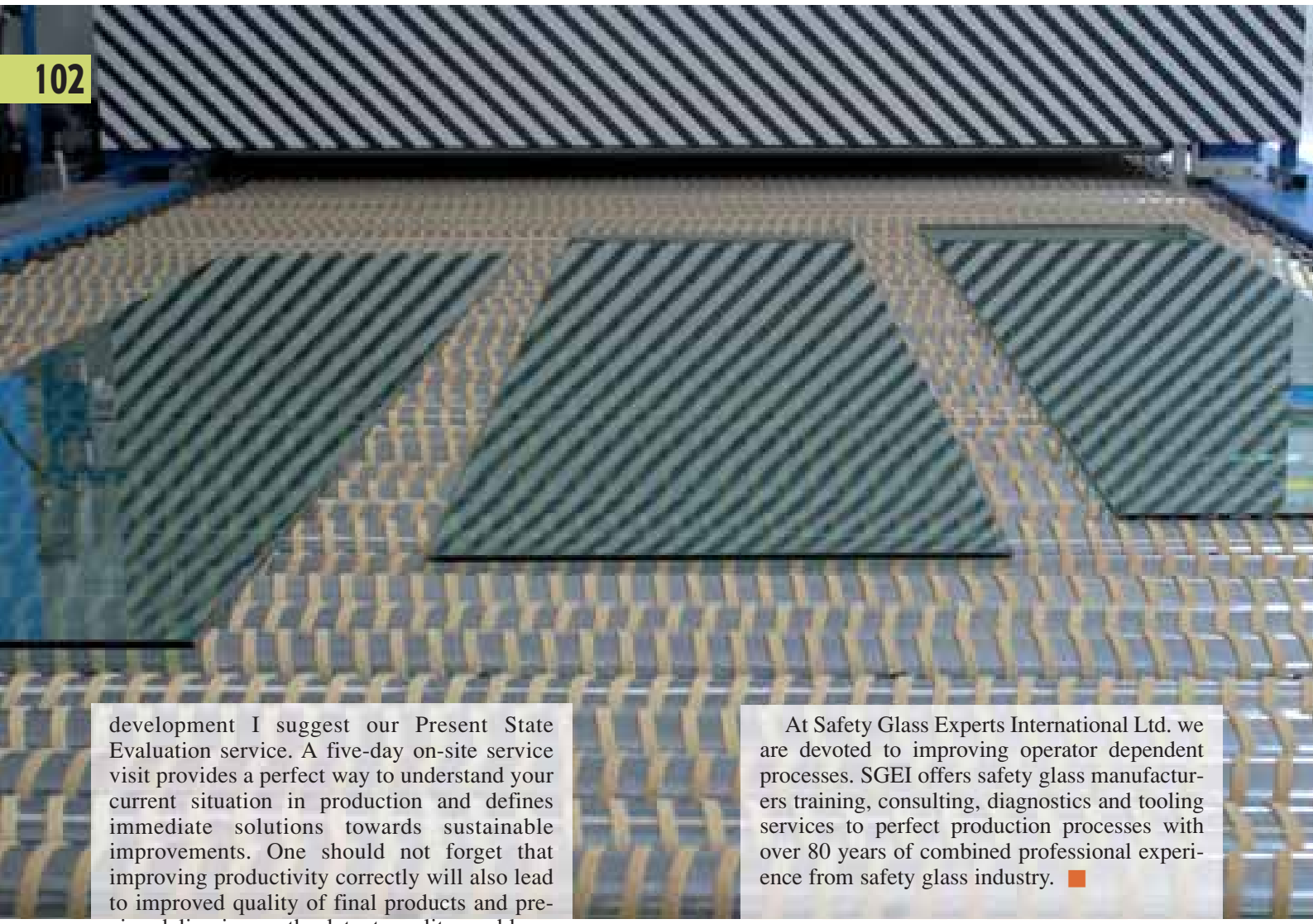

development I suggest our Present State Evaluation service. A five-day on-site service visit provides a perfect way to understand your current situation in production and defines immediate solutions towards sustainable improvements. One should not forget that improving productivity correctly will also lead to improved quality of final products and precise deliveries as the latent quality problems during the production process will be reduced.

The production environment consists of arranging and controlling the production, machinery and people. All of them are important both individually and in unison, but I would still like to emphasize most of all the importance of the role of people working in the process, due to the fact that they control it all and all their actions will have an impact on the final results. It is worthwhile to take care of their wellbeing, training and working motivation, as only positive people make positive results. Our tempering training programmes have shown great results and are available both on-site as well as remotely, and are a investment and key to immediate improvements in productivity, quality and worker motivation.

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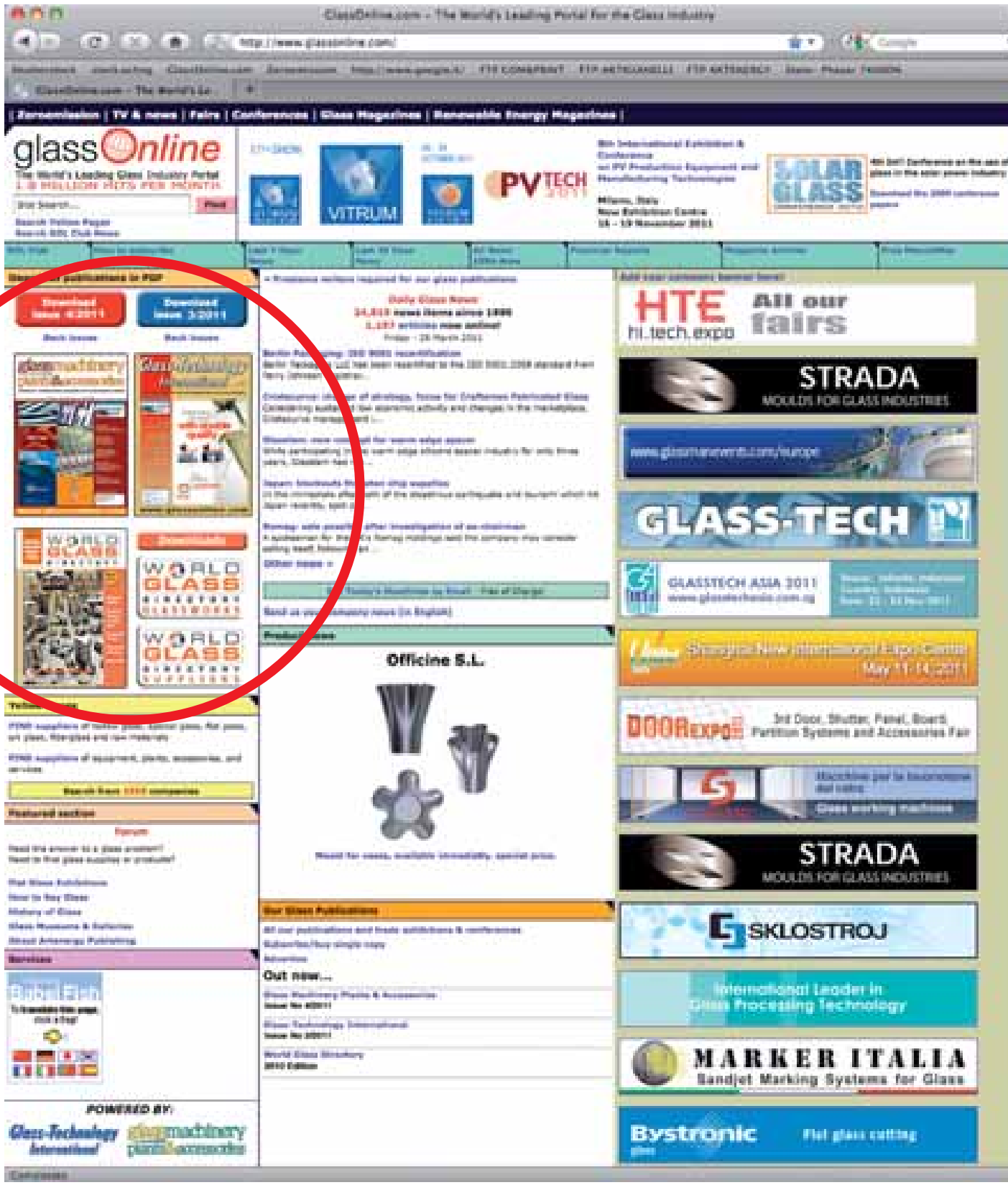

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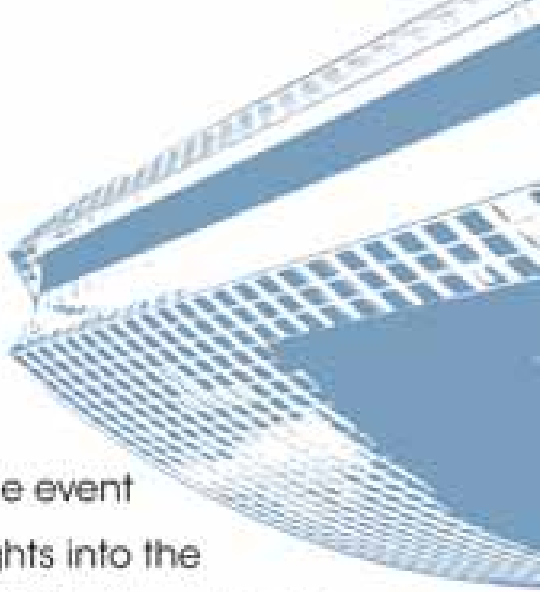

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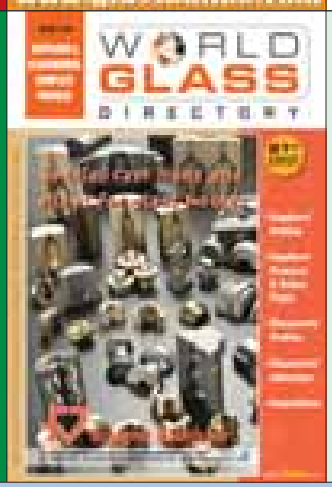

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