

GLASS WORLD.



WINTER 2010 • VOLUME 18

THIS ISSUE

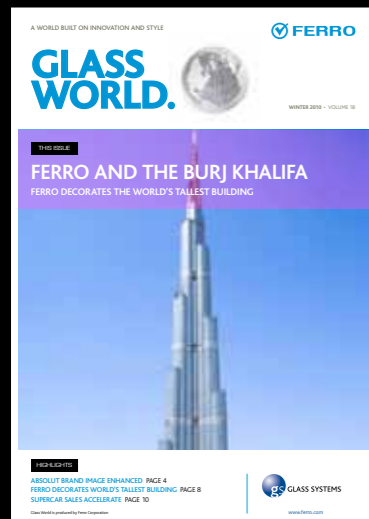
FERRO AND THE BURJ KHALIFA

FERRO DECORATES THE WORLD'S TALLEST BUILDING



HIGHLIGHTS

ABSOLUT BRAND IMAGE ENHANCED PAGE 4
FERRO DECORATES WORLD'S TALLEST BUILDING PAGE 8
SUPERCAR SALES ACCELERATE PAGE 10



Front cover image shows the newly built Burj Khalifa, the worlds tallest building at 828m and with lead-free glass decoration on the podium made possible with Ferro's System 140.

2011 EXHIBITIONS

CHINA GLASS
Shanghai, PRC, 11-14 May

MIR STEKLA
Moscow, Russia, 6-9 June

GLASS PERFORMANCE DAYS
Tampere, Finland 17-20 June

CONTENTS

FERRO AND ARDAGH GLASS WORK TOGETHER TO ENHANCE ABSOLUT BRAND IMAGE

PAGE 4

CURRENT TRENDS IN GLASS DECORATION

PAGE 5

FERRO SYSTEM 140 AND THE WORLDS TALLEST BUILDING - THE BURJ KHALIFA

PAGE 6

NEW FUNCTIONAL COATINGS

PAGE 8

FERRO MARKETS EXPAND EASTWARDS

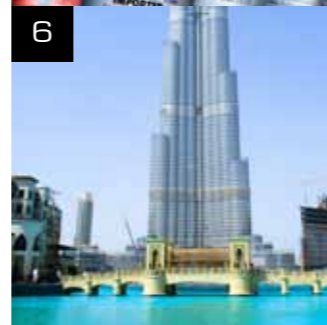
PAGE 10

SUPERCAR SALES ACCELERATE

PAGE 10

FERRO TODAY

PAGE 11



FOREWORD



GLASSTEC CONFIRMS RECOVERY IS UNDER WAY.

Welcome to the latest edition of Glass World, Ferro's global newsletter. I hope, like us, that you are heading into the end of the year feeling positive about an upturn in the market.

As a company we are definitely looking forward, especially after attending the Glasstec 2010 exhibition in Dusseldorf, Germany at the end of September. With 1,200 stands and more than 45,000 visitors, the general feeling was much more upbeat than in 2008. It certainly reinforced our view that all of the markets Ferro serves are in recovery.

Ferro Glass Systems had a very big presence at Glasstec 2010 and I am glad that so many of our customers took the opportunity to visit us and discuss business and market trends. This year we were delighted to host the President and CEO of Ferro Corporation, Jim Kirsch and VP of Electronics, Colour and Glass Materials, Mike Murry. I know they enjoyed meeting and talking with many of our customers and distributors who attended the Show.

Glasstec allows us to see the trends in the glass industry and I'm pleased it confirmed that Ferro is ideally placed to satisfy the upcoming needs and trends in the market. For instance, we are investing heavily in digital printing on glass. We are increasing our development efforts for organic decorating inks and coatings and we continue to extend our range of heavy metal free glass enamels.

We're also developing new technology to enhance the performance of solar glass products, as the solar energy market becomes of critical importance to the glass industry.

We recently announced our 3rd quarter operating results with Ferro Corporation sales up 20% from the same quarter last year and 30% year to date. The recovery was initially driven from Asia, where the construction and automotive markets are recovering, but demand in North America and Europe has gathered pace too.

Whilst we are still not back to the heights of a couple of years ago, we are optimistic about the future and we believe that our recent plant rationalization and development strategies leave us well placed to capitalize on future growth opportunities.

As we move into the festive season and New Year, I would like to thank all of our customers for your loyalty and support in 2010, especially as we navigated through the difficult challenges associated with our production transfer projects and the changing market environment.

May I wish you all a Merry Christmas and a prosperous 2011.

Hans-Juergen Frischkorn
Business Director, Glass Systems



FERRO AND ARDAGH GLASS WORK TOGETHER TO ENHANCE THE ABSOLUT BRAND VISION

ARDAGH GLASS HAS GROWN RAPIDLY DURING THE LAST FEW YEARS TO BECOME ONE OF EUROPE'S LARGEST MANUFACTURERS OF GLASS CONTAINERS, WITH A 6500-STRONG WORKFORCE ACROSS 20 PLANTS IN GERMANY, UK, SWEDEN, DENMARK, THE NETHERLANDS, POLAND AND ITALY. IT ACQUIRED THE EUROPEAN GLASS OPERATIONS OF ROCKWARE IN 2006 AND REXAM IN 2007 AND NOW PRODUCES AROUND 13 BILLION GLASS CONTAINERS PER YEAR.

It is known globally for excellence in glass manufacture and is the preferred packaging supplier for many of the world's largest food and beverage brands.

Ardagh has the largest range of in-house decoration facilities in Europe for a glass container manufacturer, and offers a full package of options including screen printing, coating, etching, embossing, PSL and shrink-sleeving. This creates endless possibilities for adding value to packaging.

Ferro has worked with Ardagh over many years through its main decoration

facilities, which are housed at Limmared in Sweden and Barnsley in England.

We have helped with the introduction of many premium packaged products for a range of global iconic brands.

The Limmared plant is Sweden's oldest glassworks, dating back to 1740. It has undergone major investments in recent times and can now boast the largest decoration capacity in the Ardagh Glass group.

This growth has been driven in large part by the development of the ABSOLUT

vodka brand and vision, a truly iconic Swedish label. Every bottle of ABSOLUT vodka is produced in the small town of Åhus in southern Sweden and Ardagh's Limmared plant is perfectly positioned to supply the glass bottles and service the ABSOLUT brand. The bottle shape is based on the design of a traditional 19th century pharmaceutical bottle found in a Stockholm old town antique store.

The ABSOLUT brand was acquired by Pernod Ricard, one of the world's largest wines and spirits producers, when it purchased the Swedish state-owned Vin

& Sprit AB (V&S) in 2008. ABSOLUT is the world's 4th largest premium spirits brand.

Created in Åhus over a century ago, ABSOLUT was launched internationally in New York in 1979, with bottles made and decorated at the Limmared plant in Sweden. Ever since, the Ardagh plant has been closely associated with ABSOLUT's development as an iconic label - and has helped capture and deliver the many design ideas presented by the ABSOLUT brand managers, who have masterminded the brand's growth.

As a major supplier of glass enamels and organic inks to Ardagh, Ferro has also become closely associated with the ABSOLUT image. We helped during the late 1980's with the move to a totally lead-free blue decoration for the original ABSOLUT blue. This original blue label has been complimented by many flavoured vodkas and limited editions over the past 3 decades, most of which have incorporated Ferro colors - either thermoplastic glass enamels, organic inks or a combination of both.

From Mandrin to Pears, Kurant to Mango, Raspberri to Apeach, Citron to Ruby Red - all the way to the 2010 launch of the Berri Açaí flavour, Ferro has helped deliver the ABSOLUT design brief with many more than 1 billion bottles produced so far.

More recently, we have worked with Ardagh to introduce our latest generation of organic coatings for the full-colored ABSOLUT bottle designs.

Bo-Lennart Nilsson, Ardagh Glass Limmared Plant Manager comments: 'I have been personally associated with The Absolut Company for over 20 years and overseen the launch of many new ABSOLUT bottles. High speed automatic decoration is a crucial element of our glass manufacturing process and we have come to depend on our close relationship with Ferro to help create the colors and provide the operational support that this demanding customer requires. We have met many challenges along the way but the journey has been enjoyable and the ABSOLUT story will continue, of that I'm sure...'

Thorsten Peters, Global Business Manager for Ferro's container glass business adds: 'ABSOLUT is a challenging client and with Ardagh's help, it's important that we understand their vision and needs. Thanks to excellent co-operation amongst our respective teams, we have been able to achieve the targets and set new standards in bottle decoration. Ferro is honoured to be part of the team and we are always striving to improve and innovate.'

HEALTH & SAFETY MATTERS

CURRENT TRENDS IN GLASS DECORATION

Regulators and the public continue to show sensitivities surrounding decorations containing cadmium and other heavy metals such as lead. For example, in the US, the Consumer Product Safety Commission (CSPC) recently set a daily exposure limit for cadmium that could be ingested from toys, jewelry and decorations. The CPSC also recommended that an existing ASTM test be amended as a standard test for such cadmium exposure.

Ferro is fully committed to providing our customers with high-quality products that meet local and international safety standards and legal requirements. We were the first manufacturer of glass coatings and inks to offer non-lead products in the mid-90s. We were instrumental in the industry's switch to heavy metal-free (HMF) enamels for automotive and architectural glass.

For glass tableware, tumblers, giftware and glass bottles, our non-lead enamels systems are all in compliance with Packaging Directive EU/94/62/EC and the CONEG Model Toxics in Packaging Legislation.

Ferro's broad product line of glass enamels, and organic coatings and inks, makes it a leader amongst glass decoration suppliers.

Ferro supplies glass enamels that are favored by many manufacturers and brand managers due to the strong vitreous bond created at the color/glass interface during the high temperature firing process. The pigment/glass system is chemically bound to the glass surface during the manufacturing process.

Additionally, our SpecTruLite® organic coatings and inks are growing in popularity as we develop new generations of organic products with improved performance and durability. By their very nature, the organic bond is not as strong as the glass/glass vitreous bond. However, the organics option can deliver a wide palette of energy efficient HMF colors and special effects, which can be cured at lower temperatures compared to glass enamels.

We offer the choice... the market decides.

FERRO AND THE BURJ KHALIFA

IN JANUARY 2010, THE BURJ KHALIFA TOOK THE TITLE OF WORLD'S TALLEST BUILDING. ITS EYE-CATCHING 828M HEIGHT IS MATCHED BY ITS AMBITIOUS DESIGN, WITH LEAD-FREE GLASS DECORATION ON THE PODIUM MADE POSSIBLE WITH FERRO'S SYSTEM 140.

At twice the height of the Empire State Building, the Burj Khalifa is the exemplar of what can now be achieved in building architecture and design. It is clad in 28,000 reflective glass panels, has 160 floors and can be seen from 60 miles away. It will be home to 1,044 apartments, 49 floors of offices and the Armani Hotel Dubai.

Since the 1970s, incredible innovation has seen more and more buildings like this made possible. Designers and architects

now have the technologies available to make their visions reality. For our part, Ferro has led the way in providing enhanced design and creativity options for architectural glass.

Our lead-free enamels for spandrel glass – revolutionary for their time when first introduced in the early 1990's to replace environmentally unfriendly leaded enamels - have now been used in many of the world's leading commercial structures, including the Petronas Towers in Kuala

THE BURJ KHALIFA HOLDS RECORDS FOR THE...

- TALLEST BUILDING IN THE WORLD
- TALLEST FREE-STANDING STRUCTURE IN THE WORLD
- HIGHEST NUMBER OF STOREYS IN THE WORLD
- HIGHEST OCCUPIED FLOOR IN THE WORLD
- HIGHEST OUTDOOR OBSERVATION DECK IN THE WORLD
- ELEVATOR WITH THE LONGEST TRAVEL DISTANCE IN THE WORLD



Lumpur, the Transportation Center in Los Angeles and the Willis (Sears) Tower in Chicago.

Our innovative s1de ONE lead-free colors – launched in 2007 – were developed for decoration of the outside surfaces of architectural exterior glass. The s1de ONE range is now increasingly adopted by architects around the world and amongst other examples, brought to life the iconic design of 'Bill-ding' – the headquarters of Lithuania Bank.

In the case of the Burj Khalifa, Ferro's industry-leading System 140 was instrumental in fulfilling the designer's dream for the atrium. System 140 is an intermixable, zinc-based system for the

environmentally friendly decoration of spandrels, interior glass, appliances and furniture. It delivers heavy metal free enamels with optimum opacity and gloss, with high chemical and mechanical durability. It can be applied by screening, roller-coating or spraying.

The laminated IGU panels using Ferro's System 140 metallic silver were processed and supplied by Al Abbar Architectural Glass, one of the leading glass-processors in the United Arab Emirates (UAE), based in Dubai. Al Abbar uses the most up-to-date glass-processing equipment to guarantee top quality end-products that are used extensively in curtain-walls, doors, windows, skylights, balustrades, frameless assemblies and other glass applications.



The glass for the Burj Khalifa Podium was used for the offices, annexes and entrances.

'We are proud to be associated with this iconic project through the Al Abbar Group', says Mina Karcher, Managing Partner of Karcher Trading, Ferro's representative in the UAE region.



1. Empire State Building, New York
Built: 1931, Height: 381m
2. World Trade Center, New York
Built: 1970, Height 417m (Tower 1)
3. Willis (Sears) Tower, Chicago
Built: 1974, Height 443m
4. Petronas Towers, Kuala Lumpur
Built: 1996, Height: 452m
5. Taipei 101, Taipei, Taiwan
Built 2003, Height: 509m
6. Burj Khalifa, Dubai, UAE
Built 2010, Height 828m



NEW PRODUCTS AND APPLICATIONS

FUNCTIONAL 'NANO-BARRIER' COATINGS FIND NEW MARKET APPLICATIONS

SPILL-PROOF BARRIERS FOR FRIDGE AND FREEZER GLASS SHELVING
ANTI-FOG FRIDGE/FREEZER GLASS DOORS AND LIDS, SHOWER PANELS AND MIRRORS
EASY-TO-CLEAN GLASS OVEN DOORS AND CONTROL PANELS.

Ferro is partnered with Nanofilm Ltd., an independent Cleveland, Ohio USA company, who are a leader in nanofilm technology and nanocoatings across a diverse range of industries.

Through this partnership, we have recently launched several new products across a number of glass market segments. The coatings are easy to apply in industrial situations and cure rapidly in air within minutes to form permanent covalent bonds to glass.

Here, we feature 2 new products:

CLARITY UltraSEAL® ABW and CLARITY UltraSEAL® HLC66

UltraSEAL ABW has excellent UVA durability and can therefore be used as a 'nano-barrier' in either interior or exterior market applications. It imparts an invisible

optically clear, easy-to-clean surface to glass that repels water, oil and dirt and makes fingerprints easier to remove. The coating also improves scratch resistance and prevents marring of the glass due to debris or other external contaminants.

Additionally, we have confirmed long-lasting heat stability, with ABW withstanding more than 500 hours continuous exposure at 200°C. ABW has also withstood over 7,000 hours of UV exposure in a QUV accelerated weatherometer, outperforming any other competitive product.

Amongst others, these glass performance enhancements are being recognised by the appliance market, notably:

- Spill-proof barriers for glass shelving in refrigerators and freezers

- Easy-to-clean heat resistant coatings for glass oven doors and control panels

UltraSEAL HLC66 Anti-Fog provides an ultra-thin (~15nm) hydrophilic nano-coating that imparts anti-fog and easy-to-clean performance and is designed for interior applications such as fridge and freezer doors and lids, shower panels and bathroom mirrors or any environment where high humidity is experienced.

HLC66 Anti-Fog provides a durable layer, whose lifetime can be prolonged indefinitely through constant renewal by simple cleaning with surfactant-based common household cleaners.

Watch out for future news about our activities with new nano-products and functional coatings for the solar and automotive markets.....

NEW PRODUCTS INTRODUCED BY FERRO IN THE LAST TWO YEARS

FLAT GLASS		BENEFITS
s1de ONE	Architectural	Durable decoration for outside surface of exterior glass. Enhances design potential
LustReflex	Architectural Appliance	Printable hi-reflective, semi-mirror effects
Nanofilm AB5 coating	Appliance AR-coated displays (interior glass)	Protective coatings with excellent optical properties, scratch and chemical resistance difficult-to-mark (DTM) and easy-to-clean (EZC)
Nanofilm ABW coating	Appliance Architectural	Protective coatings with excellent optical properties, scratch and chemical resistance difficult-to-mark (DTM) and easy-to-clean (EZC). Outstanding UVA durability.
Printable AR-coatings	Solar/Display/Lighting	Patternable, improved transmission, lower cost than PVD, CVD or dip-coat
System 140NA	Architectural	Industry leading HMF enamels; high opacity, high chemical and mechanical durability Pass GANA test specs for architectural glass
Patternable coatings for laminated glass	Architectural/Automotive	For application to surface 2 or 3 - lower cost than colored PVB film
AUTOMOTIVE		
High resistant Surface 4 black-band enamel	Laminated windshields	Passes 72 hour H ₂ SO ₄ Toyota test, wide firing range
Low Bi anti-stick enamels	Automotive	Industry leading anti-stick, busbar hiding, chemical durability and opacity
Fine line silver pastes	Automotive	'Invisible' heat grids on auto backlites
Surface 2 black band enamels	Laminated auto windshields	Single-fire; lower cost processing; hides busbars and other functional coatings
CONTAINER PRODUCTS		
88 Series SpecTruLite® Waterborne Organic Coatings	Beverage bottles Cosmetic bottles	TWO-pack high reactive coating, excellent adhesion and scuff resistance, outstanding in high speed decoration and filling lines
Kristal Transparent HTP+ organic inks	Beverage bottles Cosmetic bottles Giftware	High gloss transparent scuff-resistant
HMF purple enamels	Beverage bottles Cosmetic bottles	For both 1-way and multi-way; temperature stable during firing
Generation5 Hot Melt organic inks	Beverage bottles Cosmetic bottles Tableware	New generation easy-to-use inks with good printability for both 1-way and multi-way
Forehearth UVA	Beer bottles Cosmetic containers	UV-protection of bottle contents for extended shelf life
LASER MARKING		
Laser Marking colors	Decorative glass Laboratory glass	Brighter, stronger colors; permanent marks for logos, badges and ID
Laser Marking etch	Drinking glasses	ID, volume marks and 'beer head retention'

FERRO MARKETS EXPAND EASTWARDS

Ferro Glass Systems has a global sales network ideally placed to follow trends in global manufacturing and consumer demand.

This means that we have been able to react rapidly to shifts in demand 'eastwards', as our customers have expanded, and in some cases moved, their manufacturing locations from Western Europe and North America, often to Asian countries. In previous Glass Worlds, we have described the expansion of our Ferro operations in PRC and Russia.

In Europe, of course, we have also seen a trend for manufacturing to move eastwards as the EU has expanded to include countries of the former Soviet Union and the Soviet bloc.

Our strong agency network in countries like the Czech Republic (Sving), Poland

(ETC), Hungary (Rainbow) and the Baltic States (Algol) provides us with a real advantage to service the new business in 'the east'. Many also act as distributors and operate with local warehouses for an additional customer service benefit.

We believe it is vitally important to work with trusted agents who understand the local cultures and the services required by our customers. Additionally, all our agents receive technical training so that they become a real extension of our staff in the field. Of course, our own technical service and development staff are also available to add additional expert support when needed.

So, here we would like to pay tribute to our many external agents around the world, who – combined with our Ferro subsidiaries and JV partners - form an essential part of our global sales network!

Look out for features on our agents and distributors in future editions....



Prague, Czech Republic

SUPERCAR SALES ACCELERATE AND FERRO IS ALONG FOR THE RIDE

With the automotive industry moving gradually into recovery, supercars are, maybe surprisingly, one of the more buoyant sectors.

Ferro is proud to be involved in several of the hottest supercars around. That includes providing decorative and functional materials for the Bugatti Veyron. The world's fastest production road car is made by Volkswagen and costs more than \$1.5 million.

Lamborghini has unveiled a number of new supercars in the last couple of years, notably the Gallardo LP 560-4 and the Murciélago LP 640. All use our black band glass enamels.

Ferro has worked with glass suppliers to the world's prestige car manufacturers



for many years. So we are delighted to supply materials for the new Rolls-Royce Phantom Coupe and Cabriolet, as well as the Mercedes Benz owned Maybach models.

Why do all these prestigious marques choose Ferro? Because, with plants around

the globe, we can provide a local service to the glass suppliers, wherever the cars are manufactured. Plus, our innovation and new product development means we can meet the boundary-pushing glass designs and specifications required for these super-cars.



FERRO TODAY

At Ferro, our vision is to enhance life through superior materials performance. This simple but powerful statement describes our ideal future – what we want to become. Our vision unites our global organization around a common goal and inspires us to achieve it.

Our mission is to create a high-value, environmentally sensitive performance materials company that enhances life by serving markets aligned with global mega-trends.

With over 5000 employees and an annual turnover in 2009 in excess of \$1.6bn Ferro has substantial manufacturing capabilities in the United States, Europe, Asia and Latin America.

Ferro Corporation consists of 2 main business groups:

BUSINESS GROUPS		PRODUCTS	TYPICAL APPLICATIONS
ELECTRONICS, COLOR & GLASS MATERIALS	Color and Glass Performance Materials	Enamels, glazes and pigments; speciality ceramics and glasses; organic and inorganic colors; organic inks; foreheath colors; laser marking	Automotive glass, building, appliance and furniture glass, glass containers, tableware and giftware, dinnerware, roof tile, sanitaryware
	Electronic Materials Systems	Conductive metal pastes and powders; dielectric materials; polishing materials, chemical mechanical planarization (CMP) slurries	Solar cells, multilayer capacitors for electronic products, semiconductor wafer and optical lens polishing, integrated circuit manufacturing
POLYMER AND CERAMIC ENGINEERED MATERIALS	Performance Coatings	Frits, glazes, pigments and colors; inks for digital tile printing; porcelain enamels	Ceramic tile, appliances, cookware, hot water heaters
	Polymer Additives	Lubricants, plasticizers and speciality additives used in the manufacture of plastics and other materials	Automobiles, construction materials, home furnishings, industrial products, packaging, vinyl flooring, vinyl wall coverings
	Speciality Plastics	Glass-filled, engineered plastic compounds; pigments and colored coatings	Appliances, automobiles, building materials, packaging
	Pharmaceuticals	Custom synthesis of high-potency, active pharmaceutical ingredients	Specialised drugs for life threatening illnesses; injectable applications including vaccines, immunotoxins, hormones

We believe that our long term success will be determined by who we are and how we act. Our core values apply equally to all interactions with customers, suppliers and colleagues.

- Trust is the foundation for our future
- Delivering on our commitments is essential to our credibility
- Customer-centric thinking is the path to growth and success
- Continuous improvement sustains operational excellence
- A winning attitude will accelerate our success.



Americana, Brasil



Almazora, Spain



Ferro Cerdec, Thailand

Regional Glass Systems Headquarters

Americas
Ferro Glass & Color Corporation
West Wylie Avenue
Washington PA
USA

t +1 724 223 5900
f +1 724 228 3170

gs-americas@ferro.com

Europe
Ferro GmbH
Gutleutstrasse 215
Frankfurt am Main
Germany

t +49 69 2711 60
f +49 69 2711 6368

gs-europe@ferro.com

Asia Pacific
Ferro Japan KK,
21 Kasuminosato
Ami-Machi, Inashiki-Gun
Ibaraki Pref.
300-0315 Japan

t +49 69 2711 60
f +49 69 2711 6368

gs-asia@ferro.com



www.ferro.com

© Copyright Ferro 2010.
Ferro reserves the right to alter specifications.



A world of possibilities for your glass



Automotive
Architectural
Appliance
Furniture
Laser Marking
Containers
Tableware

For outstanding glass color and coating technologies – both decorative and functional – Ferro are global market leaders. We work in partnership with you from the start to provide the applications advice and expertise that will guide you through even the most challenging projects. Our vast technical and market knowledge, global reach and innovative approach will guarantee that you can trust Ferro to deliver a solution to exceed your expectations... **a world built on performance and style.**



www.ferro.com