A WORLD BUILT ON INNOVATION AND STYLE

FERRO

GLASS WORLD.

SPRING 2011 • VOLUME 19

THIS ISSUE

FERRO SPARKLES WITH MAJOR DRINKS BRANDS

HIGHLIGHTS

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GLASS WORLD.

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Front cover shows the Limited Edition Absolut Glimmer bottle, the latest launch from the iconic Absolut label, with Ferro lead-free enamels. The bottle is manufactured by Ardagh Glass of Sweden. Image courtesy of www.absolut.com

2011 EXHIBITIONS

CHINA GLASS
Shanghai, PRC, 11-14 May

MIR STEKLA
Moscow, Russia, 6-9 June

GLASS PERFORMANCE DAYS
Tampere, Finland, 17-20 June

GLASSPrint 2011
Düsseldorf, Germany, 23-24 November

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FOREWORD

INNOVATION & SERVICE – OUR GUIDING PRINCIPALS

Welcome to the latest edition of Glass World, Ferro's global newsletter. This issue looks at how Ferro is working with some of the worlds leading brands to deliver outstanding solutions in glass – from container to automotive to construction and appliances.

The past 30 months have seen turbulent times for all of us in business, and we have seen this across each of the industries and markets we serve. Within Ferro, we have reduced our cost base in response to economic pressures, and rationalised our manufacturing operations across the globe, especially in Europe. This program is now reaching a successful conclusion and we are looking forward to a period of stability, building on the strengths gained from our new structure to deliver the service and product innovations that you, our customers demand and have come to expect from us.

Ferro Corporation recently published our 2010 operating results – we announced sales of $2.1 billion, up 27% compared to 2009 and we closed the year with an exceptionally strong fourth quarter performance. Taken overall, this leaves us in excellent shape to capitalize on future market growth opportunities and to build on our strong customer relationships, especially as we bring new products to market during 2011 and beyond.

I can assure you all that innovation and customer centric thinking will be our guiding principals as we continue the shift in emphasis from the necessary demands of cost reduction to focusing on our markets and customers. Our goal as always is to help you add value to your own products and manufacturing processes by delivering 'stand out' performance..... For example, we have invested considerably in our R&D for organics inks and coatings and are launching a number of new product systems in 2011.... Our unique S1de ONE enamels for flat glass are appearing on more and more building projects around the world, and we will continue our efforts to tailor our automotive blacks and silver pastes to meet the demands of 21st century auto design.

In addition, we report in this issue on our commitment to fulfil all regulatory requirements concerning our products in the different markets around the world, notably the REACH and CLP Regulations that recently came into force in the EU.

As we go to press, the humanitarian and economic crises in Japan, following the earthquake and tsunami, are still evolving. Our thoughts are with all the people of Japan at this difficult time. Thankfully, our employees in Tsukuba and Tokyo are safe and well and after a brief closedown, our plants are fully back to operation. We have established contingencies to assure continuity of supply to all our customers in Japan and throughout the Asia region that cover all eventualities.

I hope that you enjoy this edition of Glass World and may I thank you for your custom and loyal support.

Hans-Juergen Frischkorn

Business Director, Glass Systems

NEW HIGH PERFORMANCE AUTOGLASS BLACKS

IN SPITE OF EXPERIENCING THE DEEPEST RECESSION IN LIVING MEMORY, FERRO HAS CONTINUED WITH ITS STRONG R&D EFFORTS, ESPECIALLY SINCE THE CRISIS HIT IN THE SECOND HALF OF 2008.

Ferro's R&D is globally managed with strong co-ordination amongst its staff based in the different regions. This is particularly important for the automotive industry which is structured globally with global product standards and specifications.

The base products are manufactured in prime production sites to assure global quality standards are maintained for the major players in the automotive glass supply market.

Final glass enamels can then be tailored locally close to the end user plants, to cater for any special requirements relating to the process conditions in these glass plants, as well as assuring fast reaction and speedy delivery.

The latest edition to Ferro's autoglass product line is our black enamel 14303, designed for laminated glass windshield applications. This bismuth-containing black is fired in standard sag-bend furnace types on surface 4.

14303 black has good gloss with high opacity and maximum blackness of the color shade. However, it is distinguished by its wide firing range and exceptional chemical durability. **This is the only windshield enamel in the European market passing the 72hours Toyota test (H_2SO_4 exposure) and is fully approved by Volkswagen.**

The new product is already well established in the market with the global auto-glass suppliers and has been used on several new car models including the VW Golf.

Our global R&D group is continuing to work on lower cost and low Bi/no Bi glass enamels and we expect to have more announcements and product launches during the final quarter of 2011.

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HEALTH & SAFETY MATTERS

REACH AND CLP REGULATIONS: REGISTRATIONS COMPLETED

Ferro is committed to fulfil all regulatory requirements concerning our products in the different markets around the world. The European REACH legislation and similar legislation in other countries has been an important topic for us in 2010.

REACH is the European regulation on Registration, Evaluation, Authorisation and restriction of Chemicals. It entered into force on 1st June 2007. It streamlines and improves the former legislative framework on chemicals of the European Union (EU).

The main aims of REACH are: to ensure a high level of protection of human health and the environment from the risks that can be posed by chemicals; the promotion of alternative test methods; the free circulation of substances on the internal market, and enhancing competitiveness and innovation.

REACH makes industry responsible for assessing and managing the risks posed by chemicals and providing appropriate safety information to their users. In parallel, the EU can take additional measures on highly dangerous substances, where there is a need for complementing action at the EU level.

In Ferro, we set up a global co-ordination team that has been working diligently over the past 3-4 years evaluating all products used and sold. We successfully completed all of our required REACH Registration filings to the European Chemicals Agency before the November 30, 2010 deadline. These registrations cover materials both manufactured in and imported to Europe. There will be further deadlines to meet in 2013 and 2018.

In addition, we have been installing systems and procedures for compliance with the CLP Regulations. CLP stands for Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, and certain CLP requirements went into effect on December 1, 2010.

Ferro is committed to complying with CLP as it pertains to the classification, labelling and packaging of our products.

Information required by REACH and CLP will be included in our Safety Data Sheets, package labels and other hazard communications, as required by the EU and member states.

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MULTI-COLOR HTP INKS & COATINGS DECORATE PRESTIGE BRANDS

FERRO STEPS UP DEVELOPMENT OF ITS SPECTRULITE ORGANICS COATINGS AND INKS

Ferro was first to introduce water-borne organic coatings during the 1990's. Whilst organic solvent-based coatings have been on the market for some time, Ferro's SpecTruLite water-borne coatings are significantly lower in the volatile organic compounds (VOC's) that are harmful to the environment. For this reason, more and more glass decorators are moving away from solvent based systems in favour of water-borne!

Since their first introduction, the range of SpecTruLite coatings has been expanded and improved. More colors are available but most importantly, the hardness of the coatings have been significantly enhanced to improve performance through glass processing lines, transportation and high speed bottle filling plants.

Ferro's latest line – System 88 – is a low VOC (MAX 10%), 2-pack polyester based system with outstanding scuff resistance that we expect to rapidly become an industry standard.

It is fast curing at low cure temperatures, typically 10 minutes at 180C, which makes it especially important where high volumes and throughput speeds are required, to support low unit cost decoration.

System 88 is recommended for clear, frosts, whites and colored transparent coatings. A full palette of pigmented opaque and translucent systems is currently under development and will be launched during the second half of 2011.

System 88 is supported by our original epoxy System 95 which although being slower curing and needing higher cure temperatures than '88', has good gloss and a broad color range.

Ferro's organic coatings are complimented by our latest generation SpecTruLite organic inks that can be decorated either directly onto glass or onto our coatings, to enhance the design of glass bottles, containers, tumblers and other table-top and giftware items.

Alongside the developments of our organic coatings, our R&D teams in North America and Europe have also taken our inks through several iterations since they first appeared at the start of the 'noughties'.

Whilst our Generation 4 SpecTruLite HTP+ inks (hot melt thermoplastic inks) are well established in the market, our future HTP+ inks – Generation 5 – are designed for improved printability on high speed printing machines, especially where multi-color over-printing is specified. The inks have the well appreciated excellent chemical durability and adhesion, which means that they can be used for both single-trip and multi-trip bottles. In addition, improved adhesion on untreated bottles will give the option to eliminate an expensive pre-treatment process, providing and important cost saving! Extensive field testing of the Gen5 inks is started.

We are also developing an improved hybrid UV-cure system that is designed to work with our HTP+ inks to further expand the printing potential for multi-color jobs. Watch out for further announcements...

Taken together, these exciting new organic coatings and inks developments from Ferro are being used on more and more brands in the cosmetics and drinks industries, as well as in the glass tableware and giftware markets. They offer an alternative to traditional glass enamels, especially where legislation demands the replacement of cadmium reds in decorations.... and for glass decorators who do not have glass lehrs, lower temperature curing ovens can be used to help conserve energy consumption.

MULTI COLOR HTP INKS & COATINGS

- SYSTEM 88 FAST CURING LOW TEMPERATURE ORGANIC COATING WITH EXCELLENT GLASS ADHESION
- SYSTEM 95 STANDARD CURING WITH BROAD COLOR RANGE
- GENERATION 4, AND TO COME, GENERATION 5 HTP+ ORGANIC INKS FOR MULTI-COLOR PRINTING
- UV-HYBRID INK SYSTEMS TO FURTHER EXPAND PRINTING POSSIBILITIES

NEW PRODUCTS AND APPLICATIONS

FERRO SPARKLES WITH MAJOR DRINKS BRANDS

FERRO IS UNIQUE AMONGST SUPPLIERS OF DECORATION PRODUCTS IN OFFERING A FULL 'PACKAGE' OF COLOR OPTIONS FOR COLORING BOTH 'ON-THE-GLASS' AND 'IN-THE-GLASS'.

Brand managers, designers and glass decorators are offered the widest choice when designing the glass package that best fits their product's image and packaging specification.

Ferro's patented forehearth color technology delivers cost effective 'in-the-glass' coloration that can be used to produce special colors and/or short to medium length color campaigns. Compared to coloring in the glass tank, forehearth coloration allows fast color changes and for tanks having multiple lines, allows manufacturers the option to produce colored products as well as flint from the same flint tank! Add in the possibility to change the color of standard tank colors, e.g. conversion of emerald green to dead-leaf green, or converting light amber to dark amber, and the possibilities become almost endless!

For in-the-glass decoration, Ferro offers the option to choose from traditional glass enamels or its developing range of SpecTruLite organic coatings and inks (see sister article), dependent on the final product specification and color requirements.

The full package of Ferro products can help deliver stand-out shelf appeal and have been used in association with several new product launches from some of the world's leading drinks brands. Some examples are: Absolut Glimmer and Absolut Watkins Limited Edition vodkas, Diageo's Johnnie Walker double black and blue label scotch whiskies and Smirnoff vodka, Nestle's new blue Perrier water bottle, Kronenburg's Baltika Russian beer, Gallo wines, Jose Cuervo Golden Marguerita… and many more.

And from the cosmetics and perfumery sector, brands such as Givenchy, YSL, Ralph Lauren Polo, Bulgari, Avon and Elizabeth Arden.....

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_2SO_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 windshields	Single-fire; lower cost processing; hides busbars and other functional coatings
CONTAINER PRODUCTS		
Red forehearth color	Tableware Giftware	Feeder Frit for use with special glass tank formulations.
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'

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FERER - WHERE EAST MEETS WEST

Ferer is Ferro Corporation's Turkish representative based in the capital Istanbul, with warehousing facilities also located at Kutahya in Aegean Turkey.

Ferer is a family-owned company and has been part of the larger Ferro family since 1997. In fact the Dulgeroglu family's connections with Ferro run much deeper, Erkan Dulgeroglu having been the Managing Director of Ferro's former JV in Turkey, Ege Ferro, that had a frit manufacturing plant in Turkey. Whilst Erkan retains an active role as the Chairman of Ferer, day to day operations are now controlled by his son, Tolga with the support of the Ferer sales and technical team.

It was in the mid-1990's that the glass industry really started to expand significantly in Turkey and naturally Ferro wanted to be at the forefront of this market development. Erkan Dulgeroglu created Ferer initially as Ferro's exclusive partner in the fields of appliance, architectural and automotive glass decoration. Ferer developed rapidly and thanks to their commitment to technical service and customer relationships, so did Ferro's glass colors business. By the time Ferro had completed the acquisition of the former Cerdec (dmc 2) business in 2001, Ferer was perfectly positioned to takeover all activities of the combined businesses in Turkey. This led to a further sustained period of expansion throughout the first decade of the new millennium.

Whilst it operates as an independent company, Ferer is regarded to be very much an extension of the Ferro sales and service team, and we believe this helps differentiate us in the market. The Ferer team receives the same training as our other Ferro sales teams around the world. This allows them to provide on the spot product support to all our major customers, backed as required with additional technical visits from Ferro product experts.

'We think Ferer and Ferro is a perfect fit - and we are rightly proud of the contribution Ferer makes to our success in Turkey and the surrounding countries', says Phil Maitland, Global Business Development Manager, Glass Systems.

Erkan Dulgeroglu, founder and Chairman of Ferer adds: 'We really appreciate over many years how the Dulgeroglu family have been welcomed into the giant family of Ferro – the size of our respective families may be very different but we share the basic philosophy that the customer is king and we are always striving to go that extra mile with our service to our Turkish customers.'

S1de ONE DECORATES MAHLER BUILDING

Ferro's s1de ONE architectural glass colors have been used to decorate part of the Mahler4 complex in Amsterdam, Netherlands.

Realised in 2009, the Mahler4 Office Tower is part of an inner city complex consisting of buildings designed by 9 international architects that is used for offices and housing but also boasts an impressive leisure complex of retail shops, cafes, restaurants and a sports centre. This remarkable complex has not gone unnoticed and was nominated for the FGH Real Estate Prize 2010.

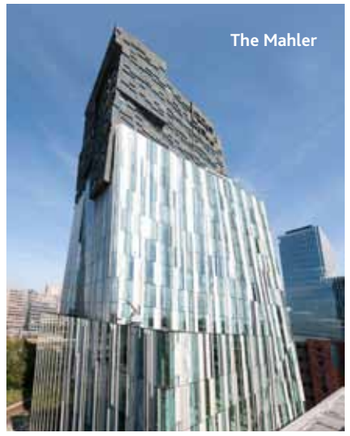
This contemporary construction based on a stacked block structure creates an expressive landmark which appears different from every angle. The Mahler4 office tower – the so-called "Rock Building"– designed by Dutch architect Eric van Egeraat, consists of three distinct sections, connected by a combination of transparent and printed glass elements that use Ferro's s1de ONE enamels (applied to surface 1). The glass is manufactured by SGGS SAS Glas, part of Saint Gobain Glass Solutions, based in Sas van Gent, Netherlands.

Our s1de ONE colors were chosen by the architects to add an extra dimension to the overall decorative effect of the extremely unusual and unique building design of "The Rock".

S1de ONE includes a unique heavy metal free glass formula with exceptional chemical, UV and weather resistance properties, making suitable the application of colors to the outside surface of buildings. There is a basic range of 7 colors, which are intermixable to give a wide range of color possibilities. Additionally the range includes special effects, like etch, and combination prints can simulate wood, stone and metals.

S1de ONE colors are backed by an industry warranty, as specified by architects and glass manufacturers.

To find out more about s1de ONE and the architectural possibilities it presents, talk to your Ferro representative.



The Mahler

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 2010 in excess of $2.1bn 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.

Ferro - enhancing life through superior materials performance.

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For outstanding glass color and coating technologies - both decorative and functional - Ferro are global market leaders.

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