

Pigment Market Still Performing . . .



but Challenges May Impact Intensity of Growth

by Cynthia Challener
JCT COATINGS TECH
Contributing Writer

The market-driven desires of the consumer have far reaching impact throughout the paint and coatings supply chain. In the automotive, electronic, household appliance, and other markets, product differentiation is being achieved through the introduction of more varied and intense colors, many of which offer multifunctional properties and/or special effects such as sparkle, luster, and color shifting. This key trend across so many industry sectors is driving the growth in demand for pigments in paints and coatings (as well as for inks, plastics, and other applications). In the U.S., this growth has occurred in spite of several challenging market conditions, including rising raw material and energy prices, increasing competition from emerging regions, globalization, consolidation in both supplier and customer segments, and ever more comprehensive and strict regulatory requirements. Despite these challenges, innovation and the ability to provide improved customer service and support will enable established pigments suppliers to continue to experience positive growth into the future.

POSITIVE GROWTH

In 2005, the global sales volume of pigments used in paints and coatings was estimated to be 2.46 million metric tons, valued at \$9.13 billion, according to Dan Murad, president and CEO of the ChemQuest Group, a consulting firm located in Cincinnati, OH. White pigments accounted for the largest volume of sales by far, at 83%, but only accounted for just over half of the dollar value (51.5%). Colored inorganic pigments were the second largest pigment type by volume (13.4%), but only represented 9.9% of sales in dollars. Colored organic pigments, which made up only 3% of the volume, accounted for over 38% of the dollar value of global pigment sales. Black pigments accounted for less than 1% of the volume and 0.5% of the

Above photo courtesy of Eckart America Corp.



chemical industry as a whole. The ability to push through some level of price increases should enable pigment manufacturers to recover a certain amount of costs derived from higher raw material and energy prices. Rising oil prices have impacted organic pigment producers the hardest because these compounds are synthesized from petrochemical-based raw materials. Metal prices have been rising as well, though.

Raw material costs are not the only issue. "Economic concerns in end-markets like the automotive industry have trickled down to pigment suppliers," says Dave Glidden, director of sales for the Pigments Division of EMD Chemicals Inc. "The production cutbacks by Ford and GM that started in January 2005 and have continued to this point have had a direct effect on the business of pigment suppliers." He adds that the increasing competitive nature of the marketplace has resulted in some downward pricing pressure, which has limited the ability of pigment suppliers to respond to other market forces like the rising costs of raw materials and energy.

Price increases will likely happen even in the face of increasing competition from low cost producers in Asia, at least for the near term. "Currently, much of the product coming to the U.S. and Europe from China and India is of lower quality. But these producers will eventually address the quality issue and western manufacturers need to be preparing now," says Murad.

Competition from emerging markets is not the only impact of globalization on pigment producers. Many pigment suppliers have already built, or are now building, manufacturing plants in regions of the world such as Asia and South America to better serve these rapidly growing economies. "Manufacturing will be based where growth and opportunity exist," notes Don McBride, chief operating officer for Heucotech Ltd., a Heubach company. "In the current global market, we believe that our customers require products that differentiate their offerings and require supply assurance from vendors so that their customers can be best served," adds Michael Corcoran, vice president coatings sales, for Rockwood Pigments NA, Inc. Rockwood is one of the few remaining iron oxide producers in the U.S.

According to Harry Sarvis, sales and marketing manager with Ferro Corporation's Performance Pigments and Colors Group, "There will always be a strong market for many different kinds of pigments. The logistics may change, but COLOR sells. The shift appears to be moving East, for both manufacturing to stay competitive and for internal consumption as Eastern economies grow. U.S. pigments and coatings businesses will need to shift their focus to niche, high performance products that will be in demand around the world."

dollar value. Geographically, the Americas and Europe each represented nearly 40% of the sales volume, with Asia and the rest of the world making up the remaining 24%.

The U.S. market for color pigments for all applications is predicted by the Freedonia Group to grow an average of 5.2% per year, from \$2.6 billion in 2004 to \$3.4 billion in 2009. The largest application for pigments is in paints and coatings (33%), followed by inks (20%), plastics (18%), and other markets (ceramics, glass, minerals, 28%). The printing ink sector is growing the fastest, but growth is expected for paint and coating applications as well.

High performance organic and specialty effect pigments will experience the largest growth as the desire for new, more intense, and durable colors and special visual effects continues to spread to greater numbers of application areas. The replacement of heavy metal-based inorganic pigments will be an additional market driver. Traditional inorganic pigments, however, will experience an overall decline in demand growth as a result of this trend. On the bright side, more complex inorganic pigments with superior lightfastness and chemical resistance will see increased market penetration, according to the Freedonia Group.

CHALLENGING TIMES

Strong growth in the pigments market is predicted despite the many macroeconomic conditions facing the

2005 Market for Pigments Used in Paints and Coatings (in metric tons)

	NA/SA	Europe	Asia/ROW	Total	Value (millions)
Colored inorganics ^a	116,000	154,000	60,000	330,000	\$900
Colored organics	29,000	27,000	20,000	75,000	\$3,500
Whites	809,000	126,000	507,000	2,042,000	\$4,700
Blacks	7,000	4,000	3,000	14,000	\$33
Total	961,000	311,000	590,000	2,461,000	\$9,133

(a) Includes specialty effect pigments.

Source: The ChemQuest Group

Color is indeed becoming increasingly important as coatings equalize from the standpoint of performance characteristics. "Globally, color is becoming more and more important in consumer buying decisions, for markets from personal electronics such as cell phones, PDAs, and laptop computers, to automobiles and home appliances," asserts Murad. High performance and special effect pigments are being used to add more vivid colors and shine, sparkle, luster, and other special visual characteristics. "Paint companies are constantly extending their color arsenals to fulfill consumer desire for new color trends," adds Guy Decelles, technical director with Eckart America Corporation.

Metallic and achromatic colors continue to dominate the global automotive market, according to Dr. Milt Misogianes, industry head of Transportation Coatings for Ciba Specialty Coatings. "The transportation sector has become the latest testing ground for new pigment technologies," he notes. "The decorative and industrial markets tend to be more resistant to new ideas and will switch to new colors and pigment chemistries only after their performance has been established in other sectors."

In the architectural market, the use of digital technology is one advance that has been quite quickly adopted. "With this capability, consumers can design an entire room including the carpeting, drapes, upholstery, and paint with matching colors and patterns," Misogianes explains. "The technology enables consumers to take control of the decorating process. They are more confident about the process and more likely to change their decorating schemes more frequently. Currently people change homes or décor on average once every seven years."

Globalization has also led to the creation of worldwide brands, according to Misogianes. "Design is becoming a major brand differentiator," notes Tom Hughes, JDSU's business development manager for Flex Products. "Many customers are looking for custom color and appearance design solutions to help establish their brand identity," he adds. Customers want to dif-

ferentiate their products through design initiatives but have cut back on resources. They are increasingly turning to pigment suppliers to provide this service," he explains.

In general, suppliers today are required to provide value to paint formulators beyond just selling them a product, according to McBride. "The increase in the number of vendors offering conventional pigments has enhanced the importance of quality, service, and price," he states. According to Guy Decelles, technical director with Eckart America Corporation, "In the challenging age of globalization, close interactions between pigment manufacturers and paint makers is necessary, and dedicated technical service should be one of the most important approaches to tackling issues related to the effect pigment industry."

Consistent quality and appearance is also an issue that must be addressed as globalization continues. "Pigment manufacturers are serving customers located around the world. Quality and appearance must be consistent no matter where a product is being produced or delivered," says Misogianes. As the demand for broader color palettes grows, maintaining color standardization will certainly be an interesting challenge for the paint industry as well as for effect pigment suppliers, according to Decelles. "One demand of global paint manufacturers is for reproduction of the same color tone in various coating systems (aqueous, solvent, powder, etc.), so that the color tones can be marketed globally."

Misogianes also notes that in many cases the different cultures of various regions require different formulations with different performance properties, and companies must be aware of these varied needs and respond accordingly.

Raw material suppliers, paint manufacturers, and pigment producers themselves have chosen consolidation as one mechanism for remaining competitive as globalization of most sectors of the chemical industry continues. BASF's \$4.8 billion acquisition of Engelhard is the most recent and notable transaction. On the cus-

tomers side, Sherwin-Williams, PPG, and Akzo Nobel have all made acquisitions to better position themselves in key geographical regions. Activity on the raw material side has also been significant over the past several years. "Consolidation has led to fewer customers and fewer suppliers. Pigment producers are getting squeezed on both ends," notes Corcoran. With the level of competitiveness in the market today, he expects the trend to continue for the foreseeable future.

The implementation of broad regulatory programs will be an additional challenge for pigment producers. The upcoming REACH (registration, evaluation, and authorization of chemicals) legislation in Europe is being very closely watched by most pigment producers. "Ciba is committed to developing cleaner production processes and ecologically friendly products," says Misogianes. "We are watching the progression of the REACH legislation to determine its impact on all of our businesses." As a smaller manufacturer, Flex Products is particularly concerned about the REACH regulations. "At this point it remains unknown what the impact of REACH will be for smaller volume producers," notes Hughes.

INNOVATION

Innovation in pigment technologies is helping companies reduce costs, increase competitiveness, and offer more value-added products. As competition increases, the customer and supplier bases consolidate and gain leverage, and regulatory agencies around the world implement comprehensive legislation, the ability to develop new technologies is becoming critical for success. At the same time, innovation can be a challenge. "Because of current market dynamics, companies need to protect their intellectual property and develop new, unique marketing offerings to stay competitive," says Kenneth Loye, market development manager for the Ferro Corporation Performance Pigments and Colors Group. "New products need to offer value either in price or utility to be effective."

Many companies are overcoming these difficulties, though. One area of innovation has focused on increasing the functional properties of pigments used in paints and coatings. "Paint formulators are looking for much more than just aesthetics and durability today. They want multifunctional coatings that can also provide antimicrobial activity, light reflectance for glare reduction and energy efficiency, corrosion protection, and other properties," Murad states. "This multifunctionality is not going to come from the resin, but from additives like high performance pig-

ments included in the formula." High performance pigments exhibit superior light- and weatherfastness; chemical, heat, and moisture resistance; high color strength and chroma; and other properties.

New high solids technology has required pigment producers to develop new technologies as well. "New polymerization processes for high solids formulations often include dispersants that can react with specific pigment chemistries," explains Misogianes. Pigment manufacturers are developing surface treatments for their products that will enable the pigments to react with these dispersants in such a way as to impart improved stabilization, rheology, and color development, particularly at higher loading levels.

The pigment industry is also investigating new ways to reduce the cost of incorporating pigments into paints and coatings. According to Murad, as much as 35% of the manufacturing cost for paints and coatings can be related to the pigments, through the pigment compounds themselves and/or the grinding and processing time required to prepare the pigments for let down into the paint. "Some manufacturers are looking to address this issue by supplying pigment dispersions that can be directly added to the mixing tank without any grinding."

Another area ripe for improvement, according to Murad, is maintaining consistency of color intensity from one batch of pigments to another. "There is tremendous potential to reduce costs and increase efficiency and productivity if pigment color intensity can be controlled," he says.

One consequence of new dispersion technology and improved control over color intensity could be the shift



Bottles with special effect pigments.

Photo courtesy of Flex Products, a JDSU company.

to paint mixing at "big box" stores like Home Depot and Lowe's. "Paint accounts on average for about 15% of revenues for these retailers, and they are interested in increasing their profit level in this area. Eliminating the paint company as the middleman would be one way to do just that," Murad comments.

Special effect pigment producers face the challenge of establishing a standard set of criteria for defining product specifications. "Effect pigments create their characteristics through reflection and scattering of light falling on the surface of the pigment. The visual effect depends mainly on particle size distribution, particle morphology, aspect ratio, smoothness of the flake surface and pigment orientation in relation to the surface of the substrate. It is difficult to describe or measure the visual impression of effect pigments because visual perception is influenced by several factors such as shade, brightness/whiteness, sparkle, gloss, tinting strength, color saturation, DOI, and flop," says Decelles. "As pigment morphology complexity increases with new product development, the need for standards will become more intense while also becoming more difficult to determine," he adds.

PRODUCERS RESPOND TO THE CHALLENGE

Pigment manufacturers are finding opportunities in spite of the challenging market conditions. Ciba Specialty Coatings is focusing on different pigment chemistries—developing solid solutions and organic/inorganic hybrid and combination products that provide an extended range of unusual colors, according to Misogianes. Two recent product lines include the quinacridones and diketopyrrolopyrroles. The company's Ultra Opaque Red (UOR) is a very opaque shade organic pigment for high-end coatings. Ciba will potentially extend this technology to other colors. A second product of note is a new transparent orange pigment that will be introduced soon. The company has also developed reflective pigments in various shades that can reduce air conditioning use by up to 30%.

Heubach is a supplier of both conventional and high performance pigments and is developing alternative technologies in response to both regulatory and cost pressures. "We are expanding our current lines of phthalocyanines, indanthrones, naphthols, titanates, copper and cobalt spinels, and anti-corrosive pigments with new chemistries and higher quality with regard to color strength, chroma, resistant properties, and more," says McBride.

The company's latest R&D efforts are geared towards combining properties of different pigment chemistries and have already led to the market introduction its

new Tico and Bitan product lines. These hybrid pigments offer ease of dispersion, cost effectiveness for color formulations, and improved fastness properties. Heubach's recently introduced yellow azo pigment, Heuco Yellow 118303, is a brilliant red shade designed for more difficult engineering polymer applications, exhibiting temperature resistance to 320°C. The company is also introducing Vanadur Yellow 1010, a very clean green shade yellow bismuth vanadate for industrial and automotive coatings where excellent resistant properties are required.

Current capital investment projects at Heubach include expansion of its R&D laboratories in India and the addition of capacity at its EUSA facility in India. The company is also constructing a third plant for production of quinacridones and DPP (startup expected in 2007). In Europe, Heubach has added 300 tons of capacity for the manufacture of bismuth vanadate and is also investing in new technologies for complex inorganic color pigment production.

BASF has launched several new pigments during the past year, extending some of its key product lines. Pallicrom® Red is a high chroma, high sparkle, opaque effect pigment that is part of the Pallicrom portfolio of gold and orange pigments. Paliotan® pigments enable formulation of brilliant yellow to red color spaces to meet the demand for high chroma/high hiding pigments. Paliofen Blue I 6360 is the newest indanthrone blue pigment with high fastness, color strength, and purity of shade in both aqueous and solvent-based coating systems. The latest addition to Xfast® stir-in granular pigments is a point-of-sale tinting system to test and adapt Xfast for usability with common customer systems.

This year, Clariant launched two new diketopyrrolopyrrole high-performance rubine pigments (Hostaperm® Rubine D3B and Hostaperm® Rubine D3B WD) with high transparency and excellent rheological properties. The two products are a new "twin pigments" concept designed to help resolve issues related to color development and performance characteristics between solventborne and waterborne automotive coatings. Brilliant effect styling shades can be formulated when these twin pigments are used in combination with aluminum and pearlescent pigments.

According to Decelles, Eckart is developing novel pigment designs and morphologies needed to create color effects with functional property requirements designed for new paint systems. "This intense activity in finding new color appearances will always be of strategic key importance for Eckart," he states. Most recently, the company introduced its Ferricon iron oxide effect pigment. This product is produced using high-purity carbonyl iron and a new grinding technology to produce application characteristics similar to conventional

silver dollar pigments. Ferricon pigments, though, possess a distinctive color flop from metallic grey to metallic black, and can be manipulated with permanent magnets or electromagnets to create patterns or lettering which lend to a coated object an impression of depth. "Designers now have previously undreamt-of options for creating unique and first-class styling," Decelles asserts.

STAPA NCP pigments are non-conductive metallic effect pigments designed for consumer electronic products based on conventionally produced aluminum pigments encapsulated with a layer of acrylate. STAPA paste and STANDARD powder zinc provide effective cathodic corrosion protection and also distinctive barrier protection due to their special lamellar shape. The pigment design also enables the use of much lower levels of these pigments as compared to traditional zinc alternatives.

Eckart's Silvershine product line is comprised of very fine, homogeneous silver dollar pigments that provide excellent hiding power and an elegant finish. Properties such as strong flop, high brilliance, and a bright metallic effect make it possible to create multifaceted effects in conventional coatings.

Eckart is interested in expanding its capabilities, both through acquisitions and internal development. Currently, the company is working on establishing pigment production in China.

IDSU Flex Products has been developing technology to adapt its Spectraflair diffractive pigments for use in water-based coatings. All aluminum-based flakes will react with water unless a protective barrier is applied. The company's special effect pigments are already in use in high solids coatings as well, and it is considering new color positions for its Chromaflair product. According to Hughes, several innovative new products are in the early development phases and cannot be discussed at this time. He did note that IDSU has been focusing on entry into new market segments and expanding its efforts in geographic regions such as South America and

Indonesia where it previously did not have a strong position.

LMD Chemicals has launched its Xirallic® crystal effect pigments, which provide an extremely high glitter effect combined with strong color saturation. These products find widest application in automotive and other OEM coatings. The company's Colorstream® pigments give formulators the ability to economically create coatings with dynamic color travel.

In 2004, Rockwood acquired the Pigment and Dispersion Business of Johnson Matthey PLC. The acquisition expanded Rockwood's global pigments capabilities with a full range of transparent iron oxides, cadmium pigments, complex inorganic color pigments, and dispersions. "The market's enthusiastic response to Rockwood's Solaplex line of inorganic pigments has been particularly encouraging," says Corcoran. These products provide lightfastness and are suitable for use in all color applications as well as architectural paints. Currently, there are three grades available: green-shade yellow, medium yellow and red-shade yellow. In addition, Rockwood's

Peroxide Orange 204 continues to gain acceptance as a replacement for organic pigments in orange and salmon-colored paints. It provides better durability in addition to cost savings, according to Corcoran.

Ferro's Performance Pigments and Colors Group is creating new, proprietary products and new market segments that its competitors cannot easily enter, says Loye. The company has achieved great success with its "Cool Colors and Eclipse" Solar Reflective technology. Products are currently in development, with announcements expected at the upcoming ICE show in New Orleans this November. "We are

in the fight for the long haul and plan to be a major player in our business sectors," stresses Sarvis.

That sentiment would likely be echoed by most pigment suppliers. Innovation, adaptability, and customer service will decide who survives that long haul into the future. □



Photo courtesy of Corbiant Pigments & Additives