Controlling Coating Color Quality with Dispersants

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Dispersant and pigment manufacturers discuss recent trends and issues affecting this sector.

CRITICAL COMPONENTS

Dispersants, although accounting for only a few percent of the total material in paint and coating formulations, play a critical role in their performance. Dispersants provide color stability and help maximize pigment opacity by increasing the exposed surface area of the pigment particles, thus increasing coverage while reducing costs. Because their products are a key component of paints, dispersant manufacturers work closely with coating and pigment producers to stay abreast of new technology developments. They also face the current challenges of higher raw material and energy costs and increasing regulations.

"The correct choice and application of a dispersant (or combination of dispersants) can dramatically affect the look and durability of paints and coatings," notes George Pilcher, vice president of the consulting firm The ChemQuest Group, Inc. Craig McNair, technical director with Pflaumer Brothers, Inc., believes that, "the technology of dispersion is essential for an effective coating to meet the requirements of the end use customer."

Dispersants today not only affect color development and stability over time and with respect to changes in shear, they also help maximize the visual, ultraviolet, and infrared opacity of pigments, protecting the binder in a coating from degradation and improving the energy efficiency of painted structures. "Effective use of dispersants can also lead to cost savings through reduction in the amount of pigment required to achieve a desired level of color and hiding power," Pilcher adds.

Pigments in general are solid particles that are insoluble in the different solvents used in coatings formulations. Dispersants are necessary to ensure a uniform distribu-

tion of these particles throughout the paint. According to Hendrik Ahrens, R&D manager for coatings in the Functional Chemical Division of Clariant Produkte (Deutschland) GmbH, dispersing agents overcome compatibility constraint experiences with the three major coating components—pigments, resins, and solvents. "As a result, the design and synthesis of dispersing agents require a lot of experience in coating technology and chemical synthesis."

Specific benefits provided through the use of dispersants include high gloss, color strength, and uniform color appearance on every substrate, according to George Robertson, director of specialty dispersions technology for Sun Chemical. "Dispersants can reduce the incidence of flaws in the coatings when they are applied to surfaces," he states.

The manufacturing process can also be improved with the use of appropriate dispersants, which can reduce the dispersing time. In the dispersing process, the pigment is first wetted and then de agglomerated into smaller primary particles through a shearing process. Dispersants are critical to initially speed the wetting process of pigment to resin, according to Andre Bendo, industry manager for Industrial Coatings with Ciba Corporation.

Stabilization of the suspended particles with dispersants is also necessary or they will re-agglomerate. "The stabilization step is the most critical and difficult to accomplish. Done well, this step allows longer shelf life of the colorants, improved color, gloss, and color compatibility," notes Thomas J. Clark, marketing manager for Coatings, Polymers & Resins with Huntsman. Proper pigment particle separation and stabilization also results in a low pigment paste viscosity, which allows high pigment loadings, according to Robert T. Miller, product manager for Troy Performance Additives and Defoamers.

Stability of the final coating formulation is also affected by choice of dispersant. Ning Chen, North American business director for Rhodia Novecare, comments that, "Good dispersion can prevent flocculation or coagulation of pigments or fillers for wet paints and coatings in-can."

"The key," stresses Walter Conti, technical specialist for Perfor-mance Chemicals with Buckman Laboratories, Inc., "is to use the proper dispersant for the specific application, although some dispersants can cross various formulation genres. It is important to select the proper amount/dosage in order to achieve a defect-free, overall smooth appearance, with excellent flow and leveling, and a gloss or sheen that meets the customer's specifications and is pleasing to the eye."

CHEMISTRY COUNTS

The ability to stabilize pigment (and other) particles derives from the chemical nature of the dispersants. There are many different types of dispersing agents, including inorganic compounds such as polyphosphates, surfactant-like compounds, and polymeric materials, or hyperdispersants. "Although the performance attributes and benefits can vary between the classes and types, they all function through the same basic mechanisms," explains David Moss, marketing manager for Air Products' Performance Solutions business. "Dispersants orient at the solid-liquid interface of a pigment or particle and prevent flocculation through steric and/or electrostatic repulsion."

Surfactant-like dispersants offer wetting, emulsifying, dispersing, and stabilizing properties for coatings. They can be nonionic or ionic (cationic, anionic, or amphoteric).

Nonionic dispersants have no charge and prevent the pigment from agglomerating via steric, or spacial, stabilization. They rely on hydrogen bonding, dipole-dipole interactions, or London Van der Waals forces to anchor to the pigment surface. The adsorption is strong because the dispersant is bound to numerous sites on the surface at the same time. Particle stabilization is provided sterically by the extended polymeric back bones of the dispersant.

In a waterborne system, for example, the hydrophobic (dislikes water) portions of the dispersant are adsorbed on the pigment's surface, while the hydrophilic (attracted to water) ends solubilize in the water phase through hydrogen bonding. In this way the particles are kept from clumping together again.

Positively or negatively charged ionic dispersants rely on electrostatic repulsions to stabilize the pigment particles. Ionic dispersants act by coating the surfaces of particles

with charges. The net charge on each particle's surface causes the particles to repel one another, thus stabilizing the dispersion.

Polymeric-type dispersing agents, which can be made from numerous different polymeric materials, are much higher in molecular weight than traditional surfactant-like dispersants. They adsorb onto the dispersed pigments but provide little wetting and emulsifying properties. In some water-based formulations, this characteristic is attractive because it leads to lower levels of foaming than would be obtained with surfactant-like dispersants.

Phosphate esters are often used in conjunction with the primary dispersants discussed above. These compounds are considered auxiliary dispersants and cannot be used by themselves. They provide assistance with stabilization largely through steric interactions with the pigment particles.

BEYOND THE CHEMISTRY: MEETING CUSTOMER NEEDS

While chemistry determines the way in which dispersants provide pigment particle stabilization, pigment suppliers must use their understanding of that chemistry to develop the most effective products based on their customers' formulation needs. Product development can be challenging in the highly regulated and constantly changing business climate of today.

To find out what the major issues are for dispersant producers serving the coatings market, JCT CoatingsTech interviewed several players in the industry. Both dispersant and pigment manufacturers shared their thoughts about key drivers, future expectations, and technology trends.

Participants in this survey included the following:

- David Moss, marketing manager, Performance Solutions, Air Products
- Walt Conti, technical specialist, Performance Chemicals, Buckman Laboratories, Inc.
- Kevin Lassila, director of technology, BYK USA
- Andre Bendo, industry manager, Industrial Coatings, Ciba Corporation
- Beth Lowe, Functional Chemicals Division, Coatings and Construction Chemicals R&D technical manager, Clariant Corporation
- Hendrik Ahrens, R&D manager of coatings, Functional Chemical Division, Clariant Produkte (Deutschland) GmbH
- Thomas Clark, marketing manager for Coatings, Polymers & Resins, Huntsman
- Craig McNair, technical director, Pflaumer Brothers, Inc.
- Ning Chen, North American business director, Rhodia Novecare
- George Robertson, director, Specialty Dispersions Technology, Sun Chemical
- Robert T. Miller, product manager, Troy Performance Additives and Defoamers
- Steven L. Wille, senior technology manager, Office of Technology Management, University of Illinois at Urbana-Champlain
- Dr. John Sinko, technical director, Wayne Pigments.

JCT: *What are the key issues driving the dispersant sector?*

Beth Lowe, Clariant: Currently, key drivers for the dispersant sector are regulatory issues and raw material costs. The constant sharp increase of raw material prices has caused us to investigate many avenues of reducing costs, including alternative, cheaper sources and optimizing processes in production.

Craig McNair, Pflaumer Brothers: The regulatory environment is in deed a major issue driving the dispersant sector. Coatings companies are being forced to market low-VOC coatings which are water-based or high solids solvent-based systems. Dispersants that work well in these systems are in high demand.

Kevin Lassila, BYK USA: Implementation of REACH will significantly increase the barriers for the introduction of new monomers, limiting the performance space accessible with conventional polymerization technologies. Enhancements in performance will have to be achieved by more effectively controlling molecular architecture. Controlled polymerization technologies will enable molecular-level control of dispersant structure, access to improved dispersant performance using conventional monomers.

John Sinko, Wayne Pigments: In the corrosion inhibitor pigment business, specific regulatory requirements for the elimination of any dust exposure hazard in paint manufacturing is the primary driving force behind the realized commercial progress of high solids pigment dispersion technology. Recently, promulgated OSHA regulations on PEL value for Cr(VI) have prompted R&D work aimed toward elimination or drastic reduction of the inherent dustiness of some well-established corrosion inhibitor pigments.

Andre Bendo, Ciba Corporation: In addition to regulatory changes, high energy costs are a main issue driving the dispersant market. Dispersants which deliver processing improvements and contribute zero VOCs to paint formulations are in market demand.

David Moss, Air Products: The ability to maximize efficacy of coatings in an environmentally responsible *and* cost effective manner is the largest challenge facing the coatings market today. While cost continues to be a major driver for reformulating, the move to greener formulations is driving a desire to use raw materials derived from renewable resources.

JCT: *Given that cost is such an issue, can paint formulators really expect to reduce the high cost of dispersion processes by using dispersant additives?*

George Robertson, Sun Chemical: Yes, dispersants can help reduce costs. They increase the rate of dispersion and the color value of smaller particles or reduce flocculation (clumping of the pigment). They also make it possible to mill coatings with higher pigment contents, reducing milling time per pound of pigment.

Hendrik Ahrens, Clariant Produkte: With the use of appropriate dispersing agents, the dispersion process is optimized. The impact energy that is needed to separate the pigment agglomerates is utilized at a maximum, and reagglomeration and flocculation of the pigments during the dispersing and grinding process is prevented. Overall, the dispersing agents maximize the manufacturing efficiency of pigment slurries, preparations, and coatings, and reduce the costs of the total process.

Thomas Clark, Huntsman: Dispersants allow formulators to increase pigment concentrations as well as decrease grind time. The higher pigment loading allows finished coating formulators to tailor their needs for either stronger color strength or longer lasting concentrate. In other words, the higher loading would result in superior master-batch of color. The decrease in grind time adds to energy savings and more efficient production of the colorants by a reduction in pass or grind times by as much as 30%.

Robert Miller, Troy Corporation: The proper selection of dispersant and optimization of the use level will result in faster process times and allow higher pigment loading. This relates to savings in labor and energy and allows for larger finished batch size, all of which are cost savings for the coating manufacturer.

JCT: *What are the most recent advances in dispersant technology for coatings from a chemistry perspective?*

David Moss, Air Products: Improvements in polymer technology and surface science understanding have reached a level where the fine-tuning of additive performance attributes is relatively simple. Such modification has become key to meeting the dynamic market needs resulting from the diversification of pigment supply and the demands of environmental and "green" considerations.

Craig McNair, Pflaumer Brothers: Dispersant technology follows the evolution of coatings technology. Polymeric dispersants that combine wetting and stabilization technology have been developed for aqueous-based, solvent-based, high-solids, two-component, UV-cured, and powder coatings systems. New dispersant technology has also been developed for pigment and powder treatment and encapsulation. These surface-active products enable the pigment or powder to be used more easily in the ultimate application or system.

Ning Chen, Rhodia Novecare: Technology that allows for highly efficient dispersion of pigments and fillers without negative impact on the physical and mechanical properties of coating films has been important for the industry. Nanoparticle dispersion is a new territory that is gaining industry attention.

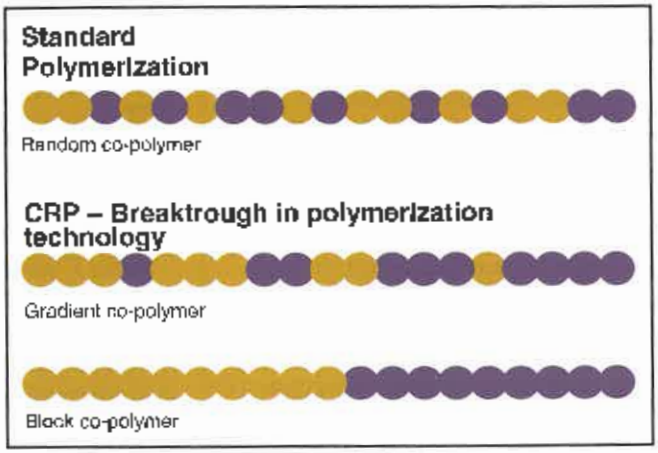
Thomas Clark, Huntsman: Much progress has been made by the industry in developing APE (alkyl phenol ethoxylate)-free and zero-VOC products. These new materials enable coatings formulators to meet new environmental regulation being implemented around the world.

Andre Bendo, Ciba Corporation: Dispersant technologies have advanced with respect to pigment surface interactions. To improve the surface interaction, acrylic block copolymer dispersants have been created using Controlled Free Radical Polymerization (CFRP) technology. The process yields a tailored dispersant with anchoring groups at defined locations that improve particle stabilization and surface coverage.

Kevin Lassila, BYK USA: Application of emerging capabilities like Controlled Polymerization Technology (CPT) to dispersant manufacture has provided access to tailored polymer structures with enhanced performance. In contrast to conventional polymerizations in which monomer units are randomly distributed along the polymer chain, CPT enables a high degree of control of polymer structure and molecular weight. This can lead to enhancements in the efficiency of dispersant utilization and improvements in pigment loading, dispersion stability, rheological properties, color development, gloss, and transparancy (*Figure* 1).

Steven L. Wille, University of Illinois at Urbana-Champlain:

Figure 1—Comparison of standard and controlled polymerization technology (CPT). *(Source: BYK-Chemie)*



Researchers at the university have developed an economic process for the production of Janus Particles. The surfaces of Janus Particles have two distinct areas, each of which has different surface properties. The two surfaces can be made from a wide range of modifiers that are of interest to dispersant producers, including surfactants, pigments, proteins, lipid layers, and polymers. The particle cores can be made from most any material.

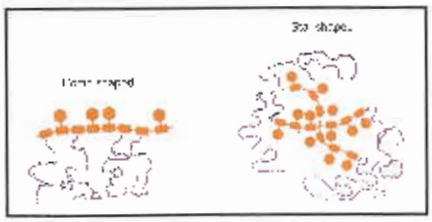
Unlike ordinary dispersants, Janus Particles can have two different chemistries (surfaces) that can be inherently incompatible. As a result, the formulator has more freedom to select what chemistries to utilize. By choosing the right particle treatments and "Janus Balance" (ratio of the two treated areas on each particle), the use of Janus Particles can provide improved stability, color development, and viscosity control in coatings formulations.

Hendrik Ahlers, Clariant Produkte: New technology from Clariant attempts to address the need for improved dispersants for water-based coatings. Various dendritic polymers with star- and comb-shaped structures have been produced using anionic and radical polymerization techniques. These new dispersing agents have a stronger affinity for the solid pigment in the coating system.

The comb-shaped polymeric dispersing agents are suitable for inorganic and organic pigments. Aromatic and aliphatic groups provide affinity to organic pigments like phthalocyanine pigments (blue, green), azo pigments (red, yellow), and polycyclic pigments (purple, pink, red, and yellow).

The star-shaped dispersing agents have an increased adsorption onto organic pigments. They absorb onto the pigment surface at a higher packing rate and overcome flocculation and sedimentation. These dispersing agents are also suitable for carbon blacks (*Figure* 2).

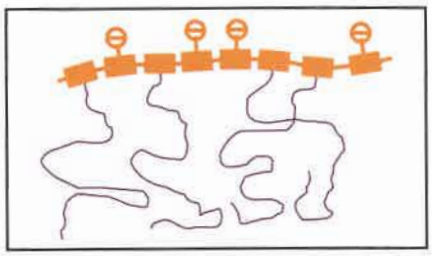
Figure 2—New dispersants for organic pigment. *(Source: Clariant Produkte)*



For inorganic pigments, comb-shaped, anionically charged polycarboxylate ether dispersants have been developed. They provide both steric and electrostatic stabilization in the aqueous phase, enabling the production of higher pigment concentrations. Polycarboxylate ethers are suitable for white pigments and extenders in emulsion paints or pigment slurries, colored inorganic pigments, such as for tinting systems, and even for highly concentrated nano-scale pigments.

Comb-shaped dispersant (polycarboxylate ethers) for inorganic pigments are shown in *Figure* 3.

Figure 3—Comb-shaped dispersants for inorganic pigments. *(Source: Clariant Produkte)*



JCT: ***Has the move to greener coatings technologies impacted dispersant technology? If so, how?***

Ning Chen, Rhodia Novecare: We see a move to "greener" coating technologies such as APE-free, zero-VOC products. A vast majority of customers have looked at products for development that meet this requirement. In addition, there have been a number of advancements in polymer chemistry to use non acrylic monomer base, i.e., use of more bio friendly monomer base. Most of them are still in the development stage.

Thomas Clark, Huntsman: Lignin has been used as a dispersant in the past so there is a precedent for bio-derived dispersants. Coatings companies are looking to increase their use of bio-based raw materials and go to low- or zero-VOC formulations. Dispersants that have bio-content will be attractive as companies look to increase their use of bio-derived materials.

Beth Lowe, Clariant Corporation: VOC regulations are impacting the industry. The industry is always pushing for lower VOC raw materials. In the short term, we are evaluating all of our dispersing agents in paint formulations to determine their effect on VOCs. In the long term, we will have to come up with novel chemistries that will be considered to contain low or no VOCs.

Walter Conti, Buckman Laboratories: With the market moving to green chemistries and higher performance, all raw materials in coatings will be under scrutiny for quality, dependability, and performance. Thus, the paint manufacturers will have to decide what dispersant will do what they require in their coating and at a cost that justifies their use. Dispersants, although only used in small quantities in coatings, have an important effect on overall coating appearance and performance. While the substitution in the ingredients may seem trivial, it can make a major change in the finished product. Only use of quality, dependable dispersants with well characterized performance characteristics will provide the desired effect.

Robert Miller, Troy Corporation: Dispersants that have low toxicity

and odor are also requested by many customers.

Craig McNair, Pflaumer Brothers: "Cool" coatings are one area of development being driven by the need for greener products. New heat-reflective pigments for these "cool" coatings are one area of focus within our research group. The latest technology looks to combine multi-functional dispersants with respect to flow and leveling, strong color acceptance and development, surface tension reduction, desirable foaming, and wetting properties with the ability to effectively disperse heat-reflective pigments.

George Robertson, Sun Chemical: Dispersants reduce the need for solvents in the formulation of coatings. By using less solvent in the milling process, you reduce emissions and save energy since it takes half the time to mill and still achieve the same saturated colors.

JCT: ***Have changes in pigment technologies led to the need for new dispersant chemistries? If so, what kinds?***

David Moss, Air Products: The importation of pigments from Asia and pigment optimization/differentiation from western suppliers has required the development of unique dispersants for optimal performance.

Craig McNair, Pflaumer Brothers: I would favor the word "technologies" rather than "chemistries." We find more pigments are being produced in Asia that are not surface treated as well as pigments that were produced in the U.S or Europe. The lack of surface treatment technology used for these pigments has caused a higher demand for wetting agents and dispersants for these pigments to be used in the same end use applications. We have developed new polymeric dispersants designed and tested for these pigments.

Ning Chen, Rhodia Novecare: Supplies of slurries instead of powder pigments have been introduced in the U.S. These products require changes in handling of the slurries (in some cases, preparation of the slurries), but reduce the necessity of grinding in the paint formulation. The newly developed surface-modified pigment will require new dispersant technologies as well.

Thomas Clark, Huntsman: Changes in pigment technologies include the finer particle sizes needed for ink jet technology and bringing lower ink viscosities, resulting in better transparency and color strength. To obtain the finer particle sizes for pigments, including nanometer sizes, there is a need of better dispersion technologies than the simple surface active agents used before. These include multifunctional dispersants, such as the block and comb polymer surfactant available today. The move is now on to dendritic surfactants, which will help to achieve even smaller particle sizes.

George Robertson, Sun Chemical: The more environmentally green milled products have higher pigment content and less solvent, which leads to an increased need for special dispersants that can achieve the correct levels of thickness by improved adsorption. As new pigments are introduced into the coatings area, they need their own optimized dispersant and synergist.

JCT: ***Where is dispersant technology for coatings headed in the near term? Longer term?***

Robert Miller, Troy Corporation: For the foreseeable future, there will be a continued effort to provide dispersant products that promote improved pigment dispersion, have no environmental impact, and give improved cost performance for the coating manufacturer.

Hendrik Ahrens, Clariant Produkte: Dispersant technology is heading towards more effective and efficient dispersing agents for a greater versatility of pigments, higher compatibility with different solvent and resin systems in combination with better environmental friendliness, and lower toxicity for humans.

Ning Chen, Rhodia Novecare: We see a future for universal colorants and pigment slurries for easy applications, low- and zero-VOC products addressing ecological concerns, and high efficiency products to reduce application times and costs.

Walter Conti, Buckman Laboratories: While aiming for low- to zero-VOC products and user and/or environmentally friendly raw materials and products, the dispersant must not allow performance to be sacrificed. Some products, by their nature, cannot easily be reformulated without VOC; making substitutions markedly decreases performance and the integrity of the coating.

Thomas Clark, Huntsman: There is an overwhelming number of dispersants and synergists on the market, making it very confusing for paint formulators. We also believe there is a real need for a "universal" dispersant technology that can be used for all colors in a selected system.

Compatibility will also be an issue for different types of resins and pigments used in in-house tinting systems for the professional segment and color mix systems for the deco market, which will require higher loadings, viscosity control, and stability.

Much longer term, it may be necessary to disperse many other types of solids into liquid or gaseous media. These will include metal particles of nanometer sizes. Ink jet dispersions of such particles will make possible new processes for preparing printed circuits and metallic coatings.

Craig McNair, Pflaumer Brothers: Near term development of dispersant technology is focused on the changing terrain of the pigment industry, originating from low-cost lo-

cations such as China and India. Longer-term, research in dispersant technology is aimed at new polymers being developed to meet stringent environmental requirements while also meeting performance requirements demanded by the end-use customer.

Andre Bendo, Ciba Corporation: With technologies changing so rapidly to meet various environmental needs and in response to increasing cost pressures, selecting the correct dispersant or dispersant blend for any given coating application will become increasingly difficult. We believe that formulators, pigment suppliers, and dispersant manufacturers will have to work more closely to determine optimum pigment/dispersant combinations for different end products. Companies that offer both pigments and dispersants and that have extensive data on their interactions are ideally positioned to help with guidance on what dispersants/loading levels to use for each pigment offered.

DISPERSANTS — Supplier Roundup

Air Products offers a wide range of wetting agents and dispersants designed to provide technical solutions for environmentally friendly coating systems. "We focus on customer needs such as ease of use and improvement of performance characteristics such as gloss, color development, or stability," notes Moss. The acquisition of Tomah Products in 2006 broadened the company's portfolio with APE-free alcohol ethoxylates and an extensive line of ether amine technologies useful for dispersing pigments.

Buckman Laboratories offers a line of sodium polyacrylates for water-based systems. Busperse 39 enables excellent color development, low foaming, reduced misting, and enhanced tint strength. Busperse 229 is a unique water-based dispersant designed for use with inorganic colors and carbon blacks and works well in water dispersible alkyds. Busperse 47, a zero-VOC product for solvent-based coatings, works well with inorganic colors and carbon blacks, and works at very low use levels of typically 0.2% based on total formula weight.

BYK-Chemie provides a broad range of wetting and dispersing additives marketed under the DISPERBYK®, BYK®, BYKUMEN®, LACTIMON®, and ANTI-TERRA® tradenames. The company's ability to access a large number of chemical platforms enables it to utilize the technology which provides the best solution for the customer, according to Lassila. Since 2006, BYK has introduced several new wetting and dispersing additives based on Controlled Polymerization Technology. These products include DISPERBYK 2009, specifically developed for the dispersion of silica-based matting agents in solvent-free UV systems; DISPERBYK 2010, designed for the production of resin-free stable pigment concentrates for aqueous coatings; and DISPERBYK 2020 and 2025 for solventborne industrial, wood, architectural, and coil coatings.

Ciba's dispersant range covers three product classes. The EFKA® 4000 series of high-molecular weight polyurethane and polyacrylate dispersants provides strong viscosity reduction and wide system compatibility for both organic and inorganic pigments, making it possible to increase loadings and reduce VOCs. EFKA 4300, EFKA 4330, and EFKA 4340 for solventborne applications, and EFKA 4585 for waterborne coatings are the newest products in this line and are produced using Controlled Free Radical Polymerization technology, which, according to Bendo, yields an optimal surface interaction between dispersant and pigment. Additional products will be launched in 2008.

The EFKA® 5000 series of conventional wetting and dispersing agents from Ciba are intended to disperse both inorganic and organic particles. The DISPEX® anionic dispersants are based on acrylic chemistries and specifically designed for dispersion of inorganic mineral particles.

Dispersion product development in **Clariant's Coatings and Construction Chemicals Division** focuses on the emerging demand for APE-free and low- or no-VOC chemistries. The company is currently evaluating the application performance of new APE-free products. To further support the industry, Clariant has also installed larger reactors in its multipurpose plant in North Carolina and is in the process of expanding its ethoxylation capabilities at another U.S. production site and in Germany.

In its Dispersogen range, **Clariant Produkte** offers polymeric dispersing agents as well as products based on surfactant technology. The latest developments are Dispersogen PCE, a polycarboxylate ether suitable for the dispersion of

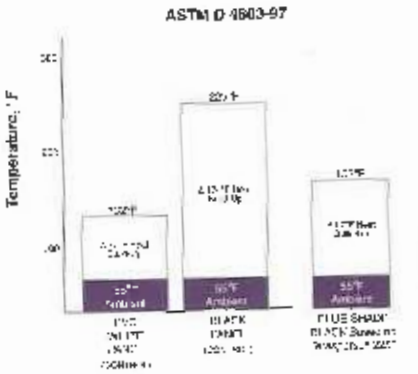
inorganic pigments, and Dispersogen ASO, a star-shaped polymeric dispersing agent for organic pigments. Dispersogen PSL 100 is a comb-shaped polymeric dispersing agent for organic pigments. Patents are pending for these three new products. The company has opened new R&D laboratories in Shanghai and Mumbai, adding to similar facilities in Germany, Brazil, and the U.S.

Huntsman's JEFFSPERSE® nonionic, comb-shaped, polymeric dispersants are sold in water-based, solvent-based and UV-curable systems that stabilize classic organic pigments, high performance pigments, and various carbon black grades. According to Clark, these universal dispersant and wetting agents provide higher pigment loading (stronger color) and superior stability (improved gloss) compared to more traditional products. The company commissioned a new manufacturing plant in Singapore in 2007 that produces polyetheramines that are used in the manufacture of its JEFFSPERSE dispersants.

Pflaumer Brothers offers a full line of wetting and polymeric dispersants for both water- and solvent-based systems. Terasperse 2255 is a new, very low foaming, APE-free polymeric dispersant for water-based systems that can be used to disperse both organic and inorganic pigments without the need for added propylene glycol. Tallicin K-8 is a recently introduced, cost-effective polymeric dispersant for solvent-based or solvent-free systems that is effective in dispersing a broad range of organic and inorganic pigments. It significantly reduces wetting time, allows for higher pigment loadings, and is effective in preventing color drift over time, according to McNair.

For heat-reflective pigments, Pflaumer has developed a new blue-shade masstone black dispersion for a coating that comes close to the heat reflectance of a white substrate and reduces the heat build-up of the control black coating by 77°F (*Figure 4*). "This reduction of heat build-up is tremendously significant," McNair says, "and the results are due to the choice of pigment and to the dispersion stabilization achieved by the new dispersant technology."

Figure 4—Heat reflective blue-shade black dispersants. (Source: Pflaumer Brothers, Inc.)



To support its development efforts, the company opened a new technology center near Princeton, NJ, in 2007. The technology center has two main focuses: synthesis of new polymeric dispersants and a complete dispersion laboratory. The dispersion laboratory includes a colorant pilot plant for commercial evaluations.

Rhodia offers a broad range of polymeric (acrylic and methacrylic copolymers) and nonionic primary surfactants under the Rhodoline® and Rhodasurf®, Igepal®, Soprophor®, and Alkamuls® tradenames, respectively. The company also provides Rhodafac® phosphate ester auxiliary dispersants.

Recently, Rhodia set up a paint application laboratory at its Center for Research and Technology in Bristol, PA. Efforts there revolve around the development of new dispersants designed to address the technical needs of customers, according to Chen. The company has a second paint application lab in Singapore and is currently adding additional research capacity in Aubervilliers (near Paris), France; Shanghai, China; and Paulinia, Brazil.

Sun Chemical offers many dispersant product lines for the printing industry. Its SunFlo® range is specifically formulated for lithographic bases and enables higher pigment content (more environmentally friendly), ease of use, and improved formulation options, according to Robertson. The company's SpectraRay® product line is formulated for applications such as inks for flexographic printing and UV, sheetfed, and offset printing inks.

A new no-VOC, general purpose dispersant for non-aqueous systems will be introduced by **Troy Corporation** under its Troysperse Z line. This product expands the company's portfolio of dispersant offerings for aqueous and solventborne systems.

Wayne Pigment Corp. recently introduced its Corrosperse® product line, which includes approximately a dozen high-solids, resin-free dispersions of strontium chromate in several different organic solvents, as well as basic zinc chromate in some selected solvents. The dust-free Corrosperse products are convenient stir-in precursors compatible with all contemporary manufacturing technologies for high performance coil and aircraft primers. Distribution of the products in recyclable containers also eliminates the issues associated with disposal of Cr(VI) contaminated packaging materials, resulting in considerable savings. "Our investment in this technology is intended to extend the commercial life of strontium chromate and basic zinc chromate, two highly valuable corrosion inhibitor pigments," notes Sinko. CT