The Inks Market: Shades of Gray

by Cynthia Challener
JCT CoatingsTech Contributing Writer

The printing ink industry, including ink manufacturers and their suppliers of key ingredients such as solvents, resins, waxes, oils, and other additives, has faced challenging market conditions in recent years, with little change expected in the months to come. Higher raw material and energy costs, increased globalization, competition from China and India, offshore production of key substrates, and growing interest in electronic media all threaten the profitability of the printing ink market.

Annual sales for the U.S. printing ink industry are estimated by the National Association of Printing Ink Manufacturers (NAPIM) to be $4.2 billion, slightly lower than estimates of the global market for ink and overlap to be in the neighborhood of $15 billion, according to Susan Anderson, a director with the management consulting firm The ChenQuest Group. North America and Western Europe each account for about 30% of the market, but printing ink sales have matured in these regions. China and India, however, are experiencing growth rates in printing of as much as 10% per year, as literacy, wealth, and manufacturing are all increasing in these countries.

Printing processes vary according to the type of substrate and end-use application. Printing ink composition changes to meet the requirements of the process, substrate, and application as well. NAPIM identifies three main application areas for printing inks. Publication is the largest end-use, followed by commercial (advertising, brochures, etc.) and then packaging.

Offset and flexographic inks are the major types of inks used in the U.S. These inks are typically high-quality oil-based paste inks with a high pigment concentration. Very thin films are produced with offset blankets to transfer the ink from the litho plate to the substrate. The resins dry by oxidation or heat evaporation. About 90% of offset inks are solvent-based, with the remaining 10% energy-cured, using ultraviolet (UV) or electron beam (EB) technology, according to Steven Netfil, a consultant with market research firm Kusumag. Netfil & Gowoney. The U.S. market for offset inks is estimated by Mr. Netfil to be valued at $1.2 billion with an overall growth rate of 1% per year. Energe-cured offset inks are leading the way, growing at 3% per year.

Web offset printing involves application of the ink to a continuous roll of substrate at high speeds, with some dirtied in ovens on the press and others dried in heat absorbers and transferred to the substrate. News inks, for example, are absorbed into the substrates and use less expensive carriers such as mineral or soybean oil. With sheetfed offset inks, the resins undergo cross-linking caused by oxidation. Metal deco inks are applied to beverage, aerosol, and other cans and require a high-temperature cure.

Demand for flexographic inks is growing at 3% per year and is currently valued at $670 million in the U.S., according to Kusumag. Netfil & Gowoney. With flexography, the liquid ink is dispersed by anilox cells onto a plate and then transferred to the substrate. Water-based flexo inks are typically used on corrugated, rigid board, and light weight newsprint paper or polyethylene film and account for about 65% of all sales. Solvent-based inks mostly find application on films, but are also used on some paper substrates. Radiation-cured coatings account for less than 1% of this segment of the inks market, but are growing rapidly at 6% per year.

Gravure inks are applied to the substrate via engraved cylinders. The low viscosity liquid inks are largely solvent-based (90%) and dry through evaporation. They are used for publication and packaging applications. This process tends to be used for longer-run applications. The total market in the U.S. is valued at $350 million and is growing at 1% per year. Water-based gravure inks are experiencing an annual growth rate of 4% per year, according to Mr. Netfil.

Oil-based, letterpress inks have resins that dry via oxidation or absorption. They are viscous and are virtually all solvent-based. Use of these inks has been declining at about 2% per year in the U.S. Annual letterpress ink sales are about $65 million.

Specialty inks include screen inks, inkjet inks, thermochromic and photochromic inks, and metallic inks. Screen inks are used in billboard advertising and labeling among other applications. Inkjet inks are used in screen printing for graphics arts are estimated at $25 million, with radiation-cured inks accounting for 60% of sales and growing at 3% per year. Use of solvent-based inks is declining in this application as well, according to Mr. Netfil. Sales of inks for screen printing of textiles are estimated to be $14 million per year and growing at 2% per year.

Inkjet inks, which contain pigments or dyes are applied directly to the substrate through a printer head. In the U.S., sales of inkjet inks total only $130-135 million, but are growing rapidly at 9% per year, according to Kusumag, Netfil & Gowoney. Waterborne inks

Focus on Soy Ink

With the industry struggling to maintain margins and in the face of ever-rising raw material prices, alternative materials for inks are receiving increasing interest. As a renewable resource, soybean oil is one such material.

Soy inks have been on the market for coldset, commercial, sheet-fed presses, and magazine heatset presses since 1989. About 25% of commercial printers in the U.S. use soy inks regularly. In 2002/2003, about 121 million pounds of soy inks were used for ink applications, with the oil coming from approximately 11,273,000 bushels of soybeans, according to Karen Anderson, director of marketing at the Iowa Soybean Association.

The largest application for soy ink is colored ink for newspaper. More than 90% of the 1,500 daily newspapers in the U.S. use soy Ink. Not only is colored soy ink cost competitive to petroleum-based inks, but it is also environmentally friendly, providing more vibrant colors, good clarity, and offers superior rub resistance. The inks also offer an advantage in recycling because they are removed more efficiently from newspaper than petroleum-based inks. Traditionally, black ink based on soy oil has been more expensive than petroleum-based inks. With prices of petrochemical feedstocks skyrocketing, however, that may no longer be the case.

In addition to newspapers, soy inks have been developed for several other applications. They can be used on coated papers, where they h remain oxidative polymerization. Heat set soy inks can be used for coated stock for magazines. Coldset soy inks can be used on web offset presses. Both waterborne and solvent-based flexographic soy ink formulations are available. Soy inks are ideal, though, for sheet-fed and coldset presses.

Recent research at the Coatings and Ink Research Institute at Northampton Community College has focused on utilization of soy products in printing inks. The work, which is funded by the United Soybean Board, is being conducted in conjunction with Lehlig University, which has made significant contributions to Ink research over the past 50+ years. According to Jean Lavellie, who came from Lehlig and is now the director of the Institute, experiments have demonstrated that as much as 25% of the expensive and toxic divinyl benzene monomer used in UV/EB overprint varnishes and lithographic inks can be replaced with inexpensive soy, a renewable resource. "In most systems, the modified soybean oil actually decreases the amount of UV energy required for cure," she notes. For EB, though, the soy products usually do not affect cure response positively or negatively.

Other benefits provided by the use of soy products in printing inks include film flexibility, adhesion to nonporous substrates, pigment wetting, reduction in the acrylate odor, and enhanced printing performance of lithographic inks. Preliminary experiments indicate that these soy products can also be beneficial in UV-curable flexographic inks.
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dominate with a 65% share of this segment, but they are growing at 7% per year, while solvent-based ink sets are growing at 15% per year. Hot melt and radiation-cured ink sets account for a very small percentage of this segment, but they are growing at 15% per year.

The success of inkjet inks has attracted many players to this segment of the market, and as a result, margins have declined somewhat. Many ink manufacturers have become involved in developing complete systems to maintain their advantage, and have found that partnerships with OEMs or preprint manufacturers is almost a necessity for success. For example, Sunjet, a division of Sun Chemical, in cooperation with Ica Digital Printers, recently launched FastJet™. A four-color digital press utilizing arrays of fixed printheads for very high-speed printing on corrugated substrates. Inkjet inks have gained ground in most printing ink markets, but the greatest success has been in screen processes. Significant potential has been identified by industry players in labels and packaging and small-tube applications where shorter runs are required.

Thermochromic and photochromic inks change color when exposed to heat or light, respectively, and are used in packaging applications and for sensitive documents. Metallic inks are attractive in consumer packaging where they are designed to differentiate products.

Radiation-cured technology finds use in the various different printing ink processes. Applications can be found in flexographic and offset printing for both food and non-food packaging and commercial/publication, where appearance, environmental regulatory compliance, and productivity are important. With ultraviolet (UV) inks, UV lamps cause photoinitiators in the ink formulation to cure the resin. They are attractive in various packaging and screen printing applications.

Electron beam (EB) inks are cured by electrons and are attractive in food packaging applications because they contain minimal extractables and have minimal odor. Most importantly, all are web-based and permit high-speed reproduction. These inks tend to possess excellent gloss and resistance characteristics and exhibit strong graphic impact.

Quick curing times are the biggest benefit offered by radiation-cured inks. The reduced amount of energy needed for the technology and the fact that these ink formulations contain no volatile organic compounds (VOCs) are also attractive features. "We fully expect there will be a continued growth of environmentally friendly technologies, primarily energy curable products with zero VOCs and hazardous air pollutants (HAPs) that allow ink makers and converters to operate with greatly reduced environmental risks and regulatory concerns," states Michael Kucharski, marketing manager—Graphics, Americas, with Cytec.

However, radiation-cured inks do currently face challenges including lack of compliance with FDA food contact regulations, raw material handling issues, odor, adhesion to substrates, consistent coating weight across wide webs in flexo printing, perceived cost disadvantages, and line speed, according to Ms. Anderson. "As these challenges are met, it is expected that UV and EB technology will replace water-based inks, particularly in packaging, as well as solvent applications," she notes. Recent advancements in improved adhesion, lower odor, and hybrid cure are being made, which is opening new opportunities for the technologies, and she expects they will grow at a rate of 6% or more per year from a relatively small base for the next several years.

Waterborne technology has captured a strong position in the flexographic processes on paper and film, and in oversprays. However, the average growth rate for water-based printing inks has declined recently as many of the applications that use this technology have become commoditized, according to ChemQuest. Potential for growth does still exist for some applications, including sleeves for packaging, food packaging, and labels. In addition, Ms. Anderson also believes that, in flexible packaging, new developments in substrates primarily aimed at raising the surface tension are expected to spur the relocation from solvent to water in years to come.

Solvent-based technology dominates publication gravure, and a large portion of the packaging gravure ink market has remained solvent-based. Use of solvent-based inks is declining, though, in flexographic printing applications. "Adhesion to flexible packaging, aesthetic quality, and slower line speeds continue to be challenges for waterborne inks," Ms. Anderson says. Many printer/converter have installed solvent recovery systems and are therefore unlikely to switch to waterborne technology.

**INDUSTRY PLAYERS AND CONSOLIDATION**

The leading players in the printing ink industry offer products and technologies for all printing processes and end-use applications. Smaller players tend to specialize in one or two areas only. Dai nippon Ink & Chemicals/Sun Chemicaldominates the global printing ink market as the clear leader, with $4.9 billion in worldwide sales. Flint Group holds second place, a position it recently made much stronger with the merger of XSYS Print Solutions and Flint Ink Corporation. Flint Group’s estimated sales for 2005 were $2.71 billion. Toyko Ink is the third largest player, followed by Siegewerk and Huber Group/Micro Inks Ltd. These top five companies account for at least 70% of the total market, according to Ms. Anderson.

The merger of XSYS and Flint, which was finalized in October 2005, is the largest of many recent consolidations in the printing ink industry. CVG Capital Partners, which also owns BBI’s Drucksysteme and ANI Printing Inks to form XSYS in late 2004, owns the new entity created by this merger. About 50% of the new company’s sales will be in Europe. Siegewerk acquired the packaging ink business of SICPA in June 2005 and, according to the company, is now the second largest global player in this segment of the industry. SICPA has become a smaller, leaner company focused on the specialty ink market.

The third major consolidation event in the ink industry revolves around the alliance between the Huber Group, the fifth largest printing ink manufacturer, and India’s Micro Inks Ltd. Huber Group has announced plans to acquire a majority stake in Micro Inks. This transaction is expected to be completed early in 2006. With the acquisition, Huber will become a more global company and also gain backward integration into resins and pigments.

In the digital ink sector, Fuji Photo Film Co. (Fujifilm) acquired Sericol, the world’s largest producer of screen printing inks, in early 2005. Fujifilm also announced in December 2005 that it has agreed to acquire Aweca’s inkjet business for $260 million (Euro 219 million), with the deal expected to close in February 2006. In July 2005, Dainippon Screen acquired Inca Digital, which has alliances with both Sun Chemical and Sericol. Jettion LLC was launched by Flint Ink Corporation in 2003.

Consolidation has also occurred among resin suppliers with Cytec Industries acquiring UCB’s Surface Specialities business in October 2004, and DSM purchasing NeoResists in February 2005. On the additives side, Alkana Chemie purchased Eckart Gmb’ll, a leading producer of metallic effect pigments and metallic inks.

"Globalization and consolidation by both ink companies and their customers is creating a changing competitive landscape," says Rita Conrad, vice president of corporate communications for Flint Group. According to Michelle Moss, industry manager with DSM NeoResists, this globalizes results in a trend for ink production to move to lower production cost regions, outside the U.S., such as Latin and South America, India, and China, for example. "The China effect will be the biggest challenge in the coming five years, both as opportunities to supply resin into this market and as a threat. As resin and ink production in China increases, there will be a rise in exports into U.S. markets. The same can be expected for even the printed stock. More and more ready made printing packaged ink..."
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will be imported from countries with low labor costs," she says.

"The consolidation is expected to continue due to the extreme pressure on margins that has been inherent in the industry and now has increased to painful levels with the accelerated climb in raw material prices," Ms. Anderson notes. She adds that consolidation of ink companies, particularly the acquisition of smaller firms, allows these industry leaders to increase their buying power across the various market segments they serve. Consolidation among customers of printing inks will also continue to place pressure on companies to reduce their fragmentation.

On the positive side, consolidation may create opportunities for smaller players in the ink market. "The ink industry will be even more consolidated than before, but will still have room for small companies that specialize in niche products. The same will hold true for the convertors," notes Bill Bayer, business director Radure, Americas with Cytec. Overcapacity at the formulator end should be reduced, both through the consolidation and as a result of plant closures and companies leaving the market. "The industry has excess capacity and there are a number of smaller, privately-owned companies whose family owners may be looking to exit the business," comments Michael Griem, president, Sun Chemical North American Inks.

Many of the recent ink industry acquisitions involve private equity companies looking for control of existing US businesses. The purchasing of U.S. ink companies is coming from investor groups who are consolidating regional companies into global groups," says Mr. Griem. "This does not necessarily remove capacity from an overburdened market. However, you would think these investors must be pretty savvy and are expecting a reasonable return on their Euro. Of course, competition is likely to heat up, but that may be based on important factors like multinational supply and local service rather than pricing."

**UNIVERSAL CHALLENGES**

No matter what type of ink technology or end-use application ink producers are targeting, they all are facing similar challenges in the marketplace. Most components of printing inks, particularly the petrochemicals, and rising oil prices have pushed raw material costs for resin, pigment, and additive suppliers and their ink manufacturing customers to unprecedented levels. Shortages of raw materials, particularly acrylics and esters, have added to the difficulties.

"Ours is an industry based on petrochemical derivatives. No market segment is immune; and most major ink suppliers have recently announced price increases and/or surcharges to help offset the burden," says Ms. Conrad. "Other print suppliers have felt the effects as well, and costs have increased for paper as well as other supplies. Since price increases on inks had not been implemented in many years, the change was working with some resistance. However, some printers that participate in multiple links of the printing supply chain, i.e., both selling and printing/converting subtrade, have raised prices themselves, and end-users cannot ignore the impact," she continues.

Like ink makers, many printers in all segments of the industry are operating with narrow margins as well, notes Mr. Griem. Consequently, changes in some supplier price increases. "However, the evidence of the rising raw material costs and the low availability of many key ingredients is clear, and most printers are accepting the ink price increases, as well as the cost increases at such high levels, as they pass through the industry," he adds. At Sun Chemical, the fact that we are an integrated supplier has helped us to ensure a steady supply to our customers," he says. "Investment in research and development to find competitive alternatives for key ingredients in short supply due to rising costs or a shrinking supplier base is also key to success for ink manufacturers, states Mr. Griem.

They have found it necessary to pass on price increases to ink manufacturers regaining resin producers, in order to achieve reinvestment economies. As a resin supplier to the packaging ink industries, DSM Neopentils has been able to maintain growth levels in an overall flat U.S. ink market, according to Ms. Moss. "The increasing costs we are experiencing are applied across the full supply chain: increasing the cost of raw materials for resin production to the formulated finished inks. The controlling factor is the cost of oil and gas, and we have little influence on this aspect. As the materials are increasing in price, it is a matter of having to pass these increases onto our customers. Likewise we see our competitors and our customers increasing prices too," she notes.

Additive suppliers have been forced to raise prices under these conditions as well. Huber Engineered Materials (a separate company from the Huber Group) provides treated and untreated kaolin clay to ink manufacturers around the world. "We have raised prices up to 15% due to increased costs," states director of kaolinite production, Shae Gilmore, "We have also implemented energy surcharges on water washed and calcined clay based on the spikes we have experienced since the hurricanes hit the Gulf of Mexico."

Recovery in the Gulf is not expected to return prices to pre-Katrina levels, either. Even with the chemical industry moving closer to post-hurricane operations, business is not back to normal. This is still causing disruptions in the supply chain," says Mr. Bayer. All segments of the ink industry are affected. "It truly doesn’t matter because every segment is involved in the same supply chain. Higher costs and the uncertainty of natural gas supplies and transportation are tied into every step from manufacturing to delivery to the customer," he says. At Condea, we’re always working to optimize our value proposition to customers. This involves continuous improvement in our key processes and cost control. However, despite our best commitment to improve our processes, customers had to pass along price increases to our customers."

Additive and resin suppliers are working closely with ink manufacturers to develop lower cost alternatives that still offer the performance necessary for high quality inks. Currently, resin manufacturers are concerned that many refiners will divert feedstocks needed for resin production into the gasoline market because they can get better returns on benzene at such high levels. "As a relatively small user, the ink industry has limited bargaining power," notes Ms. Conrad. "For example, the tire industry is in a much better bargaining position on carbon black than we are." A shortage of acrylics is also an issue, particularly for radiation-cured inks. Increased demand for these compounds in super-absorbent materials used in disposable diapers, for example, has left supply extremely tight. For the publication ink segment, these raw material issues are not the only concerns. "Growing competition from electronic media (particularly the Internet), in- creasing packaging and the movement of manufacturing and printing to lower cost regions are additional challenges," says Ms. Anderson. The packaging segment has fared better, as consumer product companies have turned to novel packaging as a way to differentiate their products from those of their competitors.

Flexible packaging is the main area of growth in the packaging segment, with recent packaging, where food is cooked in the packaging itself, along with shrink sleeves, stand-up pouches, and pharmaceutical packaging, all offer considerable opportunities for growth. There has been a lot of printing processes from gravure for these applications because flexo offers improved graphics, lower costs, and is more appropriate for shorter print runs. Digital printing (inks), however, is expected to take some market share in this area. Paper publishing in the U.S. has declined due to offshore competition. As much manufacturing of goods that require packaging moves to lower cost regions, it is expected that packaging operations will follow as well.

**INNOVATION IS KEY**

In such a highly competitive environment, printing ink manufacturers need to find ways to help their customers differentiate themselves. "Inks play a key role in..."
will be imported from countries with low labor costs," she says.

"The consolidation is expected to continue due to the extreme pressure on margins that has been inherent in the industry and now has increased to painful levels with the accelerated climb in raw material prices," Ms. Anderson notes. She adds that consolidation of ink companies, particularly the acquisition of smaller firms, allows these industry leaders to increase their buying power across the various market segments they serve. Consolidation among customers of printing inks will also continue to place pressure on companies to reduce their fragmentation.

On the positive side, consolidation may create opportunities for smaller players in the ink market. "The ink industry will be even more consolidated than before, but will have room for small companies that specialize in niche products. The same will hold true for the converters," notes Bill Baur, business director Radurex, Americas with Cytex. Overcapacity at the formulator end should be reduced, both through the consolidation and as a result of plant closures and companies leaving the market. "The industry has excess capacity and there are a number of smaller, privately-owned companies whose family owners may be looking to exit the business," comments Michael Griem, president, Sun Chemical North American Inks.

Many of the recent ink industry acquisitions involve private equity company-backed deals, notes Mr. Griem. "The purchase of U.S. ink companies is coming from investor groups who are consolidating regional companies into global groups," says Mr. Griem. "This does not necessarily remove capacity from an overburdened market. However, you would think these investors must be pretty savvy and are expecting a reasonable return on their Euro.

Of course, competition is likely to heat up, but that may be based on important factors like multinational supply and local service rather than pricing."

UNIVERSAL CHALLENGES

No matter what type of ink technology or end-use application ink producers are targeting, they all are facing similar challenges in the marketplace. Most components of printing inks, such as the pigments, resins, and solvents, which, according to the chemical industry, are linked to the price of raw materials. This "chemical belt" is the same for all ink producers. "Prices are increasing across the board," says Mr. Baur.

The rise in energy costs, particularly electricity, has added to production costs. "In our case, 40% of our costs are in electricity," says Mr. Baur. "It's a big component of the bill."

The rise in raw material prices also affects the cost of the finished product. "The price of raw materials is a large factor in the cost of the product," notes Mr. Griem. "And raw material prices, particularly acrylics and esters, have added to the difficulties.

"Ours is an industry based on petrochemicals. No market segment is immune; and most major ink suppliers have recently announced price increases and/or surcharges to help offset the burden," says Ms. Conrad. "Other print suppliers have felt the effects as well, and costs have increased for paper as well as other supplies. Since price increases on inks had not been implemented in many cases, the changes have come with some resistance. However, some printers that participate in multiple links of the printing supply chain, i.e, both selling and printing/converting substrate, have raised prices themselves. Even end-users cannot ignore the impact," she continues.

Like ink makers, many printers in all segments of the industry are operating with narrow margins as well, notes Mr. Griem. Consequently, they are working to optimize supplier price increases. "However, the evidence of the rising raw material costs and the poor availability of many key ingredients is bleak and most printers are accepting the ink price increases as they exist today," says Mr. Griem. "In the industry," he adds. "At Sun Chemical, the fact that we are an integrated supplier has helped us to ensure a steady supply to our customers." Investment in research and development to find competitive alternatives for key ingredients in short supply due to rising costs or a shrinking supplier base is also key to success for ink manufacturers, states Mr. Griem.

They have found it necessary to pass on price increases to ink manufacturers regaling resin producers, in order to achieve reinvestment economics. As a resin supplier to the packaging ink industry, DSM Neocal has been able to maintain growth levels in an overall flat U.S. ink market, according to Ms. Moss. "The increasing costs we are experiencing are applied across the full supply chain: the cost of raw materials for resin production to the formulated finished inks. The controlling factor is the cost of oil and gas, and we have little influence on this aspect. But the materials are increasing significantly, as such we have had to pass these increases onto our customers. Likewise we see our competitors and our customers increasing prices too," she notes.

Additive suppliers have been forced to raise prices under these conditions as well. Huber Engineered Materials (a separate company from the Huber Group) provides treated and untreated kaolin clay to ink manufacturers around the world. "We have raised prices up to 15% due to increased costs," states director of kaolitx product development, Shaw Gibbons. "We have also implemented energy surcharges on water washed and calcined clay based on the spikes we have experienced since the hurricanes hit the Gulf of Mexico."

Recovery in the Gulf is not expected to return prices to pre-Katrina levels, either. "Even with the chemical industry moving closer to post-hurricane operations, business is not back to normal. This is still causing disruptions in the supply chain," says Mr. Bayer. All segments of the ink industry are affected. "It truly doesn't matter because every segment is involved in the same supply chain. Higher costs and the uncertainty of natural gas supplies and transportation are tied into every step from manufacturing to delivery to the customer," he adds. "As a result, we're always working to optimize our value proposition to customers. This involves continuous improvement in our key processes and cost control. However, despite our best commitment to improve and pass along price increases to our customers.*

Additive and resin suppliers are working closely with ink manufacturers to develop lower cost alternatives that still offer the performance necessary for high quality inks. Currently, resin manufacturers are concerned that many refineries will divert feedstocks needed for resin production into the gasoline market because they can command a better price at such high fuel prices. "As a relatively small user, the ink industry has limited bargaining power," notes Ms. Conrad. "For example, the tire industry is in a much better bargaining position on carbon black than we are." A shortage of acrylics is also an issue, particularly for radiation-cured inks. Increased demand for these compounds in super-absorbent materials used in disposable diapers, for example, has left supply extremely tight.

For the publication ink segment, these raw material issues are not the only concerns. "Growing competition from electronic media (particularly the Internet), in- carrier and e-mail, and the movement of manufacturing, particularly engraving and printing to lower cost regions are additional challenges," says Ms. Anderson. The packaging segment has fared better, as consumer product companies have turned to novel packaging as a way to differentiate their products from those of their competitors.

Flexible packaging is the main area of growth in the packaging segment. Retail packaging, where food is cooked in the bag and carried home, along with shrink sleeves, stand-up pouches, and pharmaceutical packaging, all offer considerable opportunities for growth.

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INNOVATION IS KEY

In such a highly competitive environment, printing ink manufacturers need to find ways to help their customers differentiate themselves. "Inks play a key role in..."
many of the new technology developments that are emerging in the printing industry," says Mr. Griel. Stochastic screening enables the production of high quality printing even on lower-grade stock. Higher strength inks provide equal densities with use of less ink. New prepress techniques also make it possible to consume less ink. Some ink manufacturers have developed formulations suitable for multiple substrates, so printers need to keep fewer inks in inventory. The key for ink producers is to provide new technology that offers new effects along with high performance, and all at lower cost. Other new product areas for ink producers include RFID, color management, and product security. "These developments are being pushed by brand owners who want to increase and protect their brand equity," Mr. Griel notes.

A combination of innovation and service is the key to success. "Focusing on improving the short term situation is a necessary action, but for the longer term further innovations are required to stay ahead of competition," says Ms. Moss. "Innovation will fulfill a need where there is currently no suitable answer available." As globalization continues, DSM NeoResins has also organized its business to meet the needs of global supply, with production facilities located in the U.S., Europe, and China, states Mr. Moss.

"Determining how the market and competition will sort itself out, and staying ahead of the curve on all fronts will be important for achieving success in the inks market," adds Mr. Bauer. "The question facing everyone in the industry is the same: How/where do you best invest in technology/innovation as costs continue to escalate, customers squeeze suppliers, and, in some cases, see commoditization of products as short-term solutions? Regardless of these challenges, creating advanced technology solutions for our customers is fundamental to us. We're developing next generation technologies that can help our customers address their needs and grow their markets."

A balance of modest and step-change innovations are also important. "Many times the most markable innovations are evolutionary, not revolutionary. The former are often more easily adopted by the customer base," explains Ms. Conrad. "Still, far-reaching innovations are also important to continue making this industry more efficient as well as continuing to keep print materials on the map as an important marketing tool. She adds that as the balance of conventional ink-on-paper vs. digital vs. electronic media continues to shift, industry manufacturers must look for new ways to grow sales in a mature market.

"Supplying printers with the value-added resources they need to be competitive is critical," Mr. Griel emphasizes. "We invest heavily in research and development, and rely on our technology group to provide us with innovative products that give Sun Chemical a competitive advantage. In addition, we also focus on providing a superior level of local technical service, timeliness, and global perspective to our customers."

There is no doubt that the players in the ink industry will continue to face challenging times. "Whether it's due to economic conditions or increasing competition from new media, print will just not grow as fast as it has historically," says Mr. Griel. "Print won't disappear any time soon, but stagnation will likely force more printers and their suppliers to either fold or consolidate."

Those companies positioned to participate in growth segments such as radiation cured inks and digital technology will do well. Others committed to more mature sectors of the ink market such as publication inks will need to rely on cost reduction, innovation, and value-added services to sustain profits in the face of growing competition. Whether an ink manufacturer or resin or additive supplier, managing the supply chain and pricing issues will remain at the forefront of activities for all companies involved in the ink industry."

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