Supply Chain Management in Paints and Coatings

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Effective supply chain management (SCM) solutions can provide paint and coatings companies with a means to control and minimize costs while improving customer service. Development of a responsive business strategy underscores all successful SCM implementations. In the face of uncertain demand, balancing the need for cost reductions with the flexibility critical to productive operation of extended supply chains and the desire for increased risk management confronts most companies today. Formulators also face the challenge of managing supply networks to consumer-oriented markets and industrial customers through a number of different channels of distribution. Careful selection of software, business practices, and data collection can result in dramatic improvements in an organization's bottom line.

Most major chemical companies, including suppliers of raw materials, additives, and resins to the paint and coatings sector, as well as leading paint and coatings manufacturers themselves, have implemented enterprise resource planning (ERP) and supply chain management systems in some form or another. However, many have not gained the maximum level of benefits possible from their initiatives, and some have even taken actions that have inhibited their ability to reap the greatest possible rewards for their efforts.

Supply chain management systems are designed to assist in the gathering and analysis of data to enable accurate demand forecasting, which is then coupled with internal knowledge of production and delivery capability and the desired level of profitability to design and implement an effective and efficient supply chain process that extends from the supplier through to final delivery of product to the customer. There are four aspects of SCM that paint and coatings companies are particularly interested in, according to Kevin Reid, a partner with consulting firm Orr & Boss. These areas include forecasting, order processing and execution, warehouse management, and distribu-

tion resource planning. Simon Bragg, European research director with ARC Advisory Group, adds that production planning and scheduling, which reflects a company's unique production processes, is another critical issue.

"Overall, interest in the paint and coatings industry is centered around detailed plant planning and scheduling with an online link to ERP systems for a current perspective on demand," says Stephen K. Gaines, vice president, supply chain planning with Aspen Technology, Inc. He adds that scheduling must be sufficiently detailed to represent key unique aspects of the paint and coatings industry that include tank scheduling, shared resources, and linkages between production and filling.

Forecasting demand, or demand planning, has received increasing emphasis recently as markets have tightened, with some key ingredients for the paint and coatings sector being placed on allocation. "Being able to forecast demand in order to increase service levels to customers while minimizing the amount, and therefore cost, of inventory kept on hand is of significant interest," says Mr. Reid. "More and more coatings companies are embracing the demand side of SCM, and are using forecasting models to predict future sales. The key is in knowing when a product truly can be forecast and when it cannot," he adds.

For DSM NeoResins, the key to demand planning is the achievement of better communication throughout the supply chain. "We need a better understanding of our customers' product demand requirements and our suppliers need to understand what our requirements will be," explains Mike Strong, supply chain manager with DSM NeoResins. "In today's business environment, where companies are holding less stock, many products are sourced globally, raw materials can be in tight supply, and costs are increasing in all areas of the supply chain, it is more important than ever to have a good handle on demand so that we can meet our customers' needs and at the same time not spend resources on inventory that is not needed," he adds. DSM NeoResins has implemented a globally integrated ERP system and a sales and operation planning (S&OP) process.

Paint and coatings companies serving the building and construction market are more closely related to consumer products companies in this aspect of their business than other chemical manufacturers. "Finished goods inventory management, retail customer demand responsiveness, product lifecycle management, and seasonal capacity planning are all typical focus areas for paint and coating companies that generic chemicals companies can ignore," notes Andrew Sanford, director of supply chain planning, Aspen Technology, Inc. (AspenTech).

In the U.S. at least, the supply chain strategy adopted by the paint and coatings industry is one of postponement, according to Colin Masson, with AMR Research. Paint companies manufacture base colors, and tinting does not take place until the point of sale. Therefore, formulators are supplying to the consumer. According to Aspen Technologies, as much as 80% of larger paint and coating providers are now trading through retail consumer channels.

There are, of course, numerous channels of distribution ("big box" retailers, company stores, small general shops), which adds complexity to the supply chain. However, unlike with most chemical companies, point-of-sale data and information on upcoming marketing promotions is available to the manufacturer. Even the large discount stores are increasingly providing data to paint companies in order to improve their supply chain management. "With the increased visibility into demand and access to multiple streams of data, paint and coating formulators—and to some extent their suppliers—are better situated to anticipate and forecast demand more accurately, and can reduce inventory levels because there is less unexpected variability," notes Mr. Masson.

Being close to the consumer can have its drawbacks, though. "It should be noted that there has been, and continues to be, an overall increase in demand variability throughout the industry, with seasonality, changing fashion, greater numbers of brands, broadened color palettes, and customers looking for specialized services," Mr. Masson adds. "Formulators need to be prepared to ramp up and slide back production at appropriate times

and optimize inventory for the different distribution channels." In addition to the requirement of being responsive to variable consumer demand, formulators are finding that their retail supply chain partners are pushing inventory costs back to them. "Making the right product at the right time without incurring carrying costs or excessive manufacturing costs is more important than it has ever been," states Mr. Sanford.

That is where supply chain planning comes into play. Supply chain planning involves all aspects of producing and delivering goods to customers to meet demand, while optimizing production processes and inventory levels. "A production and delivery schedule is developed that matches forecasted demand with the ability to make/source the product in the most efficient, cost effective, and profitable way possible," explains Mr. Masson. Order processing and execution are important because the lead times customers expect are getting shorter and shorter, Mr. Reid notes. The sales and operation planning (S&OP) process provides the link. S&OP combines the knowledge gained from analysis of sales and marketing data (order information, point-of-sale data, weighted sales rep forecasts, planned marketing promotions, vendor managed inventory data, etc.) with an understanding of what the company can make, how quickly it can be done, and how profitably.

Production planning includes procurement and delivery of raw materials from suppliers to production facilities, as well as scheduling of production runs given a variety of constraints such as capacity, equipment availability, set up time, and desired profitability. Many types of product wheels come into play (such as a color wheel or packaging sequence) that require production of the smallest possible batch sizes in the least amount of time in order to meet demand and move through the predetermined sequence as quickly as possible in case adjustments must be made. The need to make numerous changeovers must be avoided as it contributes to reduced productivity and capacity utilization, and therefore increased cost.

Other manufacturing aspects must be considered as well, notes Mr. Masson, including mixing and blending issues, maintenance, production of color cards and swatches, and sample management. "Paint and coating manufacturing is fraught with real-world costs and constraints that cannot be ignored by supply chain solutions," adds Mr. Sanford. Examples include multiple potential production lot sizes and product routings, tightly synchronized batch production, vessel-to-vessel piping constraints, and extensive setup costs and constraints. Mr. Sanford also comments that "the capability to model these constraints is not optional."

Multi-plant sourcing is yet another issue that paint and coatings companies must manage as part of their complex supply chains. "These companies have many stocking units, innumerable formulations, and they must maintain consistent production quality not only from lot to lot within one facility, but from plant site to plant site across the world," notes Mark Wells, supply chain solution principle with SAP AG, which focuses on the process industries.

Warehouse management systems are important for minimizing inventory, reducing order costs, and locating products for shipment, while distribution resource planning is important for meeting customer delivery expectations, according to Mr. Reid. Logistics and distribution issues include packaging size, modes of transportation, and location of distribution centers. Because paint companies sell their product through so many different channels, and to the consumer and industrial sectors, their supply chain solutions are highly complex. "The use of supply network design tools to evaluate multiple supply designs for different channels can vastly reduce inventory and transportation costs," notes Mr. Masson. "These tools also help address the myriad of other considerations, such as labeling and regulatory compliance issues. They also make it easier to modify the design when changes are required."

While planning/decision making is a critical aspect of a supply chain management solution, there are other areas that need attention as well. "We consider and address four components of a total supply chain management solution," says Mr. Wells. Planning is the first and involves several different subcategories including demand planning, supply planning, supply network planning, and production planning, which have

been addressed here. Also important are execution, collaboration, and coordination. "Execution refers to the implementation of business processes and operations determined in the planning process. Collaboration with partners, suppliers, toll processors, and customers in order to gather as much relevant data and maintain awareness of current performance and potential future demand is another important feature of a successful SCM solution. Coordination refers to the tracking of progress and actual gathering of information as material flows through production and up through the value chain to final product delivery."

A company embarking on implementation of an SCM solution has already overcome a major hurdle in the process—making the decision to move forward with the initiative. "The paint and coatings sector is an industry that has performed for many years by having knowledgeable people relied upon to make key planning and scheduling decisions based on experience. Gaining the trust that SCM systems can be just as reliable is a barrier to break," says Mr. Gaines.

Once committed to pursuing an SCM solution, an organization needs to be aware of the complexity of the project it is undertaking. "Companies must choose whether to adapt the software to accommodate their existing business processes, or modify their processes to fit the software," explains Mr. Reid. "Either way, there is significant investment required when managing the software aspects of an SCM implementation." Mr. Strong recommends the former. "Companies need to understand what their strengths are as well as what their customers' expectations are and make sure they don't lose focus on the key facts when implementing the SCM program. Choosing the SCM software that fits existing processes will help ensure that this focus is maintained," he explains.

SCM software itself is expensive and accounts for a large percentage of the cost of any solution, which overall can run into the millions of dollars. Extensive training of users is also necessary and contributes to the cost. In general, typical implementations of supply chain management solutions take up to two years to complete, and longer than that to achieve a return on the investment.

When implementing an overall supply chain management solution for global operations, companies need to become familiar with the specific supply chain issues facing it, identify opportunities for improvement, determine required new business processes, and get management commitment to those new processes and other changes. Only then should software be evaluated. "Taking the time to develop this in-depth knowledge up front will have a large impact on the level of benefits gained after implementation is complete," says Mr. Bragg.

SCM Software Review

Most analysts name AspenTech, Manugistics, and SAP AG as the leading providers of supply chain management software to the process industries, which includes paint and coatings. All three companies have established supply chain management offerings for this sector that include individual components for addressing the different planning and execution aspects of an SCM solution.

AspenTech focuses on the process industries, and has many products designed to meet the broad assortment of production arrangements (batch versus continuous, for example) that are prevalent in theses sectors. aspenONE™ Supply Chain Management for Chemicals, ApenTech's integrated SCM solution, focuses on maximizing the flexibility and capacity of process plant assets while minimizing the costs of operations, according to Mr. Gaines. "Our supply chain management footprint focuses on linking these plant assets with ERP, logistics, and real-time process control systems for maximizing customer service and market responsiveness, while minimizing the operating and capital investment in plant assets. Our position is derived from direct experience in multi-plant paint and coating implementations, as well as in implementations with suppliers to, and customers of, this industry," he adds.

Mr. Sanford points to AspenTech's ability to perform detailed modeling of process plant assets using models that accurately represent the way paint plants operate as the key to the success of their SCM solution. "By linking this modeling capability to real-time business demands, AspenTech distinctively ties plant operations to business needs. With the ability to respond to market opportunities or disruptions in real time, our customers can make the best decisions within a timeframe for optimum effect. At all times, we maintain the cross-functional visibility with communications to ERP, plant operations, supply chain partners, and management cockpits, which allows the entire enterprise to stay in sync. Finally, we apply scalability based on the needs of a specific plant in order to permit flexibility in deployment," he states.

For the paint and coatings industry, AspenTech's strategy involves increasing the flexibility of manufacturing assets and improving the ability to commit and deliver goods to the customer while managing total cost. These activities are achieved through improved scheduling of decisions, increasing

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Companies also need to develop common master data, terminology, and nomenclature, and consistent work processes throughout the entire organization prior to implementation of a SCM solution. "Names of data fields all need to represent the same type of data, and processes all need to be the same, with the steps for addressing exception and problems also the same, at every plant site," stresses Marty Etzel, director of solution marketing for chemicals with SAP AG. "If people aren't all following the same rules and using the same data, too much time is spent correcting problems and managing issues and not using data to plan, execute, collaborate, and coordinate in a way that will drive out inefficiencies and increase service while reducing cost."

Air Products is one supplier to the paint and coatings industry that has maintained a focused effort on supply chain management that has included the convergence of many work processes and business rules across the company worldwide. "This was a huge effort considering the number of diverse businesses that make up Air Products," says Pat Flora, supply chain manager—Polymers North America with Air Products. One of the biggest obstacles Air Products faced when implementing an SCM solution was breaking down the functional silos within the company. "Work processes flow across functional groups, so you have to optimize the whole work process, not just the part that is in a functional group. The key benefit for me is visibility of data. You can't manage and improve your supply chains unless you can see and measure how they are performing," he adds.

Responsiveness is fast becoming the watchword for successful SCM implementations. Paint and coating companies need flexibility in their planning solutions in order to be able to respond to changing demand. "When combined with extensive knowledge about its capabilities across the whole supply chain, flexibility can enable a company to respond to and address unexpected events before they ever become a problem for the customer," explains Mr. Wells. "Sense and respond to the conditions and react in a manner most favorable to the business will soon be commonplace," notes Mr. Gaines. Legacy approaches to planning and scheduling remain valid, but they need to be enhanced with real-time optimal response to unpredictable demand events. In addition, real-time operating principles, which include true process modeling and data reconciliation, are now becoming a part of the full SCM suite. Ray Adams of SAP AG's industry business unit for chemicals adds that leading firms have efficient supply chains that not only achieve cost savings, but are willing to change business processes in order to meet variabilities in demand. "The most adaptive companies are the winners."

Aligning all aspects of the supply chain with overall business objectives is also critical to the successful implementation of a SCM solution. "Both sales and production incentives must be aligned with the business objectives. If done correctly, many times limitations in technology can be surmounted because the entire organization is working towards the same goals," notes Mr. Masson. He adds that inefficiencies in the supply network often occur because of disconnects within the organization between marketing, sales, and production. "SCM software tools won't improve the situation as long as these disconnects remain."

According to an ARC study of various SCM solution implementations, selecting good project managers that can sell upper level management on the value of the project is also important. ARC also found that most successful implementations involved at least one or more team members with a deep understanding of the SCM application's algorithms and implications for the company's business processes. "Use of internal employees (rather than consultants) that know the manufacturing processes and have industry-wide and company-specific knowledge will often result in faster implementations with fewer mistakes, and greater personnel buy-in, which leads to greater benefits in the long term," notes Mr. Bragg. Resolving obstacles as they arise and developing prototypes to demonstrate the benefits to the sales force will also contribute to a more successful initiative.

Of the leading companies that have successfully implemented supply chain management solutions, differ-

entiation has been achieved through creativity and collaboration. "The real art is in being creative in how to implement the postponement strategy, and also to find ways to make accurate demand forecasts," says Mr. Masson. Establishing good relationships with customers so that they are transparent with their sales and marketing data is also important. "Combining these two approaches with good software tools allows companies to set themselves apart from the competition," he adds.

Air Products believes in this approach. "We expect to see continued pressure to reduce costs, so we have to be more creative in where we look," says Mr. Flora. "For example, we are beginning to work more closely with customers to reduce our mutual supply chain costs. This type of collaboration will be a source of many new opportunities," he explains.

Companies that have implemented successful SCM solutions have achieved savings of hundreds of millions of dollars through more accurate demand forecasting, increased production efficiency, better sequencing, improved capacity utilization, and enhanced customer service. "SCM presents a tremendous opportunity to make a business level difference now that back office functions are reliable and largely in place," notes Mr. Gaines. AspenTech has seen reductions in operating costs of 4–14% and increases in capacity of plant assets of 6–12% for companies through SCM implementations utilizing its software packages. "While we can't quantify improved customer service, we do have several clients that have gained the ability to respond to large unexpected changes in demand without significantly increasing costs," Mr. Gaines adds. Awareness of the big picture must be maintained, though. "Companies must remember that in order to take advantage of minimized inventories and fewer distribution sites, access to equipment and the capability to move goods rapidly is required," notes Mr. Masson. In the end, effective supply chain management goes directly to the cost structure, utilization of capital, and return on assets of a business, ultimately aiding in the determination of the worth of the enterprise, according to Mr. Wells.

Those organizations with more advanced and mature supply chain management solutions in place are currently exploring the areas of risk management and pricing management as further ways to maximize the performance across their entire supply chains. "Risk management hasn't reached the paint and coatings industry yet, but we expect it will be adopted by this sector soon," says Mr. Bragg. Risk management involves the development of various possible scenarios, which are then assigned probabilities of occurrence. A production arrangement is worked out that will enable the company to meet all of the most likely scenarios. New

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visibility of the schedule and minimizing deviations from it, supporting brand management, and extending the full consumer packaged goods (CPG) supply chain to customers, suppliers, and contract manufacturers. The aspenONE SCM for chemicals software includes over 10 modules that address the key aspects of SCM management, including forecasting, production scheduling, distribution and inventory management, enterprise/operations integration, and data management.

Most recently, AspenTech added a Supply Chain Analytics module to its suite of SCM tools in response to customer requests to make the data in the supply chain business area available to other applications and people through the web. Combined with AspenTech's Operations Manager, the new module comprises a full supply chain cockpit application which can also provide supply chain information into any portal or application.

SAP AG also has an industry focus, utilizing the extensive experience of it personnel, many of whom have come directly from the chemical—and more specifically—the paint and coatings industry. "The depth and focus that SAP places on different industries enables us to provide a 'best practices' offering that includes ERP and supply chain management software that can be configured to the specific needs of individual companies," says Mr. Adam.

According to Mr. Etzel, SAP has been developing solutions for the chemicals industry for over 30 years. As a result, its supply chain solution, mySAP SCM, is fairly mature, and the company is involved currently in building out deeper and deeper into industry functionality. The software suite offers three major facets necessary for building an adaptive supply chain network: synchronization of supply and demand so that the entire supply chain is paced to actual demand; creation of an adaptive fulfillment network that includes RFID (radio frequency identification)-enabled sense and respond capabilities; and network-wide visibility, collaboration, and analytics tools that include event management and result in greater transparency throughout the supply chain. Specific modules address the four key areas of supply chain management, including supply chain planning, execution, collaboration, and coordination.

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"SAP's SCM packages are designed for adaptive companies, or companies that desire to have the ability to make decisions in an integrated fashion, considering all aspects of the business' sales, marketing, financial, and operations activities," he continues. In order to create this adaptive business environment, SAP's sales and operation planning tools are evolving so that they more resemble integrated business planning tools. SAP also offers multidimensional decision support and supply chain planning software that enables companies to quickly respond to unexpected supply chain events. "Our supply chain event manager includes an alert system that sends e-mail notifications when a potential problem occurs anywhere throughout the supply chain, including on the supplier and customer ends. With this alert system, companies are able to address issues before they ever become a problem for the customer," Mr. Etzel explains. SAP's Transportation Planning & Vehicle Scheduling program also helps paint and coatings companies manage the complexities associated with the distribution and delivery of goods, whether by rail or tanker truck, or with in-house or third-party providers.

SAP, along with AspenTech and many other vendors, is also involved in the development of S-95, an international standard for defining the interface between business and manufacturing systems that will enable "plant-to-business integration." The company has built requirements of the standard into its solutions, including new manufacturing intelligence dashboards that provide plant personnel with role-specific information, alerts, and performance indicators. SAP is also working with Intel to encourage the adoption of RFID, focusing on direct data exchange between reader hardware and business applications so that information can be fed directly into SAP, and ultimately used in mySAP SCM for real-time monitoring and response capabilities. The company is working with partner Vendavo to integrate price optimization tools into its supply chain management solution that will enable users to improve margins through better management of product portfolios. Overall, SAP is migrating completely from its client server environment (SAP R/3) to its SAP NetWeaver web-based capability.

technology that looks at order patterns more intelligently and adjusts expectations appropriately is also being introduced to the market.

One trend of interest to Mr. Masson is the move back to less complicated supply chain management systems, which rely on a pull-based approach and largely focus on demand. "Some people now have the view that complex supply chain optimization systems take too long to set up, are difficult to maintain, and don't adjust readily to changing conditions. These folks are looking to a simpler system based on inventory collaboration with customers and suppliers," he explains. The challenge, of course, is establishing that reliable collaboration. Currently it is difficult, because specific rules and software are often required for each customer. Development of collaborative planning, forecasting, and replenishment (CPFR) systems by major software vendors should address this issue.

This trend toward simplification may in part be due to difficulties companies have created for themselves. A recent Deloitte Consulting LLP benchmarking study of more than 750 global manufacturing companies, including many leading chemical manufacturers, found that many key activities of companies geared toward reducing costs and expanding into new markets are actually reducing the effectiveness of their supply chains.

In an increasingly more competitive environment, fewer companies are establishing close collaboration with customers to improve demand planning. Expansion into low-cost regions is often accompanied by local optimization of supply chains, but not global optimization across the entire organization. While most companies indicate that innovation is the key to success, few have introduced systems or tools to aid in the management of innovation or new production introduction processes. Efforts to drive down costs are also reducing the flexibility of many supply chains, which ultimately increases both risk and many hidden costs.

The Deloitte Consulting LLP survey did find examples of successful companies that have established close customer partnerships, maintained flexibility, optimized their supply chains across the global organization and from sourcing to product delivery, and introduced systems for managing production innovation and introduction. These "Complexity Masters" utilize many different supply chain management tools to attain a more efficient and effective level of performance. Rohm and Haas Company, OxyChem, Rhodia, and Dow Chemical Company were listed as examples of companies that meet these criteria.