Managing the supply chain with RosettaNet standards. (Manufacturing Management).
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Manufacturing work-in-process (WIP) is an aspect of supply chain management
that Advanced Semiconductor Engineering Inc. has fine-tuned using RosettaNet
standards in conjunction with a customer, TSMC, and TSMC's customer, Motorola. The
combined efforts resulted in a reduction of more than 50% in the time and resources
spent to establish business-to-business interfaces.

The supply chain challenge
        Time-to-market pressure and the accelerated rate of innovation have shortened
product life cycles for both the electronics and semiconductor industries. Five years ago,
an electronic product could have 18 months to two years of viability. Now, shelf-life is
between six and 12 months. Companies also face a reduced time frame to recoup
research and development costs.

        In addition to accelerated product cycles, the industry has seen an increasing
trend for integrated device manufacturers (IDMs) to outsource part of their
manufacturing capabilities. Companies such as AMD, IBM, Intel and Motorola are better
able to focus on their core expertise in product design, marketing, and distribution of
end products. Outsourcing also cuts down on the investment IDMs have to make in
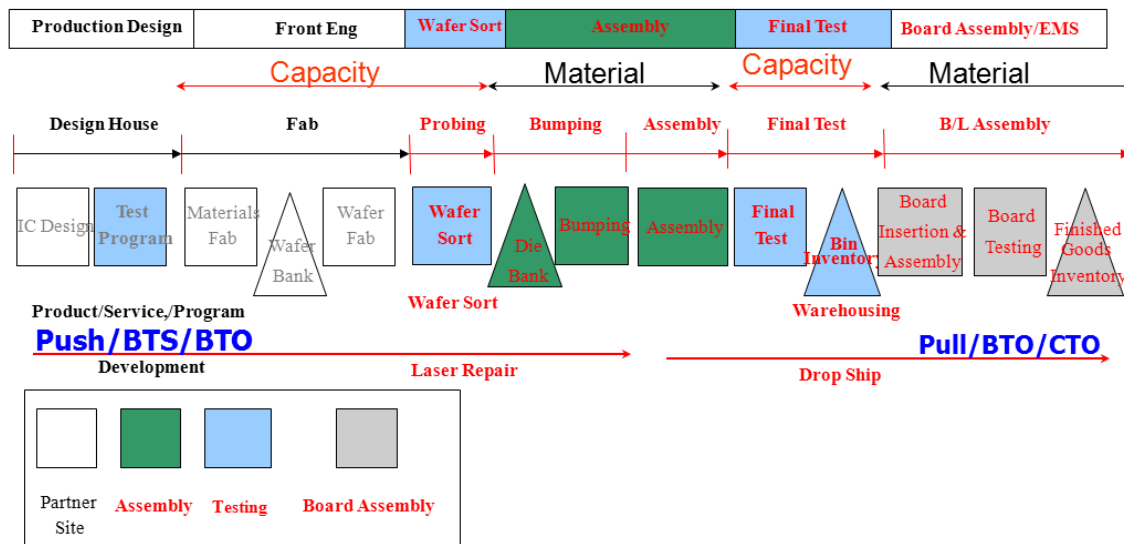capital equipment and floor space.

Figure 1. ASE's role in the electronics manufacturing value chain.

        The proliferation of fabless semiconductor companies also has given rise to the
use of independent manufacturing companies. Often, these companies have very high-
end technology and rely on a number of outsourced suppliers for independent foundry,
packaging, and testing services.

        With today's complex web of IDMs, fabless companies, and an array of
independent manufacturing companies, material and equipment suppliers, managing
the relationships for each player can be a challenge. If managed effectively, however,
such relationships can be a win-win for all parties in achieving greater efficiencies,
higher productivity, greater profits and customer satisfaction.

        From EDI to "e"
Historically, companies relied extensively on electronic data interchange (EDI) and

other manual methods of WIP communication with customers and suppliers that are painfully slow and frustrating. Reports have to be tailored to each customer's specifications, while at the same time the company attempts to align its suppliers' reports with its own infrastructure. Figure 1 shows the process of making an integrated circuit (IC) and the various stages where Advanced Semiconductor Engineering (ASE) is involved.

Clearly, efficiencies can be derived from streamlining the business processes, so strong support for the WIP project described in this article was provided in terms of funding for securing the software, hardware, and other resources. However, with more than 200 ASE customers, a large volume of e-business software, and the lack of a common standard in the market, each customer is going to have different expectations of how a supplier's programs will provide benefits.

ASE's corporate information systems (CIS) department (headquartered in Kaohsiung, Taiwan), working in tandem with the sales, marketing and customer service teams, is the champion of driving initiatives on a variety of e-business projects. ASE's Kaohsiung facility was established as the competence center (hub) for e-business development and tech support for all ASE sites. The center is responsible for gathering information, establishing initiatives, evaluating software, and assisting each site in implementing supply-chain management tasks.

Process, product, pipeline
In trying to develop the methodology and system for supply chain management efficiency, three key factors were identified: process, product and pipeline. Managing the supply chain (Fig. 2) requires a collaborative environment and standardization of these three elements.

Process refers to the methodology for conducting business-to-business (B2B) with various partners. Ideally, all partners in a supply chain should be adopting universal standards for processes within the chain. Many industry players, including ASE, support RosettaNet as a standard for processes, including those for demand forecasting, order management, WIP reports, shipping and logistics, inventory management, invoicing and payment.

RosettaNet is a nonprofit consortium of more than 400 leading electronic components, information technology (IT), and semiconductor manufacturing (SM) companies dedicated to creating, implementing and promoting open e-business standards. The organization's mission is the creation of common extensible mark-up language (XML)-based supply chain process standards for the high-tech industry.

Enabling collaboration also requires industry players to adopt unambiguous product specifications and component codification. Given the high rate of change for high-tech devices, specifications for a product tend to vary from company to company, so codification is challenging. Working closely with each customer to define all the product specifications and component codes at the customer's design stage is key. Such close cooperation enables both parties to agree to the same set of data later on during manufacturing and in the B2B exchange.
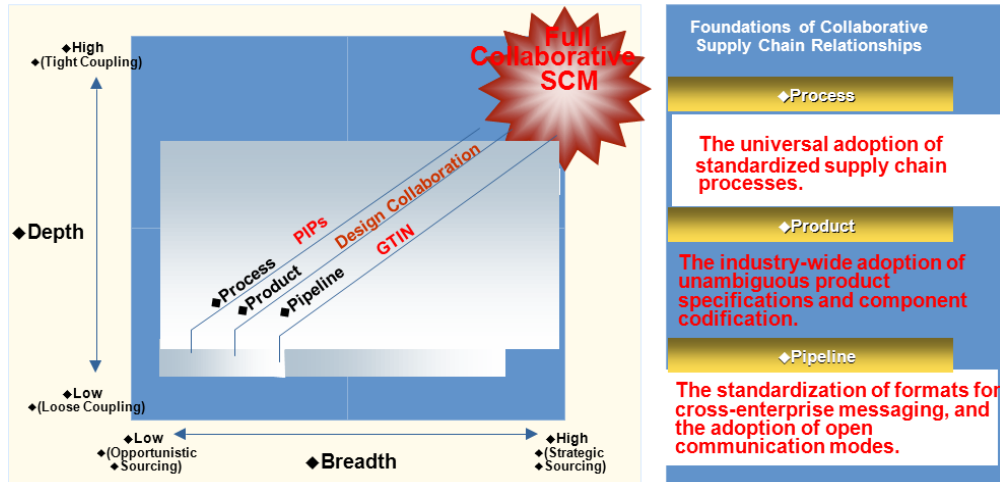
Figure 2. Collaborative supply chain management by standardization.

Click here to enlarge image The last element is the pipeline — or the standardization of formats for cross-enterprise messaging and adoption of open communication modes. Much like the use of English for commercial documentation, standard formats ensure that instructions and regulations are clearly understood by all parties. In conducting B2B, trying to standardize formats is a big challenge, and it will be a long while before any standard is agreed upon by the semiconductor industry. In the meantime, ASE is taking steps to develop with each customer based on the customer's unique SCM requirements. In a number of cases, ASE will be implementing a web-based, on-line interface system for exchanging supply chain information.

Getting started

The first step to streamline WIP communications was to evaluate current internal processes and identify where changes could be made without serious disruption to ongoing production schedules. The initial area targeted for improvement by the competence center was WIP, especially that part of the process where customers are provided information daily on their manufacturing schedule. Automating and standardizing this process enables higher supply visibility, leading to inventory reduction and allowing for more flexible operations.

What attracted ASE to RosettaNet was its ability to link the entire value chain of a high-tech business, from manufacturing to distribution. RosettaNet's global semiconductor manufacturing (SM) supply chain board consists of leading representatives from integrated device manufacturers, fabless companies, foundries, materials suppliers, and assembly, test and probe companies. The SM board drives projects and priorities, and its members serve as examples of implementing the organization's standards.

Among the many projects driven by RosettaNet, ASE committed to implementing the consortium's Manufacturing WIP Partner Interface Process (PIP) 3D8. PIPs define how two specific processes, operating in two different partner organizations, will be standardized and interfaced across the entire supply chain to achieve alignment. Information is exchanged via the worldwide-web framework that is universal, thus eliminating fear about incompatibility between systems.

PIP 3D8 enables solution providers who manufacture components to distribute WIP notifications containing information on the production status of components being manufactured. It supports the process used by wafer manufacturers or packaging and testing companies to notify trading partners of their product manufacturing status from wafer start through final testing.

Traditionally, the mode of WIP communication was conducted through e-mail, phone or fax, was often not delivered in real time, and was prone to errors.

In order to maintain a digital dialogue on the production status and planning when the wafers arrive at ASE sites, the company had already been collaborating with Taiwan Semiconductor Manufacturing (TSMC) on B2B processes, including WIP, since 1999. ASE continues to maintain a strategic alliance with TSMC — a company that processes more than 50% of total worldwide outsourced wafers. In turn, ASE packages and tests a large portion of TSMC's output. It was only an extension of the existing relationship when the two teams sat together to define the format and protocol of WIP data exchange.

Adding to the challenge was the fact that ASE and TSMC had established their own protocols and other proprietary standards. Furthermore, there are no standard interfaces for each of TSMC's customers, since each has different requirements and works on different platforms. It was necessary to integrate whatever standards existed, remove some, and add others.

Pulling and pushing
Two of the factors that influence the adoption of supply-chain management techniques are called push and pull. Pull factors include customers' expectations, communications with suppliers, and strategic partnering. Push factors are the integration of processes at all ASE facilities and the internal drive to implement e-business processes.

Customers expect suppliers to make it easier to load customer orders and manage inventory, so that they can focus on building better products and bringing them to market faster. Customers also expect suppliers to be able to provide information in their own (i.e., the customers') databases, vs. having to accommodate the suppliers' system.

Many of ASE's customers have programs to verify and update the information on the systems. In turn, ASE is expected to synchronize the provision of information to these customers. They want to know when their wafer probe will be completed, what will be done to rectify failures, when the wafers will be diced and the die packaged before undergoing final testing, and when the package eventually will be shipped. There must be an effective system to report all this information to all customers.

Implementation
The RosettaNet manufacturing WIP Milestone Program kicked off in March. Over three months, the system was tested among ASE, TSMC, and Motorola — TSMC's customer. The teams first studied the specifications defined in the PIP's message guideline and made exchanges with customers to determine the information requirements for the WIP data. Each company's internal systems were modified to meet these requirements. Audit, control and measurement processes, as well as established troubleshooting processes were determined.

To enable the exchange of structured business information, partners ensure adherence to the RosettaNet Implementation Framework (RNIF) and RosettaNet Technical Dictionary (RNTD). For example, product and component descriptions are created to adhere to the RosettaNet Technical Dictionary. (It is fortunate that a number of ASE and TSMC's customers are already using RosettaNet standards as a common interface. This greatly shortened the time for implementation of the new platform.)

Computers, storage devices and network cards were acquired to ready the hardware infrastructure that can run applications that execute RosettaNet PIPs. ASE also installed an NT server and selected Extricity (now a part of Peregrine) as its B2B software provider. As an integrator of RosettaNet standards, Extricity supports multiple platforms and its solutions are based on industry standards.

Results

By July 2001, PIP 3D8 was successfully implemented in a live environment. The achievement was remarkable as it underscores the commitment made by each partner to realize seamless WIP communication through automation within a reasonable timeframe.

Previously, customers viewed WIP information by accessing ASE's Internet server, which is not integrated with customers' systems. Then, customers had to re-type the data manually into their systems. PIP 3D8 allows integration with customers' systems, enabling viewing and transmission of data without re-work and in real time.

The biggest benefit derived from adopting PIP 3D8 was the reduction in B2B implementation cycle time with customers to 13 days or less. With each customer, ASE typically takes about 27 days to derive specifications, format definition, code, test and validate the type data required by customers. This is because the customer will request WIP data in a variety of formats and channels. If a customer adopts RosettaNet, however, implementation would take only about 13 days, because both ASE and the customer use the standard guidelines to determine all the data formats and information exchange.

Standards-based and user-friendly procedures, such as those developed by the RosettaNet consortium, play a vital role in streamlining IC design, development and manufacturing and speeding time-to-market.

Though too early to quantify the results of implementation, it is expected that in the long term ASE and its trading partners will notice a higher level of visibility throughout the entire manufacturing chain, from wafer fabrication, wafer probing to chip packaging, testing to final shipping. Undoubtedly, planning at ASE factories will improve, as operation managers are now able to better allocate production capacities and manage material inventories with accuracy. The immediate benefit from the IT standpoint is that the system is stable and relatively easy to maintain. There are savings with respect to the dedication of IT resources, because with customers who support the RosettaNet standards, there is only one system to maintain. These attributes translate into further cost reduction and resource maximization. Automating WIP inquiries and responses in manufacturing environments using industry standards will certainly lead to greater operational visibility and result in reduced inventories and other efficiencies.

What's next?

Meanwhile, ASE is working to address the demand forecasting, order-management, shipping and logistics, and inventory reporting needs of the semiconductor manufacturing network. These efforts are expected to reduce IT and transaction costs and improve customer service. Working through RosettaNet is one way to promote B2B processes, but only through collaborating with trading partners and facilitating the adoption of open standards can the industry speed time-to-market and reduce business costs in a competitive high-tech world.

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