

Amkor achieves an industry edge by using visual, interactive analytics to significantly improve manufacturing efficiency

Semiconductor packaging leader deploys Spotfire DecisionSite® in key areas of 120,000-square-foot factory realizing significant cost savings and improved competitiveness

Business Profile

Amkor Technology, Inc. is one of the world's largest providers of advanced semiconductor assembly and test services. Its factory in Iwate, Japan is the leading source of more than 200 package formats for more than a dozen Japanese semiconductor companies.

Application Profile

Amkor's Iwate factory has deployed Spotfire DecisionSite across its inventory, manufacturing and human resources departments to improve operational decision making and factory efficiency.

Challenges

- Must find ways to continuously reduce cost to compete in highly competitive semiconductor assembly and test industry
- Market demands high operation efficiency and high quality products, while business demands material balance and high throughput
- Need to track product performance against hundreds of process, equipment, operator and material variables
- Front-line operations require higher speed and higher accuracy results than traditional industry software can provide

Solutions

- Visual, interactive analytics helps technical and business people see problems across entire workflows
- Easy-to-use software rapidly identifies root cause of assembly and test processes problems
- Accurate data on material balance and waiting/processing times improves factory productivity
- Results can be shared with customers, partners and employees in an easy-to-understand manner

Results

- Increased throughput without sacrificing quality and turnaround time
- Improved efficiency of workflow and inventory control reduces obsolete inventory 10-15% in first 3 months
- Daily process tool time reduced by 50% and required tool set reduced by more than 40% for certain key processes
- Yield problem on key product stabilized due to 50% reduction in defect density

Amkor Technology, Inc. (NASDAQ: AMKR) is one of the world's largest providers of advanced semiconductor assembly and test services. Founded in 1968, Amkor has become a strategic manufacturing partner for many of the world's leading semiconductor companies and electronics OEMs, providing its customers with a broad array of package design, assembly and test solutions.

Amkor's 120,000-square-foot factory in Kitakami, Iwate, enables Amkor to better serve Japanese semiconductor companies with quick turn-around, and high quality packaging and test services. Amkor Iwate is Japan's leading source for contract semiconductor assembly and test services, supporting Toshiba and more than a dozen other Japanese semiconductor companies.

Challenges

Semiconductor packaging is a high-volume and highly competitive business. Frequently, changes in market conditions require operating with limited human and capital resources. This dynamic makes it an absolute necessity that all key decision makers in the organization have the analytical tools they need to be effective. In addition to the market ebbs and flows, the industry experiences human resource turnover, so training and assessment of output quality from line employees is essential to ensure consistent business quality.

At its Iwate facility, Amkor manufactures a diverse product portfolio comprising more than 200 packages. Its customers also vary in terms of the priority they place on quality, turnaround time, and price.

Keeping the business running smoothly requires high performance in multiple areas – manufacturing, inventory and materials balance and human resources. Each area has individual business process constraints; at the same time they are interrelated. Amkor needed

to continuously track product performance metrics against hundreds of process, equipment, operator and material variables.

Amkor set its sights particularly on producing its broad range of packaging solutions in the shortest cycle time by minimizing the amount of tool downtime and equipment performance variations and by minimizing the use of raw materials. Amkor also sought a better way to more accurately determine how much of each raw material to keep on hand to deal with batch requirements and changing priorities.

Solutions

In 2005 Amkor Iwate looked to Spotfire and its DecisionSite visual, interactive analytics software for inventory and material/cost control, as well as to address specific back-end test and assembly problems. Today DecisionSite is applied at each critical decision point in the Amkor Iwate manufacturing material and workflows to improve analysis capability for better decision making and overall factory efficiency (see *Figure 1*).

Amkor was introduced to DecisionSite by its customer, Toshiba, which was already a Spotfire customer. Amkor quickly discovered that the software had the potential to help every engineer and manager in the enterprise make better decisions – the same technology used to do material balancing and production quality assessment could just as easily be used to analyze employee competence programs.



Figure 1: Material cost and labor cost are the two largest cost structures. DecisionSite is applied at each critical decision point of the Amkor Iwate manufacturing workflows to improve ability to make better decision making and overall factory efficiency.

Inventory and material balance control –

In a high-volume industry where companies are constantly trying to balance resources, DecisionSite makes it possible for Amkor Iwate to better optimize its supply chain and inventory of raw materials. For the first time the company has a detailed analysis of which customers are buying which array of material in what volumes – to assist it in balancing its inventory of raw materials. This enables Amkor to quickly explore material turnover rates and assess stagnant material quantities to balance excess and deficient inventory, which in turn enables it to reduce the material cost contributions to a product (see Figure 2).

Manufacturing equipment analysis –

It’s essential that Amkor Iwate closely monitor the quality of its finished packages and be able to quickly perform a statistical analysis to determine the root cause of any unsuitable product lots. Is it a process problem? Equipment malfunction? Operator error? Material defect? DecisionSite helps Amkor narrow down hundreds of possibilities to pinpoint the most likely cause and take corrective action, wasting fewer materials in the process because problems are being identified more quickly.

Visual analysis makes it easy to identify equipment performance variations that need further investigation (see Figure 3). “DecisionSite helps Amkor engineers iteratively search for relationships between poor quality material and all possible contributing factors,” observes Mitsuyuki Takahashi, Amkor Iwate Manager, Industrial Engineering Group. “Because the results are computed statistically but presented visually, our engineers can have confidence in the results and easily share them with their project teams.”

Human resources optimization – While Amkor initially implemented DecisionSite to assess and improve material balance and manufacturing quality, senior management quickly saw how the software could be used to help ensure its employees were doing their highest quality work. Using data that captures task accuracy, production capabilities and inspection statistics, DecisionSite provides visual, easy-to-interpret graphs that spot trends in inaccurate chip placement and measurement deviations to separate faulty production or metrology equipment from problems due to operators and inspectors who may need additional training (see Figure 4).

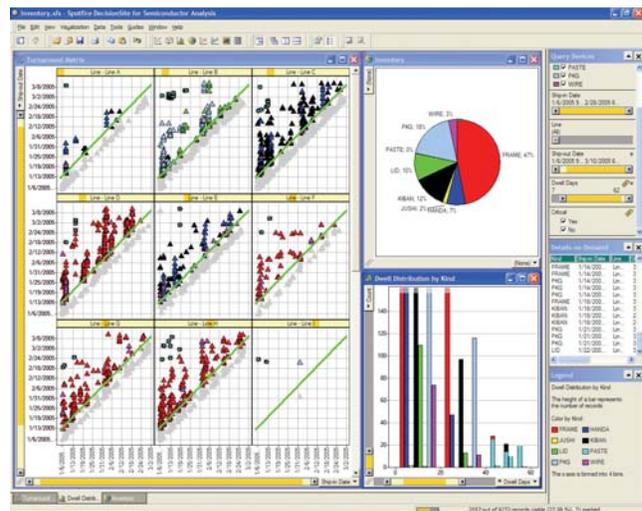
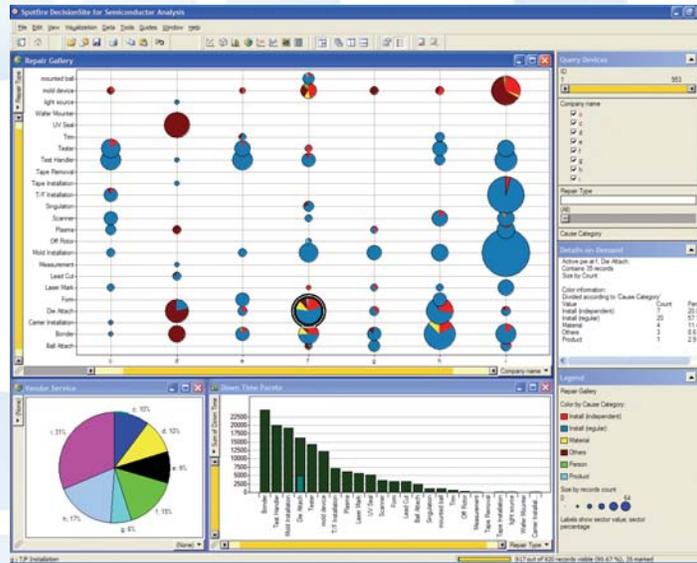


Figure 2: Scatter plot to analyze days materials stay at inventory for each product line. This trellis chart enables all product lines to be viewed at the same time, facilitating quick identification of problem areas.

Figure 3: Visualization of equipment down by vendor. Pie chart color classifies by primary tool down factor. Equipment with the highest downtime and the breakdown of the root cause is clearly identified.



IT infrastructure –

DecisionSite integrated seamlessly into Amkor Iwate’s existing IT infrastructure and data collection system and enabled the organization to have a coordinated “big picture” view of the entire materials balance and workflow process that wasn’t attainable with special purpose reporting and analysis software. “Amkor’s IT and manufacturing systems are custom designed to support our constantly changing product and technology mix,” says Kenji Abe, Amkor Iwate Department Senior Manager, ICS. “We routinely reject standalone tools that can’t adapt to how we do business. With Spotfire, we can build the analysis power and flexibility our users demand directly into our deployed infrastructure.”

Results

Amkor Iwate now has unprecedented visibility into and a better understanding of its most important business challenges. DecisionSite’s real-time analysis and high accuracy results augment the knowledge of front-line managers enabling them to attack critical business issues and make informed decisions to improve overall manufacturing efficiency.

DecisionSite’s highly visual, real-time analysis of data empowers decision makers in key areas of the company to take action quickly, as well as to share the compelling results with all constituents – customers, partners and employees. Spotfire’s technology has become the critical factor in an initiative started in 2005 to reduce cost and double profit.

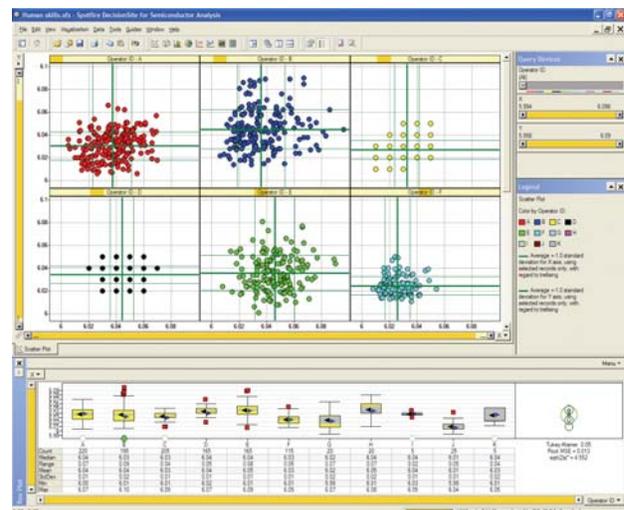


Figure 4: Interactive visualization of measurement repeatability by multiple factors helps distinguish operator accuracy versus measurement tool and process variability.

“Amkor wins and keeps loyal customers because we work smarter and more efficiently than our competitors...Spotfire gives us a big advantage because it helps us solve problems faster in so many technical and business areas.”

– Naohiko Urasaki
Amkor Iwate President

Amkor Iwate has realized improved competitiveness as a result of deploying DecisionSite that includes:

- Improved efficiency of workflow and inventory control resulting in 10-15% reduction in loss due to obsolete inventory
- Reduction in the total process tool time per day by 50% and the number of tools required by greater than 40% for certain processes and products
- Ability to pinpoint yield problems on a key product resulting in a 50% reduction in defect density
- Improved training and defect specification after DecisionSite analysis discovered two operators showing trends of routinely rejecting more wafers and have higher defect counts than other operators

“Amkor wins and keeps loyal customers because we work smarter and more efficiently than our competitors,” concludes Naohiko Urasaki, Amkor Iwate President. “Spotfire gives us a big advantage because it helps us solve problems faster in so many technical and business areas.” Based on the success of this deployment, Amkor plans to continue to expand and deploy DecisionSite to other departments in the organization including labor planning and control and financial analysis.

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About Spotfire

For thousands of business users faced with day-to-day decisions, Spotfire analytics offers the platinum user experience for visually interacting with information. Distinguished by its intuitive ease and analytic power, Spotfire software rapidly reveals unseen threats and illuminates new opportunities, creating unprecedented economic value. Spotfire's customers include industry leaders among the Global 2000 that have deployed Spotfire analytics to gain an information advantage over their competitors. For more information, visit <http://www.spotfire.com>.