Tecnomatix for the electronics industry
Manufacturing process management solutions for global electronics manufacturing

Tecnomatix® software from Siemens PLM Software delivers speed, flexibility and quality throughout the extended enterprise.

Siemens PLM Software
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Why you need digital manufacturing
A company’s biggest cost center—and that of its supply chain—is manufacturing operations. Your product’s competitive advantage is squandered when delays and cost overruns result from inefficient, expensive and unpredictable manufacturing processes. The economic success of innovative product designs hinges on the performance of your manufacturing operations.

Digital manufacturing is a combination of open software and manufacturing methods that transforms production processes and business initiatives. It provides a solution covering all manufacturing disciplines including manufacturing process design, process simulation/engineering and production execution. By doing so, digital manufacturing results in companies getting not only much more from their production operations, but also more from product design investments and supply chain partnerships.

Digital manufacturing is an essential component of PLM initiatives because it closes the gap between product design and product delivery by managing both the design and execution of manufacturing processes. For example, digital manufacturing allows manufacturing process planners to work in concert with product designers for truly transformational product development improvements and supply chain advantage.

Helping global electronics manufacturers bring products to market faster
Electronics manufacturers must bring cost-effective products to market faster than ever while meeting a variety of challenges, including the introduction of large numbers of new products in record time; manufacturing a growing mix of complex products; meeting customer and regulatory demands like traceability and lead-free manufacturing; and introducing new technologies, such as components, software, equipment or processes.

Beyond these day-to-day manufacturing challenges, global electronics manufacturers face the challenge of acquiring new facilities; selecting the right equipment; balancing workloads between factories; managing inventory and quality on a global scale; and managing the outsourcing business process.

Manufacturing process management for electronics = NPI + execution
Tecnomatix software for Electronics from Siemens addresses these critical issues, by providing the most commonly used manufacturing process management (MPM) solutions for designing, managing and integrating the new product introduction (NPI) process, production execution on the shop floor and the outsourcing business process at the single plant, corporation and extended enterprise levels.

Manufacturers worldwide are using this complete, end-to-end manufacturing solution to design, optimize and execute board and box-level production processes. Tecnomatix solutions help electronics manufacturers introduce new products faster by more easily programming and optimizing the widest variety of assembly machines and test equipment in low- and high-mix scenarios, logging defects in the repair process and managing all aspects of manufacturing execution, from material management to machine monitoring and quality management to full product and process traceability.

MPM is a technology-enabled business strategy that connects the NPI and production processes by determining digitally “how” a product will be manufactured; evaluating how well the planned process will work and optimizing it; managing the execution of the planned processes; and providing feedback and process visibility across the manufacturing chain.

In short, MPM is the how: how to design a process and how to execute its manufacture.
The most commonly used PCB NPI solution in the industry: Tecnomatix PCB Assembly and Test is the only integrated set of solutions covering the entire NPI suite of activities, providing unique support for continuous improvement of NPI processes through process automation. The PCB Assembly and Test system provides best-in-class, industry-proven solutions for optimizing SMT lines for low, medium and high volumes and mixes at the machine, line and factory level.

The leading final assembly line design solution: The Tecnomatix Box Build solution is an end-to-end methodology and integrated toolset for planning and validating box assembly lines and processes. This proven and tailored solution for electronics box assembly is intended for manufacturing engineers and industrial engineering teams at the corporate level as well as at dispersed plants, and provides an integrated toolset that increases engineering efficiencies throughout the organization.

The most comprehensive MES solution for electronics manufacturing: The Tecnomatix Electronics MES solution is the most comprehensive and mature MES solution, custom-built for the electronics industry and covering both PCB and box assembly. Primarily an out-of-the-box solution, yet extremely configurable, this web-based point-and-click software covers the entire set of electronics MES functions, including: feeder verification; material tracking and management; lead-free compliance; repair management; machine monitoring; quality management; product genealogy; and full product and process traceability.

The most innovative, end-to-end outsourced manufacturing management solution: Tecnomatix outsourced manufacturing management (OMM) is designed for OEMs using a partial or full outsourcing model for their manufacturing. It enables OEMs and suppliers (EMS/ODM/CM) to establish tight collaboration and controlled relations, making manufacturing partnerships work more efficiently and more productively by: improving financial control; significantly reducing shortages and access inventories; removing delays and reducing expedite fees; enhancing employee productivity and effectiveness; and improving quality.

Tecnomatix solutions from Siemens can help you enhance your enterprise competitiveness by allowing your extended teams to:

- Get the NPI process right the first time
- Optimize throughput even in high-mix conditions
- Cope effectively with change
- Tighten your grip on shop floor execution
- Minimize size of product recalls and internal reworks
- Analyze production information and get to the root cause of issues in real-time, helping to prevent mistakes from eroding your cost margin
- Meet ever-growing customer and regulatory demands
- Streamline the OEM-ODM/EMS/CM outsourcing business process
Siemens PLM Software’s Tecnomatix PCB Assembly and Test solution is the most commonly used NPI solution for the design and optimization of PCB assembly and test processes. By covering the entire NPI process from CAD import through manufacturing recipe generation and by supporting single-platform and mixed-vendor lines, this proven solution helps continuously improve your NPI process and maximize the uptime and throughput of your lines.

**Continuously improving the complex NPI process**
Faster time-to-volume and better NPI accuracy impacts downstream processes, from higher end-product quality to on-time delivery. Instituting a cohesive, comprehensive NPI discipline via a standard workflow, consistent knowledge capture and a standard set of tools to automate, program and optimize, provides the means to continuously improve the NPI process and is a critical component of success in this age of on-demand fulfilment. By maintaining a process database containing jobs, workflows, machine and part libraries, the PCB Assembly and Test solution enables the capture of NPI processes and allows re-use of best practices.

**Addressing the NPI complexity: covering the entire process**
Offline design of manufacturing processes starts by importing and merging CAD and BOM, which becomes the basis for the manufacturing job and is the foundation of an NPI database for future revisions and best-practice capture. Automatic upfront verification checks for correct data versions and for any discrepancies between data files. From there, the process is mapped by selecting the line or lines and associated processes, including hand insertion. Documents, in user-configurable templates, can be generated once the processes are allocated, mapped and verified. Since the documents are based on both CAD and line resources pulled from libraries, there is no room for ambiguity. And since the manufacturing job is based on upfront CAD and BOM import, any revisions in the form of an engineering change will update the entire process.

**Addressing the NPI complexity: optimizing the process**
With the NPI process mapped, powerful simulation tools enable production engineers to optimize the line performance offline and introduce optimized machine recipes for entire lines, whether they consist of single- or mixed-vendor machine platforms. If production is characterized by longer volume runs, engineers may prefer to optimize for cycle-time performance and ensure maximum machine throughput. If production is characterized by frequent product changeovers or high product mix, then optimization for common setup is a more desirable strategy for minimizing machine downtime. Whichever strategy is selected, optimization for high mix or high volume, Siemens has developed comprehensive optimizers based on parametric algorithms and machine kinematics which can perform multiple iterations in minutes and base optimization on very specific machine behavior.
**Addressing the NPI complexity: integrating Assembly and Test**

Effective test engineering can positively impact both product and process quality by upfront capture of test issues that might compromise quality and by ensuring appropriate test coverage that will eliminate false alarms and process bottlenecks at testing stations. Siemens offers its Assembly and Test users an integrated solution that imports and verifies the manufacturing job just once, but is used for both assembly and test processes. Any updates in the form of engineering changes will correct the manufacturing database for both assembly and test organizations.

More than 3,000 manufacturing sites around the world use Tecnomatix Assembly and Test solutions to manage and accelerate NPI.

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**Key benefits of Tecnomatix solutions for PCB Assembly and Test**

- Reduce change-over time as much as 75 percent by clustering boards and optimizing processes
- Increase line throughput by up to 20 percent
- Program all of your SMT machines and lines with a single programming solution
- Achieve test engineering gains of up to 20 times faster on dense SMT boards
- Create an environment with the tools and methodology for continuous improvement

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**Process optimization**

Deploy optimization strategies that meet business requirements. Optimize for increased cycle-time throughput during longer production runs, or optimize for common setup during frequent product changeovers or when running product families on a single line.

**Test engineering**

Complete test engineering solution with upfront testability checks and reporting, as well as automated fixture fabrication, including nail selection to increase test coverage and tester programming for the most common platforms of ICT, AOI, inspect and flying probe equipment.

**Shop floor documentation**

Generate complete sets of shop floor documentation and assembly instructions including process setup and hand-insert instructions. Import a variety of picture and drawing files to create unambiguous instructions. All change order introductions are updated automatically.

**Viewing and distribution**

Use powerful viewers to query manufacturing jobs and facilitate collaboration among different groups in the manufacturing organization. Viewers may also be used to distribute electronic documents to specific stations on the shop floor for paperless distribution of work instructions.
The box-build process design solution

Box-build process design
Tecnomatix eM-Box Build is an end-to-end solution for designing, optimizing and validating electronic box-build NPI processes and transferring them to volume-manufacturing plants. Its process-oriented environment allows OEMs, CMs and EMS providers to collaborate on the development of manufacturing processes and is a major facilitator for outsourcing.

Starting the NPI process
Tecnomatix provides a powerful 3D environment to create and analyze a box-build assembly sequence based on 3D MCAD data. Product design errors can be discovered early, when problems are cheaper and quicker to fix. This process also verifies that the BOM and CAD data match. The output is a valid sequence of assembly or the initial sequence of operations.

Planning an assembly process
eM-Box Build tools and methodologies are used to plan assembly processes by means of an electronic bill of processes, or eBOP.

The eBOP contains all the information about your various processes, manufacturing resources and products, as well as the relationships among them. eM-Box Build allows you to plan facility layouts in a CAD-embedded environment, estimate assembly times based on time and motion standards of your choice, balance the lines, evaluate costs and carry out variant and change management.

Optimizing, detailing and validating the process
Discrete event simulation – where the simulation model is automatically created from the process plan – allows you to validate and optimize line performance, including throughput, bottlenecks, resource utilization and buffer sizing. These models facilitate the evaluation of different manufacturing scenarios and maximize their throughput potential. The eM-Box Build 3D environment is used for detailing manufacturing cells and lines and performing human simulation, including ergonomics analysis.

Assembly sequence verification and BOM checking
Define the assembly sequence and verify product assemble-ability. Check BOM completeness.

Process planning
Allocate parts and operations to assembly stations. Estimate cost of the manufacturing process.

Time estimation
Estimate and allocate assembly operation times using any time and motion standard or your own in-house tables.
Delivering process information to the shop floor
The solution automatically generates electronic work instructions, including text, pictures (real or virtual), drawings, animations and movies in the template of your choice. Based on information from the manufacturing database, these work instructions can be updated at the push of a button when changes are made to product parts, resources or operations. Moreover, because they are created from animations, they do not require the actual physical prototype. Work instructions can be published and distributed either in hard copy format or over the Intranet to monitors on the shop floor.

Transferring processes from NPI centers to mass-production plants
The eBOP includes all of the data required to build a product. By enabling the sending of the eBOP from the NPI center to mass-production plants, eM-Box Build reduces the time it takes to transfer processes to volume manufacturing facilities, thereby accelerating demand fulfillment. This time savings applies to both the number of engineering hours required and the duration of the processes.

Facilitating outsourcing and collaboration
Tecnomatix eM-Box Build allows for the distribution and sharing of manufacturing data over the Internet – a major facilitator for collaboration among OEMs, CEMs and EMS providers. Once a process is captured in the form of an eBOP, it becomes the basic token of information and is exchangeable among participants throughout the extended product and process designing organization. The consistency of creating and capturing the process means that anyone looking at the eBOP can easily understand the process design.

Tecnomatix eM-Box Build enhances enterprise competitiveness by:
- Enabling “plan anywhere, build anywhere” strategies
- Facilitating outsourcing
- Cutting process ramp-up and transfer times by up to 50 percent
- Reducing NPI duration by up to 20-30 percent
- Shortening the time to create electronic work instructions by as much as 50 percent
- Reducing time to update and maintain work instructions by up to 80 percent

Cell and line layout and detailed design
Lay out the assembly line in an embedded AutoCAD or Microstation environment. Detail and analyze the line in 3D, including human simulation and ergonomic analysis.

Electronic work instructions and reporting
Create web-based electronic work instructions and manufacturing process-related reports, including text, pictures and 3D MCAD-based animations.

Process transfer and collaboration
Allow insight to processes as they are created. Share eBOPs throughout the extended enterprise.

Line balancing and performance analysis
Balance lines and analyze line performance to optimize throughput, size buffers and relieve bottlenecks.
eM-Execution is the Tecnomatix electronics manufacturing execution system (MES) custom-designed for PCB and box assembly manufacturers. Provided in modules or as an entire integrated suite, eM-Execution covers the entire range of requirements for electronics production management, including traceability and RoHS-compliance support. It is a web-based solution that provides visibility to key performance indicators (KPIs) for real-time control of manufacturing processes at the plant or across an enterprise.

Managing the shop floor: instilling process discipline
Electronics manufacturing has become more challenging than ever – with shorter product lifecycles, more complex product mixes and increased regulatory and OEM customer requirements. Manufacturers need to instill a level of discipline on their shop floor to ensure that cost and delivery targets are met consistently. Enforcing discipline through documented procedures and periodic audits has already proven to be insufficient and ineffective. Tecnomatix eM-Execution provides automated shop floor management by enforcing key manufacturing rules during setup, assembly, test and repair – thus ensuring that processes are executed as planned to meet delivery and cost challenges.

Managing the shop floor: decision support that actually matters
Manual methods of data collection and quality management with standalone systems delay root-cause analysis and result in ineffective “after-the-fact” corrective action recommendations. By automating data collection from every resource on the shop floor, including direct parsing from equipment and presenting the data in an easy-to-analyze form, eM-Execution allows correction of processes before they become out of control. With expanded visibility provided by real-time collection, notifications and alarms, eM-Execution allows manufacturers to make data-driven decisions that actually make a difference.

Managing the shop floor: complete final assembly control
Manufacturers must be able to verify the build process, manage ECO implementation and deliver required work instructions for the box level just as they would at board level. With increased after-sale service requirements, along with environmental legislation, it is all the more important that all components and histories of a product build are captured and known. eM-Execution from Siemens enables manufacturers to capture and manage changes in the genealogy of a full system build and manages quality, disassembly, reconfiguration and repair throughout the product lifecycle.

Part verification system
Verify setup at kitting stations and on machines to eliminate part placement and build errors.

Material management and inventory tracking
Gain real-time visibility into actual in-plant material locations while determining which locations are dedicated to WIP. Ability to Synchronize with ERP/MRP systems to achieve more accurate material counts.

Machine performance monitoring
Aggregate machine events into logical reports, thereby allowing traceability and improved equipment utilization. Gain real-time web-based visibility with alarms when utilization threshold drops below acceptable range.
Meeting traceability requirements
Neither ERP/MRP nor disconnected shop floor systems are able to provide full traceability of the production history as required by customers and industry legislations. Tecnomatix enables you to capture every aspect of the manufacturing process, from materials to production processes, whether at the board level or the entire system build, thus providing full product and process traceability. Deploying Tecnomatix helps manufacturers to limit the scope of product recalls and reduces associated recall costs, while providing for compliance to a variety of environmental and safety regulations across all segments of the industry and thereby mitigating manufacturing liability.

Managing the shop floor with a complete and integrated solution
Standalone point solutions traditionally deployed on shop floors are inadequate for today’s manufacturing environments, due to the exponential increase in shop floor events and transactions while coping with challenging delivery and cost targets. Only an integrated set of manufacturing execution capabilities can adequately cope with today’s manufacturing realities. eM-Execution from Siemens offers manufacturers the leading manufacturing execution system, custom-built for electronics manufacturers, and integrating material, quality, and traceability solutions on a single framework.

Key benefits of the Tecnomatix MES solution:
• Win more business by complying with regulatory and traceability requirements
• Minimize size of product recalls and internal reworks
• Meet new challenges, like lead-free assembly and compliance declaration
• Analyze production information and get to the root-cause of issues in real-time
• Eliminate wrong-part placement and build-process mistakes
• Gain instant visibility to your raw material, WIP and finished goods to support your inventory reduction efforts

Supporting lead-free assembly on the shop floor
As the RoHS deadline is fast approaching, electronics manufacturers have focused their efforts on sourcing lead-free parts and solving technical process issues in order to produce compliant product. However, manufacturers are still unprepared for the range of issues that will impact manufacturing performance as the industry migrates to lead-free assembly – in terms of material handling, implementing waves of ECOs to replace tin-lead parts and anticipated quality and reliability issues. By providing a solution that eliminates part number/marking confusion, manages dual inventories (lead-based as well as lead-free), tracks ECOs, monitors and verifies processes and manages quality, Tecnomatix supports full lead-free traceability and compliance declaration.

WIP monitoring and route enforcement
Enforce board manufacturing routes and time-stamp and date-stamp every pass of a WIP station for full process traceability. WIP progress is monitored in real-time via a web browser.

Quality management
Automatically collect data from the shop floor, thereby enabling real-time monitoring of trends. Should yields drop below acceptable thresholds, system alarms and notifications are activated to enable process management. Powerful Pareto and SPC reporting allow root-cause analysis eliminating guesswork in correcting process defects.

Repair management
Perform graphical defect logging and defect location. Toggle between board and schematic for faster query. Likely root cause and suggested repair route are advised to accelerate the repair process.

Web reporting and dashboards
Leverage thin client web browsers to gain full visibility onto the shop floor or into a remote location. Enable executives to to configure a manufacturing dashboard with real-time data to make informed decisions for better production management.
Outsourced manufacturing management

Tecnomatix eM-Outsource, the Siemens outsourced manufacturing management system, is a dedicated solution for the challenging global outsourced manufacturing environment. Provided as a perpetual solution or a hosted, on-demand solution, eM-Outsource covers the entire range of functionality needed to manage the business relationship, quality and inventory. This unique event-driven solution allows you to bring back the same control levels of internal, pre-outsourced manufacturing to the distributed, global-outsourced environment, thereby ensuring on-time and on-quality deliveries.

Managing the supply network: streamline your outsourcing business process
As outsourcing becomes the mainstream, and as supply chains become more complex and span multiple time zones, the need for a structured and controlled outsourcing business process is evident. eM-Outsource introduces discipline, and streamlines and automates outsourcing business processes by replacing unstructured business practices (emails, faxes, calls, etc.) with workflow applications. These allow for standardization for data collection, rationalization and analysis, and for the raising of notifications and alarms. These business control tools eliminate delays and inefficiencies and significantly increase the responsiveness and economies of demand-to-supply networks, while reducing inventory, improving product quality and reducing returns and warranty costs.

Controlling the supply network: global monitoring and control in real time
Manual data collection results in after-the-fact, “rear-view mirror” analysis and corrective actions. Automating data collection with eM-Outsource – in near real-time – from suppliers, ERP, MES, home-grown shop floor applications, inventory and other systems, allows you to monitor and control the extended enterprise as if it were a single entity. The solution lets you make more informed, proactive and timely decisions, leading to lower costs on the one hand and more satisfied customers on the other.

Key benefits of Tecnomatix eM-Outsource include:
- Increased on-time deliveries
- Reduced inventory
- Lower expediting fees
- Increased financial visibility and control
- Enhanced employee productivity

Supply network management
Manage orders, purchasing, WIP and delivery. Includes capabilities to manage availability to promise and supply chain cycle time.

Inventory management
Provide visibility and control over finished goods as well as material/component inventories at the CM locations.

Quality management
Aggregate and analyze quality data; manage SCAR, CAPA, RMA and more.
Maximize the benefits of your Tecnomatix solution
Siemens offers customers much more than depth of expertise. We take great pride in our ability to deliver the highest level of professional services so that you can achieve maximum benefits from our Tecnomatix solutions in the shortest possible time.

Whether you face challenges at home or in a remote part of the world, Siemens has the flexibility and the people in place to respond. Our professional service experts share vast experience and business knowledge in project implementation, project design and project methodology. They are your experts in Tecnomatix MPM technology.

We are ready to help you achieve maximum impact on your business processes by providing end-to-end MPM solutions matched with consulting, development, implementation support and engineering services that fit your environment and objectives.

Prepare, predict, perform better manufacturing processes
The Siemens PLM Software professional services team can help you to:

• Maximize market potential for your products
• Optimize and manage global distributed manufacturing
• Respond quickly to new market opportunities
• Accommodate frequent changes in where and how you produce, as well as what is produced
• Deliver speed and flexibility across the extended enterprise
About Siemens PLM Software
Siemens PLM Software, a division of Siemens Automation and Drives (A&D), is a leading global provider of product lifecycle management (PLM) software and services with 4.3 million licensed seats and 47,000 customers worldwide. Headquartered in Plano, Texas, Siemens PLM Software’s open enterprise solutions enable a world where organizations and their partners collaborate through Global Innovation Networks to deliver world-class products and services. For more information on Siemens PLM Software products and services, visit www.siemens.com/plm.

Siemens PLM Software leads to greater innovation
There is no single road to innovation, but there are signs you’re headed in the right direction. Leading innovators get to market faster, manage compliance, optimize resources and achieve globalization. They’re also four times more likely to use PLM software to plan, define, build and support their products. Siemens PLM Software’s family of PLM solutions helps businesses establish Global Innovation Networks that transform their process of innovation. Drive your business to greater innovation and accelerate your growth.

BE COMPLIANT  GET OPTIMIZED  GO GLOBAL

MOVE FASTER

INNOVATE MORE

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