

# Traceability In Electronics Manufacturing

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Traceability is a challenge for manufacturers in every industry, from automotive to aerospace and from medical to food. In an era of globalisation, the ability to track an item to its source is essential for customer relationship management, maximum customer satisfaction, and for compliance to stricter consumer and environmental regulations. Siemens EDMS (Electronic Design and Manufacturing Services) is making a strategic investment in state-of-the-art product and process traceability software from UGS to minimise product recalls and returns, eliminate defects during the manufacturing process and guarantee compliance with forthcoming standards and regulations.

More than ever before electronics manufacturers are striving to maximise productivity and reduce costs. To achieve this, every step in the overall manufacturing process must be monitored and comprehensive historical records must be maintained. Manufacturing problems that affect product quality must be identified quickly and corrected before products continue down the production line.

## A total traceability solution

Working closely with Tecnomatix, a leading worldwide provider of Manufacturing Process Management (MPM) solutions and a UGS subsidiary, Siemens EDMS is committed to implementing a total traceability solution for a wide range of applications. Traceability is an essential component in the solution to a number of inter-related problems, for example:

- How can products be identified in order to reduce the number of recalls or returns when there is a product failure in the field?

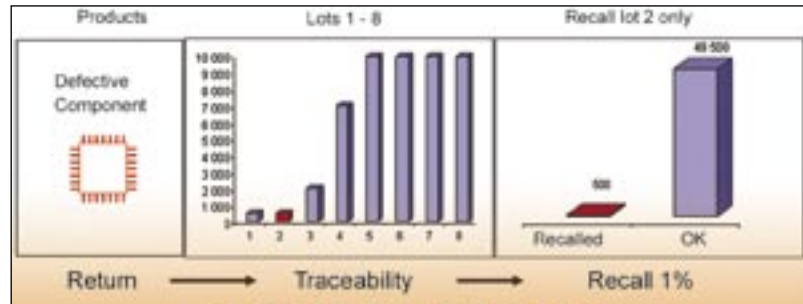


Figure 1 – Traceability: minimising recalls

- How can the number of products that are shipped with suspect or defective components, or with defects introduced during manufacturing, be minimised, in order to reduce potential returns?
- How can the current location of every board in every lot which is being manufactured be known on-line and in real time?
- How can the system prevent a board from following the wrong route?
- How can permanent visibility of what components are available for use in a manufacturing process, including components on reels, sticks and trays that have been partially used, be achieved?
- How can every final product be tracked to its final shipping destination?
- How can the system break-down the final product into a hierarchy of components, boards, software, mechanical elements, etc. and break-down the production steps into assembly, test, inspection, repair, etc.?

In addition, ISO/TS 16949 certification is a challenging but highly desirable goal which requires the ability to track products. This certification covers process ownership, process definition and linkages, process monitoring and feedback loops for process improvement, process effectiveness in meeting customer requirements, process efficiency and key performance indicators.



Figure 2 – From design, to traceability, to reports

The benefits of meeting the traceability challenge are obvious, but it is worth considering one simple example before going into more detail. Using the traceability solution that will be implemented at Siemens EDMS, it will be possible to identify a lot of bad components responsible for a failure in the field or a lot of boards responsible for a failure due to an unforeseen glitch in a particular manufacturing process step. Without traceability it might have been necessary to recall up to 50,000 products. With traceability, it might only be necessary to recall, say, 500 units or even less. This represents significant savings for manufacturers like Siemens EDMS, for its customers who are vendors of medical, automotive and other products, and for the end users of these products (Figure 1). Traceability also reduces the cost of company liability insurance.

## New Product Introduction and Manufacturing Execution Systems

The traceability solution that will be implemented at Siemens EDMS is a component of a broader Manufacturing Execution Systems (MES) solution. In addition to traceability, the MES solution includes modules for planning, material management, work in progress (WIP) tracking, performance monitoring, box build and genealogy, quality management, paperless repair and web reporting. The MES solution uses board data generated by a New Product Introduction (NPI) solution. The NPI solution imports PCB computer aided design (CAD) databases and bills of materials (BOMs), manages the parts library and approved vendor lists, generates optimised programs for assembly lines, generates test fixture designs and input lists for in-circuit and flying probe testers, and generates shop floor documentation. The NPI and MES systems manage a common database stored on the same Manufacturing Server.

Siemens EDMS have been using Tecnomatix's NPI solution for several years. This solution includes eM-Assembly Expert and eM-Test Expert. When Siemens EDMS evaluated MES solutions including the required traceability, Tecnomatix's ability to provide an integrated NPI and MES solution was one of the factors that influenced Siemens to acquire its MES modules.

A second factor was the possibility of running the integrated solution on top of either an Oracle or a Microsoft SQL Server database, a necessary feature because Siemens uses both Oracle and Microsoft SQL Server at its sites.

A third factor was Tecnomatix's partnership with Diplan for an integrated solution. Siemens' NPI solution includes a Siplace specific module from DiPlan which uses the source QD file generated by Tecnomatix's eM-Assembly Expert for Siplace lines. The company's MES solution will include software from DiPlan for collecting and generating data on material input and usage (components, boards,

reels, feeders) and monitoring machine performance (component usage and scrap). This data is accessed and used by Tecnomatix's global eM-Traceability solution.

However the critical factor that convinced Siemens to adopt the Tecnomatix solution was the company's ability to demonstrate its eM-Traceability software, integrated with its other MES modules, operating successfully at a reference site.

### Traceability

Traceability - using Tecnomatix's eM-Traceability solution - means maintaining a comprehensive relational knowledge base on every physical component, every board, every lot, and every significant operation and task that is executed in every manufacturing process at every Siemens EDMS site (Figure 2).

Order information and information on all components on all reels that are received in Siemens' factories is stored in the company's ERP system, SAP, including supplier information and component properties (for example Lead free or not).

Operator/supervisor responsibilities are defined in the planning section of the manufacturing database and manufacturing personnel are scanned in order to facilitate problem-solving when failures arise.

During box build, when a product is assembled from a set of individual boards, the main and sub-boards, mechanical components and software are all tracked. The Packaging Manager assures full traceability for all shipments.

Comprehensive web based traceability reports, accessible by anyone anywhere, can be generated in real time by component serial number, board serial number or date code. They include information on the components on

each physical board, the exact manufacturing process that the board went through (line, machines, stations, operators, etc.), the time taken to complete each process, product genealogy for assemblies including multiple boards, and a complete set of complementary information. The reports guarantee conformity to health and environmental regulations and to regulations concerning electronic signatures and records. They also provide information on the break-down of the final product into a hierarchy of components, boards, software, mechanical elements, housings, etc., and the break-down of production steps into assembly, test, inspection, repair, etc.

### Quality management and paperless repair

The Quality Manager module of the Tecnomatix MES solution, eM-Quality, manages defect diagnosis and repair. It makes it possible to correct problems upstream in the manufacturing process (Figure 3).

The quality manager includes functionality for collecting failure data from test and inspection systems automatically, identifying the causes of defects, taking corrective actions, and logging the causes and corrective actions in order to build up a database. The quality manager includes SPC (Statistical Process Control) analysis of variable and attribute data, real time alarms to stop processes that are out of control, and Pareto reports. Furthermore, traceability takes quality management into another dimension by giving access to the board manufacturing history (machines, stations, operators, components, etc.).

Figure 3 – Traceability for defects elimination and overall process improvement

