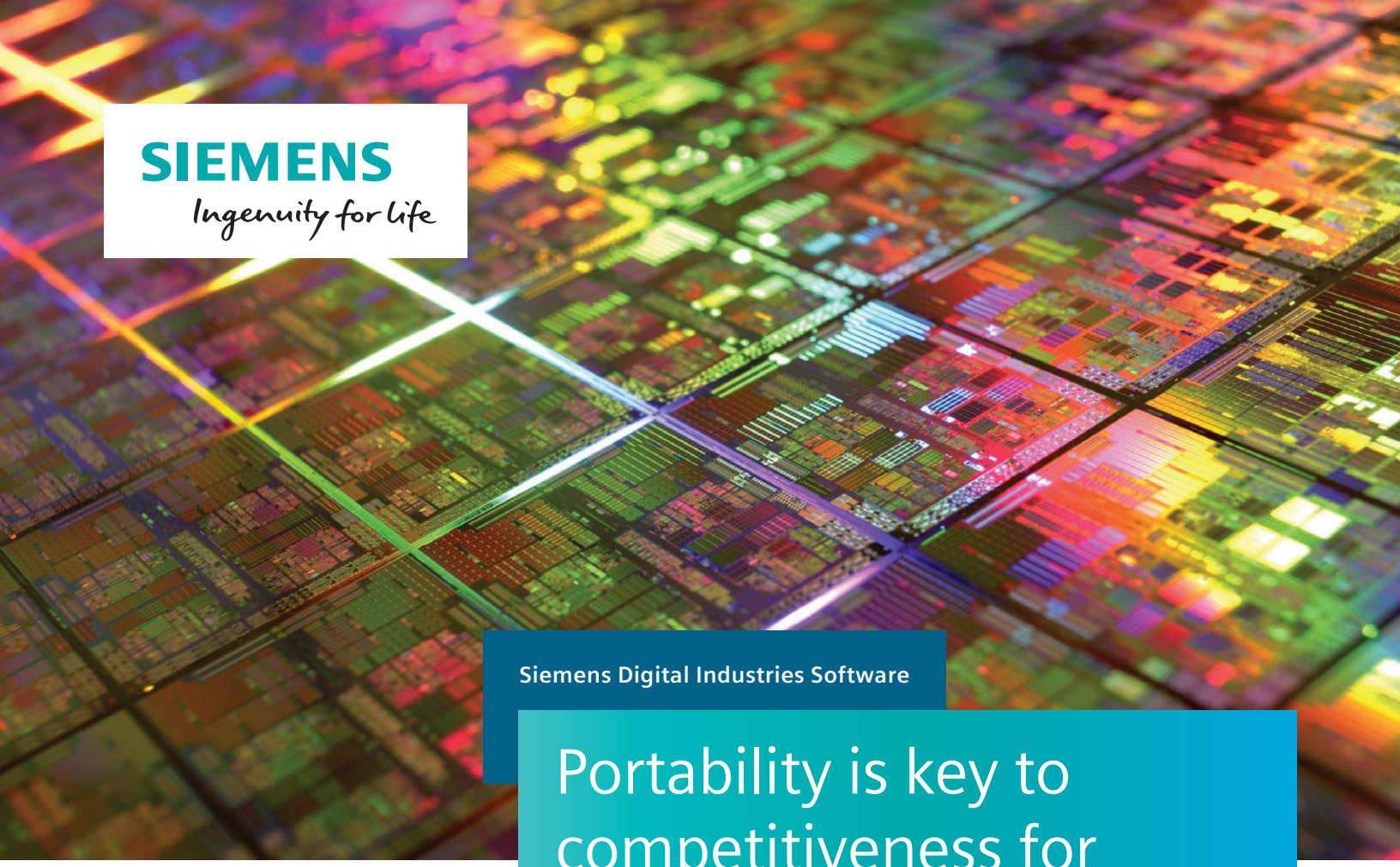

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Portability is key to competitiveness for PCB manufacturers

PCB manufacturing

Executive summary

The ability to move the manufacturing of a product from one physical location to another efficiently is critical for any PCB assembly company (figure 1). Whether your company has in-house manufacturing with several factories available or is a company that uses different equipment manufacturers to make your products, most likely one of your greatest challenges is switching product lines from one factory to another. The reasons for switching may be to reduce manufacturing costs, manufacture larger quantities, or move to a higher quality manufacturer. The challenge is the same, regardless of the reason for moving product to a new factory – how to remain efficient. You want the switch-over process to take as little time as possible, avoiding the added costs of increased time-to-market. You also want all the data to be transferred accurately, without any translation issues. Lastly, you want all the libraries to be available, without requiring any additional adjustments and adding redundant, time-consuming work.

Portability is key to competitiveness for PCB manufacturers

The challenge of moving products from one factory to another

Although many PCB assembly companies prefer to have a single supplier for their specific SMT placement needs, local sourcing and support requirements means that they are using at least two, if not three, vendors around the world to manufacture their product. Even when using a single vendor, different quality inspections (such as solder paste inspection, X-ray inspection etc.) have to be done that require the use of additional machines and often several factories.

Moving a product line from one manufacturing site involves redoing existing programs and adjusting them to the new factory, which takes time and creates higher costs. Programs that have to be redone include stencils, pick-and-place equipment programs, test programs, inspection programs, and work instructions (assembly documentation). The associated machines will also need to be adjusted, even when the two lines are located in the same factory. Machine vendors in the new line likely will be different than the machine vendors in the original line. These differences will require re-managing part and package library data to align them between the different machine vendors. Links between the part number, package type, part manufacturer, electrical part attributes and supply forms all have to be defined before decisions can be made on how to place, test or inspect the part.

Any PCB manufacturer can move the manufacturing of a product from one location to another, but the difference in competitiveness is moving product efficiently and quickly. The process includes taking the original CAD and BOM files and sending them to the new factory, which then needs to start creating the dataset into ready-to-use programs from scratch, without being able to use the work that was already done at the original site. Configurations at different locations is rarely the same, and even if they are, because of subtle machine differences, the programs need to be updated to work at the new location. And different machines complicate the process further.

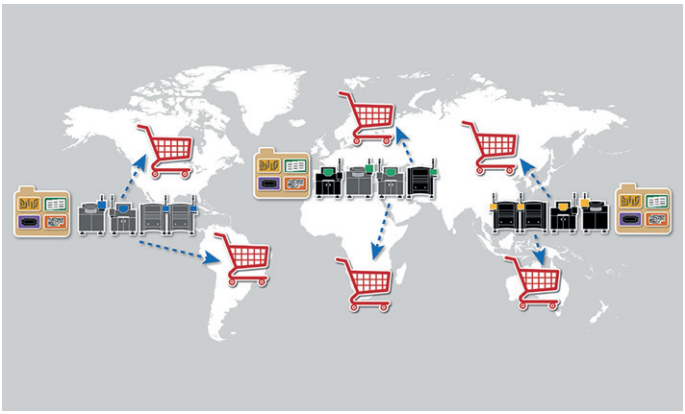

Figure 1: In today's electronics industry, a PCB assembly company needs to be able to move products between factories efficiently to be competitive.

Is there a better option?

When a product originally arrives at the first factory location, the new product introduction (NPI) phase includes the definition of all product specific data. This data includes all PCB-related information, specifically, the panel, part and package data of each component to be placed and, ultimately, how to build the product.

The Valor Process Preparation software solution includes everything needed to change the current process, while enabling full portability of products between factories and between different machine vendors. The software provides the ability to share the full product and part model data seamlessly, reducing time and effort. Also, each site maintains their process data, namely stencil guidelines, assembly machines, inspection machines, test equipment and work instructions. Once a product has been sent to another location, the data can immediately be taken by the target process definition to finalize new programs and documentation for the new environment easily and intuitively. Manufacturing data can either be transferred from one machine vendor across a company or between different vendors (for example, from Juki to Panasonic, ASM to Panasonic, or for test equipment from Teradyne to Keysight).

Achieving maximum efficiency with Valor Process Preparation

The key to efficiently moving the manufacturing of a product from one location to another is easy portability of the product data, that is, what is being manufactured, and how to build it.

Below is an example of two manufacturing lines that we can use to illustrate a workflow with the Valor Process Preparation solution.

Let's say the existing volume manufacturing occurs at a plant in China, but then a modified version needs to be built in Mexico to support the local markets. Manufacturing inside Mexico will help avoid high shipping costs and reduce drastic time-to-market that would otherwise enforce a non-realistic product cost increase.

The initial NPI phase will be performed at the original manufacturing site, in this case, China. This site will create the original project, using the source CAD files, importation of the BOM, and creation of neutralized product data that forms the basis of the project. All machines in the line will use that data throughout the manufacturing process. Any new parts needed for the product will be downloaded from the Valor Parts Library (VPL), or manually created if they are not found.

Once the BOM is merged with the project, the master part library is accessed using the part number, pulling in all the related attributes to drive the component data used by the TestStation ICT output. Attributes such as device type, value, tolerances, pin mapping, and model names are quickly and automatically merged to the project.

The VPL parts are then used to create keep-out areas for the Teradyne TestStation ICT machine. They will also be used to create neutral machine shapes which will be used to create the machine-specific shape data for the Panasonic NPM and Cyberoptics AOI outputs. Then, the test engineers can apply their testplan to determine the level of test-probe access and create output files for the ICT machine, making the entire NPI process time-efficient.

Screen-printer requirements are seamlessly applied using the stencil technology, based on the source paste data from the CAD. This creates the output stencil files for both the top and the bottom sides of the board, which can be cut by the stencil vendor without having to go back and forth to interpret the PDF guidelines that were used in the past. The stencil data is also used by the Koh Young SPI machine for paste inspection.

Next, the manufacturing site team applies their documentation template to the project to create the necessary work instructions for their site. The resulting documentation is deployed into an electronic format that is used by the station's document viewers.

Line 1 (China)	Line 2 (Mexico)
MPM screen printer	DEK screen printer
Koh Young SPI	Cyberoptics SPI
Panasonic NPM	Assembleon A-Series SMT machine
Cyberoptics AOI	Assembleon iFlex SMT machine
Teradyne TestStation ICT	Keysight (Agilent) 3070 ICT
Hand assembly	Vitrox AXI

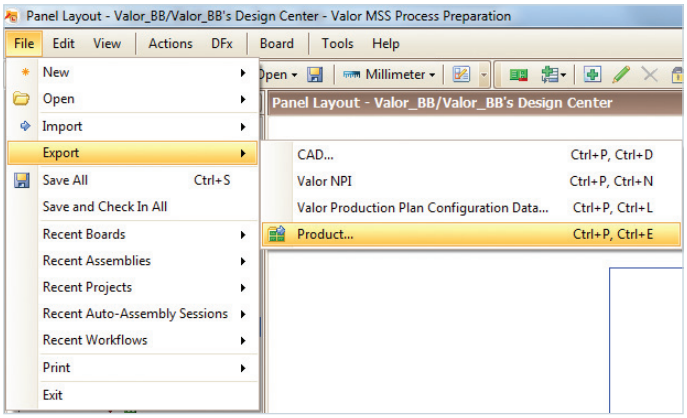

Figure 2: Valor Process Preparation lets you quickly export your project, including all PCB panel and machine neutral shape data, enabling full portability of your project between factories.

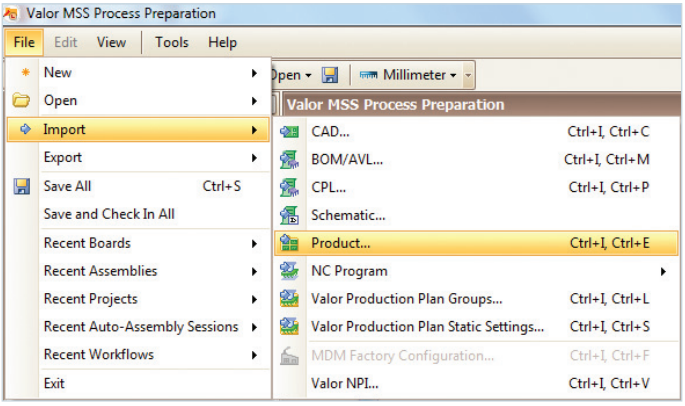

Figure 3: Quickly import the project file to efficiently begin the setup of the project in the new site.

After a few weeks of volume production in China, production can be moved to Mexico to create a variant of the original product built in China. The team at the China site easily will be able to export their project, which contains the PCB panel data and the neutral machine shape data in a single container to begin the transfer process (figure 2).

The exported project will then sent to the factory in Mexico to be imported into their database (figure 3).

Because the imported data does not contain the detailed process data and the machine parameters, minimal work is needed to resolve conflicts between the imported data and the existing library (figure 4).

Next, the site in Mexico needs to import an updated BOM for the variants. First, the team applies their specific stencil technology to create the output for the screen-printer, which will also be passed on to the Cyberoptics SPI machine for the paste inspection.

All the BOM attributes that were previously entered by the team at the Chinese site are now updated in the project for the site in Mexico. These are not machine-specific and so

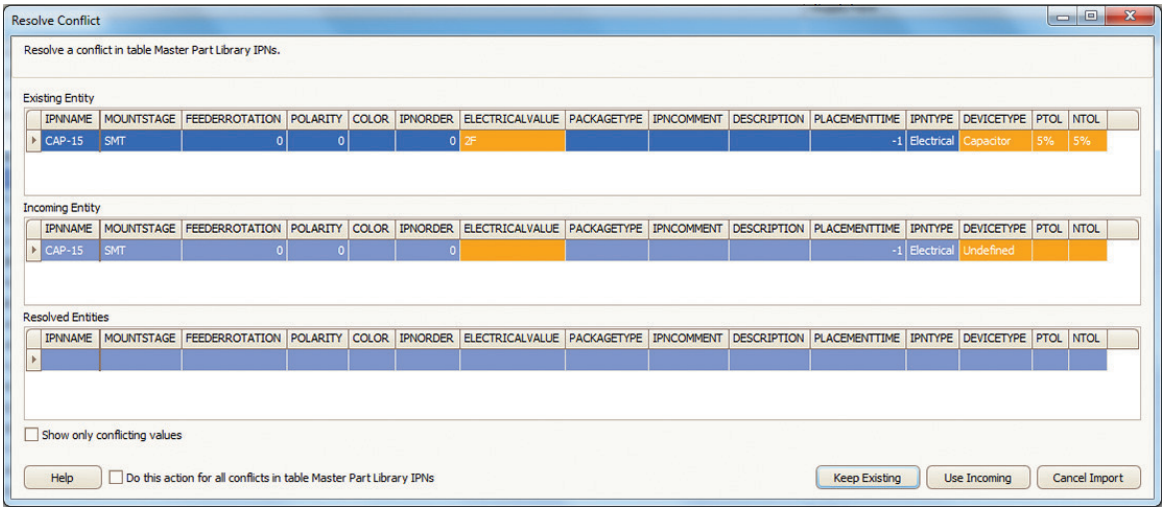

Figure 4: Minimal work might be necessary to resolve conflicts between the imported data and the existing library.

can be used by the Keysight (Agilent) 3070 ICT output as well. The team in Mexico will execute their test plan to get test-probes placed for the specific machines in the site and will then create the output files for the ICT machine.

The neutral machine shapes that were previously defined along with their supply forms are now part of the database at the new site, providing all the needed data for the automatic generation of new machine-shape data in Assembleon SMT and Vitrox AXI formats. The machine-output formats can then be quickly created to the specifications of each machine in the target line.

The team in Mexico has different documentation needs than the team in China, and therefore they have their own template. They also uses electronic documentation viewing, making sure the documentation maintains the same format.

This process will be identical with each attempt to move between manufacturing sites, enabling enhanced portability, flexibility, and efficiency in the manufacturing process.

Meeting the portability needs of high-tech manufacturing

With Valor Process Preparation, a single product model can drive all the manufacturing sites of a product worldwide. The leveraging of ODB++ to seamlessly move production between lines and factories eliminates engineering time and increases the quality of end-products. Product NPI tasks can be done once at the corporation competence centers, so that only process NPI has to be repeated at each manufacturing environment.

This portability doesn't only simplify the process of moving between sites, but also moving between different machine vendors, because sites are rarely assembled on the same lines and machines. Part libraries can be created for each machine directly from the Valor Master Parts Library, and parameters can be customized to enhance part/shape data. Native machine programs can also be imported and quickly converted into alternate machine formats for maximum flexibility, and programs can be optimized for each line.

Valor Process Preparation gives you a powerful tool to keep you up-to-speed with the changing global environment for electronic products, helping you maintain cost-effectiveness, while meeting time-to-market.

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