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Smoothing the Transition from Design to Manufacture:

Best Practices

Conquering Complexity®

In the race to bring innovative products to market, ensuring a seamless transition from design to manufacturing is critical. Yet, in today's marketplace, design and manufacturing engineers alike are faced with many new challenges.

Supply chain issues like component obsolescence, material availability and shortened lead times are some of the nuances that must be resolved early in the process in order to prevent production headaches later. With today's speed of innovation, new manufacturing processes or capabilities are required, which demand the specialized knowledge of process engineers. Future product testing requirements must also be considered, with checkpoints for product and validation testing built into the planning process.

How much energy will the product require? How much servicing will it need? Will the product be used in a harsh environment? What regulatory and product safety requirements must be met? These are just a few of the questions that design engineers must answer. As a result, including manufacturing considerations early in the design cycle has become a high-priority objective for companies seeking faster, leaner production.

Best practices for the design-to-manufacturing hand-off

It's clear to see that any disconnect in the transition from design to manufacturing can slow time to market and create the potential for costly failures and customer dissatisfaction. The following are a few ways to ensure a seamless transition:

1 MAKE SURE DESIGN DOCUMENTATION IS COMPLETE

Incomplete design documentation is often the reason that projects get off to a challenging start. A complete design should include:

- **Drawings with specifications for all components**
- **Bill of materials**
- **Layout files for circuit boards**
- **A requirements specification document that includes product requirement specifications (PRS), software requirements specifications (SRS), and user requirement specifications (USR)**
- **Regulatory approval requirements**

2 CONVERT THE DESIGN DOCUMENTATION INTO CLEAR MANUFACTURING INSTRUCTIONS

Models and drawings should be adapted into step-by-step manufacturing instructions with images, particularly for

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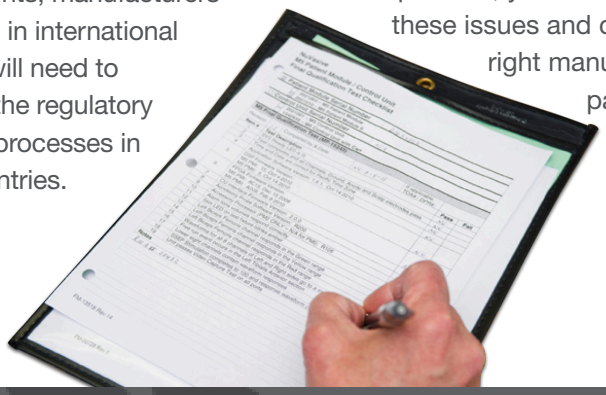
complex assemblies that can often involve thousands of steps. Every drawing should be accompanied by complete specifications. By involving manufacturing engineering early in the design process, potential obstacles can be recognized and corrected before they impact critical time-to-market deadlines.

3 CONSIDER MARKET REQUIREMENTS EARLY IN THE PROCESS

It is important to clearly define requirement specifications early in the development cycle. For example, industrial product designers need to consider the life expectancy of the end product and the environments in which it will operate.

In regulated industries such as medical device manufacturing, FDA Quality Systems Regulations for Medical Devices require that manufacturers maintain a device history record (DHR) for each device, covering the entire product lifecycle and including dates of manufacture, quantity and other details about the device. The DHR procedure should begin at the same time that manufacturing instructions are developed.

And, as more and more countries develop their own regulatory requirements, manufacturers interested in international markets will need to consider the regulatory approval processes in other countries.



4 BE PREPARED TO MEET CERTIFICATION AND THIRD-PARTY TESTING REQUIREMENTS

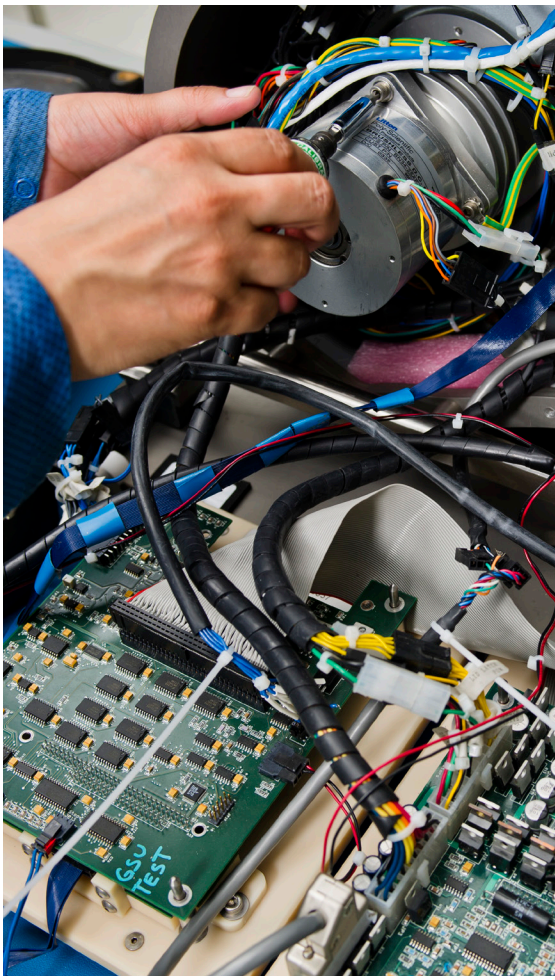
Often, environmental testing will be required to determine the need for environmental protection. This may include:

- **Product safety testing and certification — such as UL, EMC, CE and VDE testing**
- **RoHS compliance testing**
- **Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) testing — required by the European Union**
- **Functional testing for subassemblies and full device assembly**

Involving a process engineer at the design phase can be helpful in determining optimum placement for components in order to accommodate — and simplify — future testing.

5 MAKE COST-EFFECTIVE MATERIAL SOURCING DECISIONS

When design and manufacturing partners are in different geographic locations, choosing suppliers for parts — and determining their potential scalability — can quickly become contentious issues. By involving manufacturing supply chain partners early in the process, you can resolve these issues and choose the right manufacturing partner for the job ahead.



6 FACTOR IN THE COMPLEXITY OF THE ASSEMBLY PROCESS EARLY IN THE DESIGN PHASE

You may need to build in modularity to accommodate disassembly down the line. In the case of complex assemblies, cable route planning is a critical issue. And, at the design and manufacturing selection stage, it will be important to consider whether your manufacturing partner has the appropriate level of technological expertise with specifics such as lasers, optics and fluidics — to name a few.

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7 BE SURE TO CONSIDER PRODUCT PACKAGING AND LABELING

Before design begins, it is important to plan for the placement of regulatory agency requirements for serial numbers or other agency markings required to appear on the packaging for the end product.

Shipping should also be considered at this point. When the size or shape of the end product adds complexity to the shipping process, you will also need to consider planning for custom packaging.

8 CLARIFY INTELLECTUAL PROPERTY (IP) RIGHTS

IP is a critical issue in the development of any new product, especially those requiring third-party design and manufacturing. Documenting and clarifying the IP protection rights — for any contracts, trademarks, or patents on designs, processes, or technologies — of all parties involved at the early stages of the process is a critical step in order to avoid potential pitfalls.

The Process Matters

With all of these issues to consider, the value of working with a single source for design and manufacturing becomes clear. A product design partner that leverages value engineering will help you identify potential issues and suggestions early in the process, so you can avoid many of the potential issues.

Working with a single resource will also assure that consistent versions of design software *(e.g., AutoCAD, SolidWorks)* and modeling tools are used from start to finish, avoiding any compatibility issues. Working with one resource also makes it possible to complete manufacturing documentation and design at the same time, so manufacturing can hit the ground running faster, saving you time and considerable costs. A single resource also prevents any IP issues. And, of course having a single resource accountable for the entire process simplifies things considerably.

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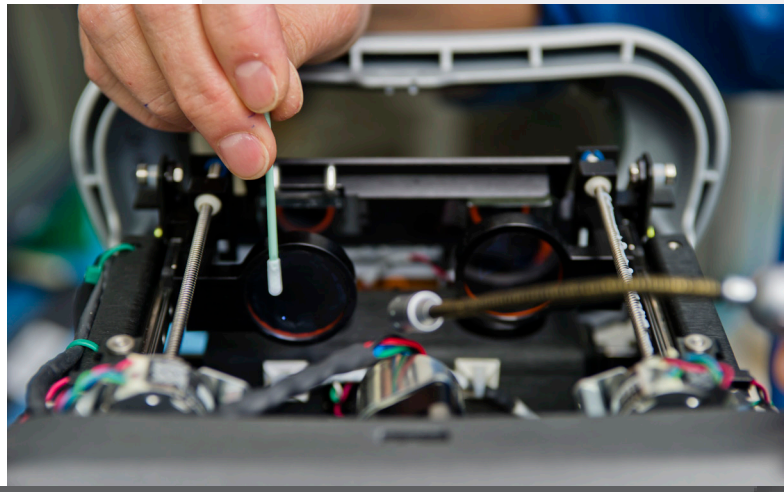
A best-in-class methodology

- ☐ We involve manufacturing engineers at the design stage to prevent supply chain issues later.
- ☐ Through in-depth discussions about process validation and test procedures and how assembly procedures will be written, we develop the most effective manufacturing documentation.
- ☐ Quality and Regulatory involvement, with checkpoints for review built into the process, are critical for success.
- ☐ State-of-the-art testing is accomplished at critical points — through automated optical inspections, functional tests, printed circuit board testing and more.
- ☐ Our Manufacturing Execution System (MES) gives our clients access to real-time status information about production.
- ☐ And we measure every action we take against the six elements of the Sparton Production System (SPS): Safety, Cost, Quality, Delivery, People, and Growth.



About Sparton Corporation

Sparton Corporation *(NYSE:SPA)*, now in its 113th year, is a provider of complex and sophisticated electromechanical devices. We use our Sparton Production System *(SPS)* to produce breakthrough products and address complex manufacturing challenges — faster and more cost effectively. We have experience in many industries, including medical and biotechnology, industrial and commercial, and military and aerospace. Headquartered in Schaumburg, IL, Sparton has design centers and manufacturing facilities worldwide. For more information, visit www.sparton.com.

SPARTON CORPORATION

425 N. Martingale Road, Suite 2050
Schaumburg, Illinois 60173
800.772.7866
www.sparton.com