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Ten ways to improve wiring harness manufacturing

Executive summary

We describe ten ways in which engineering solutions can help wiring harness manufacturers overcome some of the pressing business challenges they face. In an industry in which manual engineering methods are still largely dominant, we describe how innovative approaches can have a significant impact on reducing the harness design cycle time and cost, how to improve product and process quality, and how to reduce harness manufacturing turnaround time and costs. With thin margins coupled with large volumes, improvements to efficiency, reductions in cost and production time can have a significant impact on customer satisfaction and long-term business sustainability. Read on to see how solutions utilizing high levels of automation, data coherency and robust integrations can do just that.

Introduction

Discovering errors late in the product or manufacturing engineering process can cause timeline slippage, leading to slower turnaround for quotation and lost opportunities to bid for new business. Engineering changes are similarly treacherous. A small change to the specification of a manufacturing module or subassembly can make a big difference in the material cost, supply chain management and the efficiency of the manufacturing processes.

The prevalence of manual engineering methods in wiring harness manufacturing compounds these challenges. As harness complexity increases, these legacy methods will come under increasing strain, and

eventually may fail completely. Fortunately, a new generation of electrical systems and wiring harness engineering tools are available to help companies, large and small, as they tackle new challenges. With increased automation, these tools help engineers rapidly create drawings, calculations, work instructions and other needed documentation and outputs, leading to reductions in time to quote and superior service and responsiveness to their customers. Furthermore, these new solutions provide robust integrations with tools from other domains and parts of the engineering flow, ensuring better collaboration up and down the development cycle and reducing errors from data exchange.



Ten ways that these engineering solutions can help wiring harness manufacturers

Reduce harness design cycle time and cost

1. Automated harness engineering and validation

The creation of bill-of-materials (BOM) can be streamlined by eliminating manual processes. New tools contain automated engineering facilities that can calculate wire lengths, splice positions, taping quantities and more, and then apply appropriate wire types, multicores, terminals and other elements based on engineer-defined rules. Rule checks are then used to validate and ensure the final design meets defined best practices before the BOM is generated automatically.

2. Subassemblies streamline production design

The design of product subassemblies another manual process in traditional methods, can be frustrating and time-consuming. Today's electrical and electronic (E/E) system and wiring harness engineering solutions feature production module assignment algorithms that identify and configure manufacturing subassembly modules. These

algorithms use predefined best-practice rules and constraints to allocate production modules so they increase manufacturing efficiency and reduce cost.

Improve product and process quality

3. Controlled, automated change management

The management of engineering changes is a perpetual challenge during E/E system and wiring harness engineering. With robust data integrity and automation, modern software solutions make change management faster, easier and less error-prone. Approved design changes are integrated into existing harness designs, preserving details added at earlier design stages. Users can create multiple change policies to control how the tools respond to change and ensure that manufacturing data added to early design iterations is retained as the design matures and changes. The system will automatically assess the design change impact and provide intuitive outputs that can be used to validate the changes were implemented as expected.



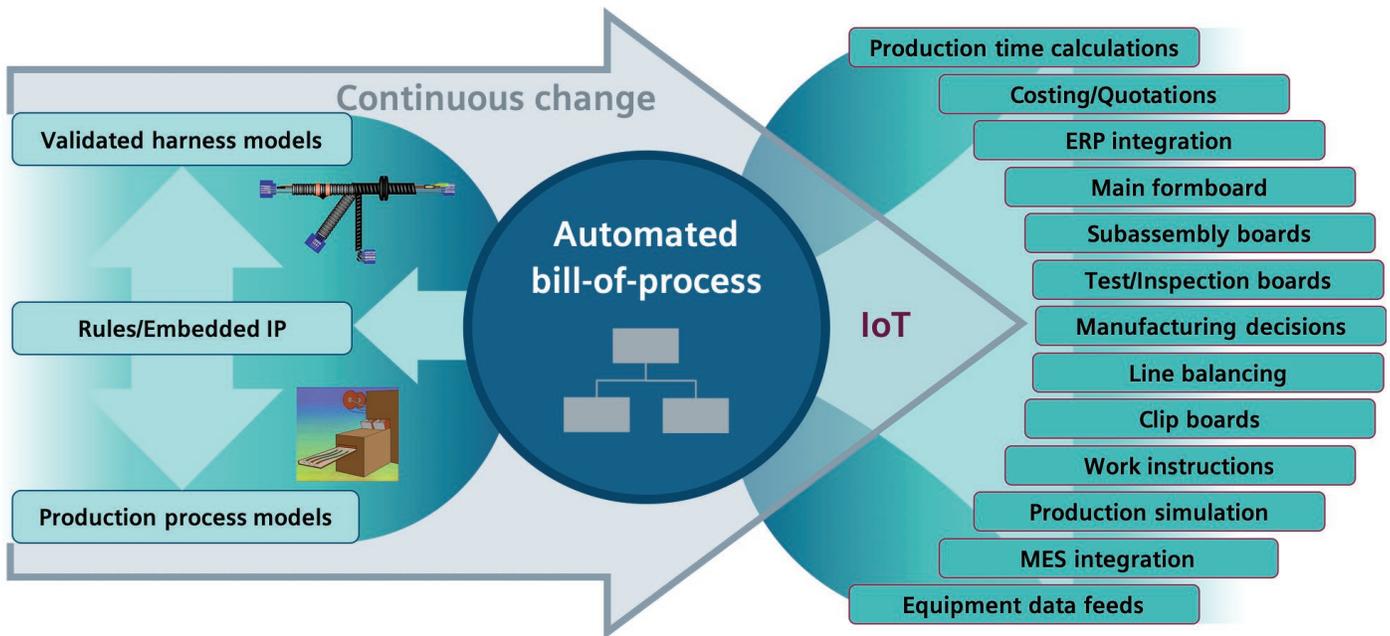


Figure 1. Digital continuity enables a high level of automation in the wiring harness manufacturing process.

4. Digital continuity design through production

Traditional E/E system and wiring harness engineering processes create silos, prevent collaboration and hinder data sharing throughout the engineering flow. The rich data model of modern solutions supports digital continuity with each design and manufacturing process (figure 1). Data from the design environment flows directly into the harness production environment with no duplicated data entry. Changes can flow automatically while powerful automation helps achieve correct-by-construction designs and manufacturing engineering outputs to production.

automation to ensure best-practice manufacturing engineering.

6. Effective formboard utilization

Effectively designed formboards enable manufacturing engineers to build production lines that are more efficient. Today's best solutions enable the creation and maintenance of merged or combined formboards, as well as the ability to split and organize formboards to show only the relevant subassemblies for a given part of the production line (figure 2). These capabilities enable the creation of efficient production lines that use existing

Reduce harness manufacturing turnaround time and costs

5. Full-scale formboard layout and fixtures

Discrepancies between design intent and physical parts can occur due to out-of-date manufacturing diagrams. These discrepancies cause increased cost due to wasted material and delay production. New solutions allow you to generate full-scale diagrams directly from the engineering environment. Engineering changes made in one diagram are automatically updated in related diagrams, eliminating a common source of error. Furthermore, fixtures and other manufacturing elements can be selected and placed interactively, or with rules-based

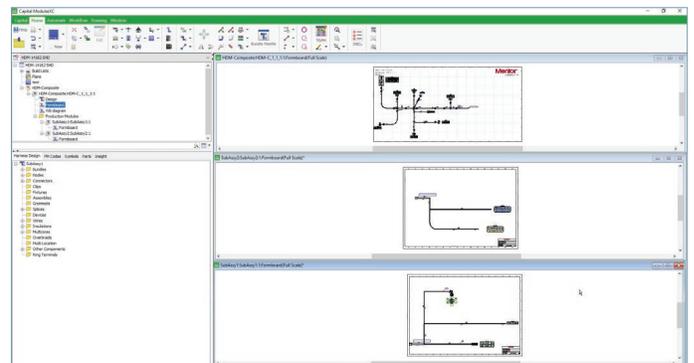


Figure 2. Modern wiring harness engineering solutions help create and maintain effective formboards to improve shop floor processes and efficiency.

Conclusion

Wiring harness manufacturers face growing challenges as harnesses become more complex and timelines accelerate. Legacy methods of harness and manufacturing engineering will prove insufficient in the future, driving harness manufacturers to evolve to meet the challenges of tomorrow. An automated and integrated E/E system and wiring harness engineering solution, featuring robust data integrity throughout the development flow, will enhance the ability of manufacturers to produce advanced wiring harnesses on increasingly tight timelines. This digital transformation is vital to grow revenues, increase profitability and ensure the future success of harness manufacturing businesses in an increasingly competitive environment.

As companies digitalize their processes, solutions that can operate in multi-domain contexts will be most beneficial. CAPITAL™ software, part of the Xcelerator portfolio from Siemens Digital Industries Software, provides a digital twin for wiring harness manufacturers that can interface with multi-domain engineering teams to enhance collaboration and success. This is where wiring harness manufacturing meets tomorrow.

Modern solutions enable today's wiring harness manufacturers to deliver and utilize:

- Complete, accurate, validated harness designs for all required configurations
- Data re-use, for example, via multiple, individually styled diagrams of the same harness model
- Best-in-class capabilities for subassembly (production module) and formboard design
- Rules-based synthesis of labor calculations and the full manufacturing bill-of-process
- Automatically generated, highly graphical work instructions for every step of the process
- Reduced response times to new or changed designs via automation and a continuous digital thread