

Improved Operational Efficiencies Drives Johnson Controls to Adopt Expedition Enterprise Flow

Johnson Controls is a global market leader in automotive systems and facilities management and control. In the automotive market, they are a major supplier of seating and interior systems, and batteries. For nonresidential facilities, they provide control systems and services including comfort, energy management and security management.

Introduction

As a world leader in the automotive and building controls industry over 120 years, Johnson Controls, Inc. has a goal of continuing to exceed its customer's expectations. To meet this goal, Johnson Controls has strived to always improve; improve its products, improve its service and improve its productivity.

Johnson Controls is a diverse company that produces a variety of products ranging from car batteries, electronics, seating and interior trim systems to heating, ventilation and fire safety equipment. All of these products consist of complex designs that demand the highest quality of tools to help build those designs. Because of the diversity of their

products, Johnson Controls doesn't just need tools to help design and engineer their products; they need a complete enterprise solution that allows them to meet their design challenges and provide quality, first-time correct designs. The solution that they selected is Mentor Graphics Expedition Enterprise flow.

Expedition Enterprise integrates and manages the system design flow, enabling seamless data transfer and improved designer productivity and performance, all while facilitating communication with the corporate enterprise. This enterprise solution leverages the supply chain, which improves library data quality and signifi-

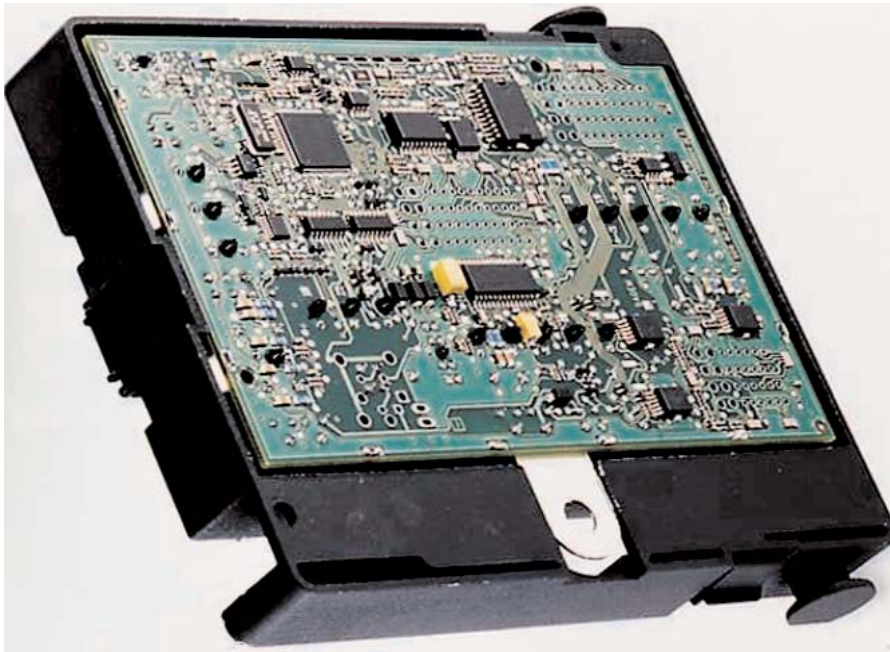
cantly reduces product costs.

Integration of FPGA and PCB design flows leverages the FPGA's I/O flexibility and addresses routing and timing challenges, while facilitating common design constraint management. This increases system quality and reliability, while improving designer productivity. Automation of the design flow improves designer productivity, while enabling customized and optimized design processes.

Johnson Controls faces many challenges as a company in the marketplace of the 21st century. They must be able to compete with other companies not just in their own country but with those in countries all over the world. This global marketplace has created business drivers that did not exist ten years ago. So companies that adapt the best and adopt enterprise design solutions are better equipped to deal with the challenges brought about by this new marketplace.

"The industry is seeing more and more electronics in cars," said Robert Jensen, director NA electronics engineering, Johnson Controls. "And those electronics are becoming more and more complex while OEM time-to-market requirements are shrinking."

"Johnson Controls needs to be prepared for that because in some cases, the complexity is going up



A printed circuit board for a body controller.

exponentially," continued Jensen. "We're talking telematics now, with Bluetooth enabled technology and real networking capabilities running all kinds of protocols. With these telematic systems and the interactivity in your car, it's a much more demanding environment where the demands for quality continue to go up."

Inter-related Initiatives

Johnson Controls' business initiatives are the drivers for their decision to use Expedition Enterprise as its global design solution. These goals and initiatives are a necessity to reach their objective of improved operational efficiency. Initiatives, such as reducing design cycle time and engineering costs while increasing design quality, can only be achieved by implementing a global enterprise design solution that covers all areas of the design process. But how they achieve those goals and initiatives is an important step.

Design Reuse & First-time Correct Designs

One of the challenges that Johnson Controls faces is the ability to reuse designs to help expedite the design process. This ability allows them to leverage the intellectual property that they have created and enables designers and engineers to create higher quality designs.

Design reuse is the key to solving other challenges that Johnson Controls faces because this ability means that designers and engineers can improve upon the

previous designs, tweaking and perfecting them so that they can move towards their goal of first-time correct designs.

"With design reuse, it's a way to leverage previous best practices and 'lessons learned' that are already incorporated into a reuse block of an existing design," Jensen stated.

"Design reuse elements need to be presented directly to the engineer at design time as well as the appropriate parameters to help them make the right decisions."

Another critical component of first-time correct designs is verification. "We have implemented stringent verification processes to ensure manufacturability and signal integrity on designs," stated Jensen.

Addressing the challenges of design reuse, increased design quality and first-time correct designs all helps address the challenge of reducing the cost of the products. This reduction in costs is actually in two different areas: operational costs and product design cycle time.

Operational Cost Reduction

The reduction in operational costs depends heavily on the ability to acquire new and improved tools. With Expedition Enterprise, Johnson Controls can take advantage of an exceptionally flexible licensing program designed to speed up the adoption and implementation of necessary tools. Mentor Graphics licensing program allows Johnson Controls to be more competitive because they can add new tools to their enterprise to address critical

emerging design technologies. The quicker new tools are implemented to address changes in the landscape, the quicker designers and engineers can work to improve the designs of their products.

"It's a true enterprise solution that we can manage globally, allowing us to have some plain old operational efficiencies, which matter to us," said Rick Sturgeon, executive director engineering systems and PBU IT, Johnson Controls. "Instead of three systems in three locations, its one system in one location with one administrator focused on maintaining the tools and processes."

"Everything revolves around data management; our components are in there, design elements get managed in there, it provides the direct interface to the user and it truly is a global environment."

Design Cycle Time Reduction

A benefit for Johnson Controls of implementing Expedition Enterprise as a complete solution is the reduction in design cycle time. With the ability of designers and engineers to reuse designs and take advantage of Expedition Enterprise's simulation and verification tools, Johnson Controls can experience more first-time correct designs and in turn, eliminate costly design respins and design iterations.

"Expedition Enterprise provides an interface that is available to engineers at their desktops when they are making design decisions," said Sturgeon. "It also provides a consistent look and feel on how the infor-

mation is presented that improves productivity thus reducing design cycle time. It also serves as a catalyst for driving our common processes and formats across the globe."

"We employ a 'follow the sun' design process that efficiently leverages our global resources to significantly shorten our design time. Expedition Enterprise's ability to facilitate central library management, as well as design data transfer, is the key to this initiative."

Operational Efficiencies

Johnson Controls is confident that the acquisition of the Expedition Enterprise flow will help them achieve business best practices while understanding that it's a continual process of improvement. Expedition Enterprise is the tool that they will use to measure whether they are successful or not.

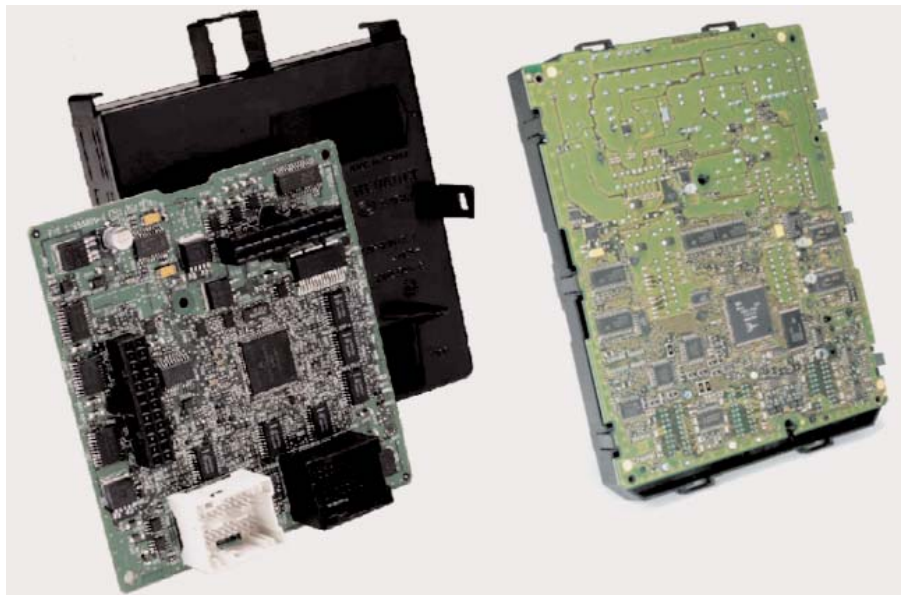
"What we do is profile and measure out standard practices, then we use those measures to see who is best and finally deploy," stated Sturgeon. "Afterward, we do a continual improvement effort where we see what we can improve upon. This initiative is important so we can always understand which content actually ends up in a partic-

ular final design because we have metrics to track our percent of reuse. Expedition Enterprise provides a single stop shop to pull those metrics out."

In the end, Johnson Controls had to determine the best way to develop the capabilities necessary to best serve their customers. The need to find an enterprise solution that would allow them to design a product, design it once, design it right and design it on a global basis lead them to choose the Expedition Enterprise flow from Mentor Graphics. Expedition Enterprise possesses the ability to:

- Create library elements in a single design environment
- Manage library and design data

- Provide common rule definition and verification
- Utilize a powerful hierarchy to capture large designs
- Simulate analog, digital and mixed signal circuit
- Develop integrated FPGA/PCB designs
- Verify the integrity of synchronous and asynchronous signals
- Place and route complex PCBs in a single design environment
- Optimize team resources through simultaneous design
- Run fabrication checks and facilitate fixes in a single design environment



For more information, contact 1-800-547-3000 (503-685-8000) or visit us on the web at www.mentor.com

Copyright ' 2005 Mentor Graphics Corporation.
Mentor Graphics is a registered trademark and Expedition are trademarks of Mentor Graphics Corporation.
All other trademarks mentioned in this document are trademarks of their respective owners.

Corporate Headquarters
Mentor Graphics Corporation
8005 SW Boeckman Road
Wilsonville, OR 97070-7777
Phone: 503-685-7000

Sales and Product Information
Phone: 800-547-3000
503-685-8000

Silicon Valley Headquarters
Mentor Graphics Corporation
1001 Ridder Park Drive
San Jose, CA 95131 USA
Phone: 408-436-1500
Fax: 408-436-1501

North American Support Center
Phone: 800-547-4303

Europe Headquarters
Mentor Graphics Corporation
Immeuble le Pasteur
13/15, rue Jeanne Braconnier
92360 Meudon La Forêt
France
Phone: 33 (0) 1-40-94-74-74
Fax: 33 (0) 1-46-01-91-73

Pacific Rim Headquarters
Mentor Graphics (Taiwan)
Room 1603, 16F
International Trade Building
No. 333, Section 1, Keelung Road
Taipei, Taiwan, ROC
Phone: 886-2-87252000
Fax: 886-2-27576027

Japan Headquarters
Mentor Graphics Japan Co., Ltd.
Gotenyama Hills
7-35, Kita-Shinagawa 4-chome
Shinagawa-Ku, Tokyo 140
Japan
Phone: 81-3-5488-3030
Fax: 81-3-5488-3021

Mentor Graphics



Printed on Recycled Paper

JC-09-05

1024260-w