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## Johnson Controls Achieves Zero Shipping Errors with InduSoft Web Studio Software

### *...CE 3.0-based Software Keeps Seats Flowing to GM...*

Johnson Controls, the largest division of Johnson Controls, Inc., is the world's leading supplier of automotive interior systems. As the manufacturer and supplier of automotive interior products for General Motors trucks, Johnson Controls' Ossian facility ships seats to GM's Truck and Bus plant in Fort Wayne, Indiana. The correct time, location, and sequence of each delivery are dictated by strict GM requirements.

### **The Challenge**

Meeting GM's stringent requirements had become difficult due to the unpredictable element of human error in the current inventory control and shipping system. Human operators would often store seats in the wrong location and, when staging a shipment, would load seats out of sequence. In addition, parts inventories were frequently inaccurate, causing operators to recount inventory by hand.

Johnson Controls turned to Flexware Integration (Noblesville, IN) for assistance. The goal was to eliminate the element of costly human error in the storage and shipment of seats. Flexware responded with the design of an automated storage and shipping system that required limited user input and was based on Xycom computers, InduSoft software, and wireless communications.

### **Trouble-Shooting A Time-Sensitive Process**

When a newly built truck enters GM's paint area, the GM computer calls in an order to Johnson Controls for compatible seats. Orders for seats arrive at Johnson Controls via a direct, electronic just-in-time feed from GM. Johnson Control operators retrieve the correct seats and shuttle them through a staging area and into a shipping trailer. Each pallet holds the seats for one truck. The pallets are brought to the shipping area and placed on the truck in the GM-specified sequence. Upon arrival at the GM plant, the pallets are unloaded in reverse order and positioned to meet trucks as they come down the assembly line.

As trucks leave the paint area and enter final assembly, GM expects seats of the specified style, color, and fabric to be readily available for installation. Just 168 minutes elapse between the called order to Johnson Controls and the time the seats are due at the customer's plant. If any seat is incorrect, GM ships the pallet back to Johnson Controls. Because GM does not want any trucks on the assembly line held up for parts, Johnson Controls must immediately send the replacement seats on the next shipment.

### **Error-Free Solution**

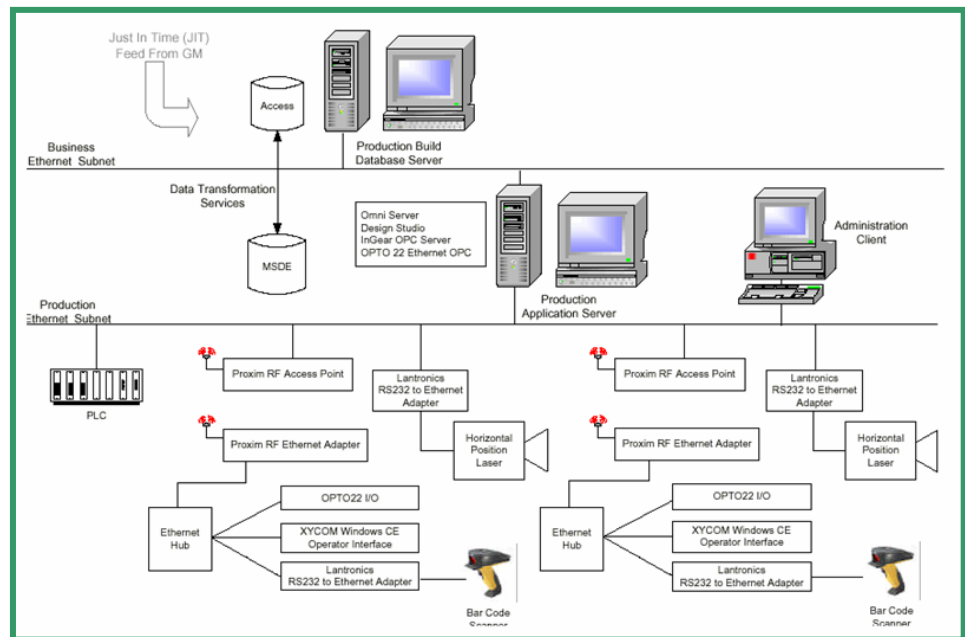
In order to address these time-critical, costly errors, Flexware created a new storage and shipping system using the original legacy inventory control software to track orders, supplemented by a Microsoft SQL database. The InduSoft Web Studio application reads an incoming order from the legacy system, locates the appropriate seats in the electronic inventory system, and sends the location of the pallet to the Web Studio client application (running on the forklift's CE computer).

The software instructs the forklift driver to retrieve a pallet from a specific location in the warehouse. It then monitors the forklift's position in the warehouse and directs the operator to the correct location based on laser positioning. The forklift operator scans the pallet with a bar code reader to verify retrieval of the correct seats, and the InduSoft application indexes the staging system, directs the operator to deposit the pallet on the correct staging conveyor, then removes the seats from inventory. After the operator unloads the pallet, the system issues an order to pick up another pallet. This process continues until the system accumulates enough for a truck load. On average, the system loads a truck every 20 minutes.

InduSoft eliminates storage, retrieval, and loading errors by controlling and recording inventory storage. When a seat reaches the end of the Johnson Controls assembly line, it is scanned and entered in the inventory system, then released to the InduSoft system for storage. A forklift picks up the pallet from the assembly line and the operator scans its bar code. When the forklift arrives at the storage location, the operator triggers a laser-positioning device that identifies the exact X,Y warehouse location, with a positioning accuracy of one millimeter. The storage system also dictates FIFO (first in, first out), keeping product current, enabling quality record retention, and avoiding excess dirt and dust in storage. When the forklift retrieves the pallet in the future, the InduSoft system will check this location to be sure the correct pallet is being loaded.

### Software and Hardware

The Flexware/ InduSoft system relies on a dedicated ethernet segment which includes Proxim wireless devices (**Figure. 1**). The InduSoft Web Studio server, running on a desktop PC, has access to both the business ethernet and the production ethernet networks. It retrieves orders from the legacy system via the business ethernet, and sends them to InduSoft Web Studio client applications on the forklifts.



**Figure 1. Johnson Controls network architecture.**

Each forklift has its own local area network (LAN). Connected to the hub is Opto 22 I/O, a Xycom 3406 computer running InduSoft Web Studio software, and a Sick optics bar code reader. An INGEAR OPC server is connected to Allen Bradley PLC and an Omniserver OPC server communicates with the scanners and laser devices. Flexware authored all the software for this system using a combination of Microsoft VisualBasic and InduSoft Web Studio.

A key element to the entire system's success is the Xycom 3406 industrial computer, which rides on the forklift trucks and survives the rigors of a plant floor environment. Finding Windows CE software to run on the Xycom system was a challenge. After searching all the available software packages, Flexware found that InduSoft Web Studio software was the only CE-based software package that had all the necessary functionality. "We did a competitive analysis on all the available software, and InduSoft Web Studio was the only product on the market that could do the job," adds Rod Doolittle, lead project engineer.

"We developed this application without direct help from InduSoft, up to the final phase of the project when InduSoft helped us out with final testing and modifications," says Doolittle. "Their service was outstanding during development—we could send questions to them via e-mail, and get answers by phone or e-mail within hours."

### **Success**

Because the Flexware/InduSoft system does not build a better product or improve product quality, it is difficult to quantify the exact savings Johnson Controls has experienced. But success has been tangible and measurable. Prior to system installation, Johnson Controls' Ossian facility was shipping incorrect seats at a rate of 300 parts per million. In the nine months since the system was installed, there have been zero shipping errors.

Johnson Controls no longer requires rushed, added shipments to correct shipping errors, and staffing can be scaled back without the need for manual checking and rechecking of order accuracy. The system has eliminated the element of human error and the economies of time and money have been meaningful and comprehensive.