Case Study: Grupo Antolin

Grupo Antolin Gains Control of its Headliner Assembly Processes; Connect, Inc. Develops Comprehensive Solution Using SNAP Ethernet I/O™ Technology

The Challenge: Data Management and Device Control while Adhering to Assembly Standards

Grupo Antolin is a leader in the design and production of a wide range of products for the automobile industry. The company has developed integrated, modular systems for designing and manufacturing automobile headliners (interior ceilings), doors, and seats. With roots dating back to the 1950s, the company has expanded globally to its current presence in 15 countries throughout Europe, Asia, Africa, and the Americas.

Grupo Antolin's headliner manufacturing facility, located in Hopkinsville, KY, produces over 2,000,000 automobile headliners annually. These headliners are manufactured for vehicles like the Ford Explorer and Expedition, Ford Ranger and F-250, Lincoln Navigator, Mercury Mountaineer, Chevrolet S-10, Pontiac Sunfire, and Chevrolet Cavalier.

In most cases, Grupo Antolin must supply the headliners needed for each automobile in precisely the order the vehicles will go down the assembly line at the manufacturer's assembly plant. This standard is known as In-Line Vehicle Sequencing (ILVS). Accurate ILVS is critical to production in the automotive industry, and incorrect sequencing could shut down a production line and cost the manufacturer millions of dollars in down time.

To maintain its ILVS standard, Grupo Antolin developed a rapid assembly process for production of its headliners, which dictates that all accessories needed for installation on the vehicle's ceiling be included on the ceiling substrate, a flat, rectangular sheet of fabric with a specially designed foam backing. This system streamlines headliner assembly to one single operation on the factory floor, and reduces both the time and cost of production.

To develop and improve this advanced manufacturing process while simultaneously meeting its increased production demands, Grupo Antolin utilizes sophisticated technology including robotics, scanners, "pick-to-light" bins, bar coding, and inventory controls to manufacture and ship these headliners to assembly plants across the US.

For their headliner assembly operations, Grupo Antolin called on Connect, Inc. to provide a solution for its data collection and discrete manufacturing application needs. Connect specializes in connectivity tools for wired and wireless device control, data collection applications using radio frequency terminals and Ethernet I/O devices from Opto 22.

The Solution: A Trip Down the Assembly Line

Connect recommended its PowerNet DataLinc family of flexible, comprehensive, Microsoft® Windows®-based software development tools. DataLinc includes PowerNet AirLinc, used for client/server radio frequency data collection (RFDC) applications, and PowerNet ControLinc, used for serial, digital,

and analog device control and data collection applications using I/O devices like Opto 22's SNAP Ethernet I/O and SNAP Wireless LAN I/O™.

The headliner assembly process begins with Grupo Antolin receiving an electronic data interchange (EDI) data file from the vehicle manufacturer. The EDI file dictates the number of finished headliner stock-keeping units (SKUs) to be assembled and shipped. A scheduling program determines the greatest headliner SKU demand and recommends which headliner mold should be used for manufacturing the headliner substrate.

The substrate is then fed into a large molding press where the substrate is pressed into a shape conforming to the contour of the vehicle. After the headliner substrate is pressed into shape, a water jet robot designed and built by Auburn Hills, Michigan-based Robotic Production Technology (RPT) then trims the substrate to size and cuts any holes necessary to accommodate dome lights, coat hooks, air conditioning ducts, and other special features. Inside the water jet enclosure is an Opto 22 SNAP Wireless LAN I/O system used for sending and receiving serial and digital signals between the RPT robot and Connect's ControLinc software. The SNAP Wireless LAN I/O system communicates over a 2.4GHz spread-spectrum signal to a Symbol Technologies access point network. The Wireless LAN system was chosen over a wired appliance due to the ease with which it could be implemented and because of the wiring restrictions within the water jet enclosure.

As the substrate is ejected from the enclosure, the RPT water jet robot sends a digital signal to the SNAP Wireless LAN I/O system indicating part ejection. The robot also transmits a serial string containing SKU number and line ID information. ControLinc continuously monitors these events over the wireless network, time/date stamps the transaction, and writes a record to a database automatically increasing on-hand inventory for the respective substrate SKU. ControLinc prints a serialized SKU label and sends a digital signal through the SNAP Wireless LAN I/O system to the RPT robot confirming successful receipt and label printing. The substrate is then placed on a sequence rack and moved to the Rear Wire Harness Assembly Station.

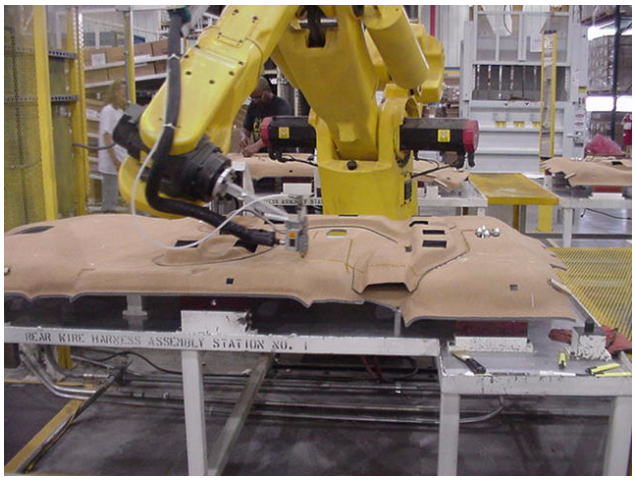
At this point, the headliner substrate is placed on an assembly fixture. A Microscan fixed-position scanner reads the finished headliner SKU label and serially transmits the information to the Opto 22 SNAP I/O system. ControLinc compares the scanned information against the finished headliner SKU bill-of-material file. Based on the results, ControLinc transmits a binary code through the SNAP I/O system that tells the robot which glue pattern to use. At the same time, ControLinc also transmits a digital signal to illuminate a "pick-to-light" bin signaling the appropriate wiring harness to be installed. An assembly worker then removes the designated wiring harness from the illuminated bin and places it on the glue pattern applied by the robot. The front wire harness is then applied in the same manner.

The partially assembled headliner is now placed on a conveyor and transported to the next assembly station where similar data collection and work-in-progress tracking is repeated. At each stage of assembly, the SNAP I/O system provides the interface as the finished headliner SKU barcode data is read by the scanner and transmitted back to ControLinc, which then determines the appropriate assembly procedure and sends the commands necessary for execution.

Headliners are checked for proper sequencing before advancing to the final continuity check. Here, the front and rear wire harnesses are inserted into a test block and closed. The finished headliner SKU labels scanned and proper functioning of wire harness, visors, and lamps is verified.

Finally, the finished headliner is moved to a staging area where an operator scans both the shipping container label and the headliner SKU label to verify that they match and that the headliner is ready for shipment.

Currently, four water jet enclosures are utilizing this process on separate lines at Grupo Antolin. The entire process, from the time the initial EDI file is received until the finished product leaves the shipping area, includes 12 fixed-position scanners, four RFDC Terminals, 216 bin lights, and eight robots, all controlled by PowerNet AirLinc, PowerNet ControLinc, and the Opto 22 SNAP Ethernet I/O and SNAP Wireless LAN I/O systems.



The Results: A More Efficient System Adds Control and Increases Production

Despite fears of a complicated deployment due to the complexity of manufacturing 96 different versions, integration was seamless and the company experienced few problems in design, installation, or startup. By implementing Connect's PowerNet DataLinc solution, Grupo Antolin now has complete control over all stages of its headliner assembly production process and has also increased the overall rate of production on their factory floor. This has translated into a reduction in their work force of 13 people, as the company was able to move from three shifts to two and a half shifts.

The new system has also allowed Grupo Antolin to win additional business. "Without Connect and their automated integration solution we would not have received the Ford contract—2000 headliners a day for five years," says William Copeland, Grupo Project Engineer.

Others close to the project agree. "I've been in the automotive industry for 17 years, and the Connect solution is the most efficient system I've seen and it's not really complex," says Randy Moore, RPT's Southeast Director. "The ability of Connect and ControLinc to respond to the constantly changing parameters (as dictated by Ford) helped us win their business."

The headliner facility has also enjoyed other benefits including greater accuracy in order fulfillment and a reduction in work-in-progress inventory. "With the Connect integration in place, we are now able to more quickly and easily modify our production lines to meet Ford's frequent requirement changes," states Copeland. "Ford has changed starting dates for us at least six times for various reasons, and we were ready each time."

Overall, the Connect system at the headliner factory has been so successful that the company is moving towards adding the same functionality to all of the water jet enclosures on their remaining production lines throughout the facility. They are also currently making plans for future installation of the system in their other manufacturing plants worldwide, with the Hopkinsville implementation serving as a project model.

Connect, along with their integration partners, Opto 22, Symbol Technologies, RPT, and Microscan, are looking forward to these challenges and continuing to complement each other's strengths. "I would not even attempt to automate the ILVS process without a solution like PowerNet DataLinc," asserts Moore.

Connect Product Manager David Dwyer sums things up nicely. "ControLinc gives the assembly operators the ability to control the entire manufacturing process from one location, while the Opto 22 SNAP I/O systems transfer the data and provide the control interface between our customized middleware, RPT's robots, the Microscan scanners, and the other devices used in the assembly process."

About Opto 22

Opto 22 develops and manufactures hardware and software products for applications in industrial automation, remote monitoring, and data acquisition. Using standard, commercially available Internet, networking, and computer technologies, Opto 22's input/output and control systems allow customers to monitor, control, and acquire data from all of the mechanical, electrical, and electronic assets that are key to their business operations. Opto 22's products and services support automation end users, OEMs, and information technology and operations personnel. Founded in 1974 and with over 85 million Opto 22-connected devices deployed worldwide, the company has an established reputation for innovation, quality, and reliability.

Opto 22 products are sold through a worldwide network of distributors, partners, and system integrators. For more information, contact Opto 22 headquarters at 800-321-6786 (951-695-3000) or visit the website at www.opto22.com.