Robotics

Car interior components, Johnson Controls, Germany
Case study: Injection Moulding

Automated production lines with robots for manufacturing fabric-covered interior components at Johnson Controls.

A quest for perfection

At the Johnson Controls plant in Wuppertal, Germany, the pillar trims for the new Opel Astra compact car are being manufactured on fully automated, injection-moulding production lines. The fabric covering of the trim components is cut using a laser robot supplied by Robot-Technology and an ABB IRB 4400 robot, which is responsible for the ultrasonic trimming process.

The new Opel Astra is characterized by its excellent driving dynamics and progressive design. But the designers of the new generation of Astras were not only concerned with the car's external appearance. Their aim was also to ensure that the interior trim would reinforce the high-quality image of the Opel brand.

Opel commissioned Johnson Controls, one of the world's leading automotive interiors companies, to design the interior of the car. Johnson Controls developed the entire seating system, the instrument panel, the roof trim and the door and pillar trims for the Astra interior project.

Pillar trims for the new Astra

The pillar trims are injection moulded by Johnson Controls at their Wuppertal plant using robot-based production lines. Neureder AG, which specializes in automated systems for manufacturing plastic components, was the general contractor for the construction of the four highly automated, injection- moulding production lines, which use an in-mould fabric backing process. The production lines produce the trim for the A, B and C pillars of the three-door, five-door and estate models. The three lines, which are already in volume production, are identical, with the exception of the A pillar line, which has no laser. The lines consist of an injection-moulding machine, a longitudinal pick-and-place robot to load and unload the machine, an enclosed laser cutting cell with a laser robot, a 6-axis robot for material handling, another industrial robot for ultrasonic trimming and a conveyor belt to remove the completed trim components and waste fabric. The fourth production line, which will be producing pillar trims for the Astra also has a laser cutting cell.

Fully automated in-line process

The injection-moulding systems supplied by Krauss-Maffei Kunststofftechnik GmbH have injection-moulding machines with the Decoform package, which use oversize plates for back-injecting the trim components. The production cells use a fully automated in-line process. A linear system from Wittmann, removes the plastic components from the mould and at the same time brings the textile blanks from a rack for the next moulding cycle. After removing the trim components from the mould, the pick-and-place robot takes them to the laser cutting cell and puts them on a turntable fixture.

The turntable moves the components into the cell, where they are cut by a Robocut A 300 laser robot.

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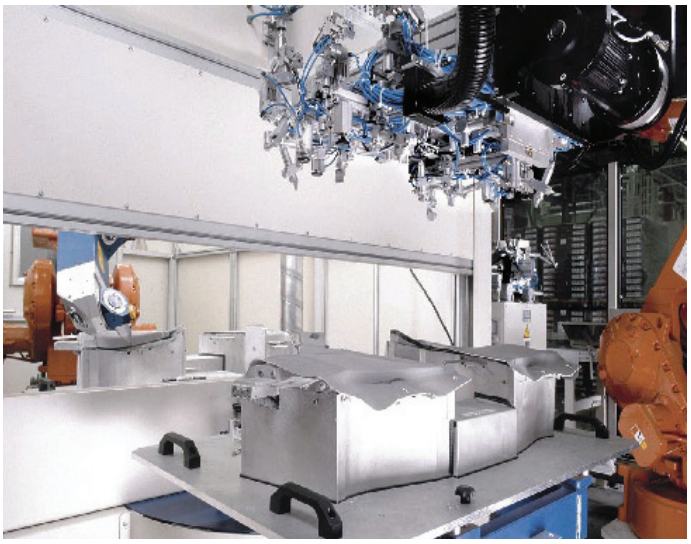

Developed by Robot Technology GmbH The laser robot is based on an ABB IRB 4400 robot. The CO2 (obs se till att 2 blir nedsänkt) laser has an inherently stable laser housing with axes 4 and 5, which replace the standard main axes of the robot.

Laser robot results in high process speeds

Axes 4 and 5 can rotate through 360 degrees. As a result the components do not have to be rotated or put down during the cutting process, which allows them to be cut at a high speed. “The cutting operations follow the pace of the injection-moulding cycle,” explains Reiner von Prondzinski, project manager for injection moulding at the Wuppertal plant. Other benefits of the laser robot include high levels of component accessibility, high acceleration and an integrated gas-supply process.

The Robocut A 300 cuts the excess fabric off two components at once (the left-hand and right-hand pillar trims are always processed in pairs) and then cuts out the hole for the seat belt, including the slots that will be edge-folded in the following application. “We have divided up the cutting jobs,” says von Prondzinski. “All the visible parts are cut using ultrasonic. The invisible parts, which make up the majority of the B and C pillars, are cut with lasers to fit in with the production cycle.”

Production-ready precision cutting is the decisive factor

Johnson Controls has to meet high processing-quality standards. “The decisive factor is production-ready precision cutting. The cuts on each component must be of consistently high quality,” explains Karsten Spohn, project manager at Robot-Technology. The accuracy of the robots is particularly important in this respect. “The parts are fixed in place. During the laser cutting and the ultrasonic cutting, the robots move the cutting components past the parts,” adds von Prondzinski.

Once the laser cutting stage is completed, the parts are removed from the cutting cell and an ABB IRB 4400 robot puts them in an ultrasonic cutting machine. The robot has a multigrip, which allows it to remove the waste material at the same time and place it on the conveyor belt. In the subsequent production cell, an IRB 4400 with an ultrasonic cutting head cuts and edge-folds the trim components. The robot then removes the finished parts and puts them on the conveyor belt, which transports them to the final assembly area.

High level of automation

The production-line design allowed Johnson Controls to produce ready-assembled parts using a fully automated process in a relatively small area of its Wuppertal plant and to dispatch them with minimal buffering. The in-line process guarantees an optimum throughput time and high cutting quality. According to Krauss Maffei Kunststofftechnik, the production line has the highest level of automation currently available for this type of application.

FACTS

Robot-Technology

The product range comprises roboter-aided automation systems and laser cutting equipment for plastics and metal-working industry. Several main product categories, like laser cutting of plastic parts, clips assembly into plastic parts, automatic adhesive tape application as well as compact systems for various problem definitions.

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