The heart of Robotics

Thermo Forming

Case study: Instrument panels, Lear Corporation, Sweden

Applications in Plastics

- ■ Cutting/Finishing
- ■ Glueing/Sealing/Dispensing
- ■ Flaming/Painting
- ■ Assembly
- ■ Packing/Palletizing
- ■ Inspection/Quality control
- ■ Machine Tending

Design is one of the automakers' most powerful weapons in the battle for potential car buyers. Buyers' preferences can be influenced by the colour of the panel or a smart coffee cup holder With an annual output of around 250,000 instrument panels for both Volvo and Saab cars, Lear Corporation in Tidaholm has become quite a master even at producing car panels of extreme design.

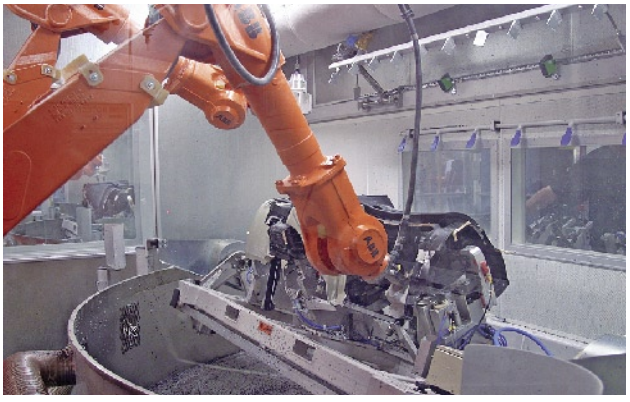
FROM FOIL TO LUXORIOUS CAR PANELS

The instrument panel is one of the factors which often determine the buyer's impression of a car and consequently car manufacturers devote much attention to this detail. Some extra space, a smart coffee cup holder or the "right" colour can influence the buyer's preferences.

Lear Corporation in Tidaholm, Sweden has been a supplier to the automotive industry for over 100 years. Every year, it manufactures around 250,000 instrument panels with Volvo and Saab as its biggest clients. Lear is renowned for its workmanship and its ability to meet car manufacturers' demands.

Lear's production is very much based on a combination of operator know-how, a solid quality awareness and the latest in robotics.

It is easy for visitors to the factory to be impressed by the "natural" work distribution between robots and operators. Robots and machines take care of the fine details and difficult tasks which are often heavy and hazardous, while operators are in charge of supply, control and inspection. But not even this work distribution is perfect, improvements can still be made, for example in the area of materials handling, but clearly things are moving in this direction.



Lear uses robots at every stage of production, from ultrasonic cutting, foil gluing and PUR foaming, to milling of finished panels.

"We use ABB robots for our applications," says Anders Freding, technical manager at Lear in Tidaholm. "We programme the robots off-line. This allows us to perform simulations already at the project stage. Then when we get the robots we can start production fairly quickly."

Durable TPO (Thermoplastic Elastomer Polyolefin) foil is used for the surface layer on the instrument panels. The disadvantage with TPO foil is that it is rather tough.

Production starts with vacuum-moulding of the foil which is delivered in rolls. The foil is heated to around 160 degrees Celsius and using vacuum, ///deep-drawned over a moulding tool. The foil is then cooled by air and the machine produces a finished vacuum-moulded piece of foil.

Ultrasonic cutting

"We used to die cut the moulded surface from other foil, but there was a problem with 'smearing' foil and rough sections. There were some ///chips and small pieces of foil left. Since the foil and the moulding tools become static, small foil pieces stick to the moulding surfaces of the tools and when next

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piece of foil is fed through an ugly mark was easily the result and the foil had to be scrapped."

"Now we have switched to an ABB robot equipped with an ultrasonic knife cutting around the whole geometry. We have removed a major scrap reason which has resulted in considerable savings.

"Ultrasonic cutting works like this: a booster transmits a high-frequency sound which puts the knife in motion. At the same time as the knife is in motion it follows, by the aid of the robor, a track in the laminated fibreglass."

"The ultrasonic technology allows us to achieve a very distinct and controlled cut. This technology is superior to laser, hot knives and suchlike. There is no smoke and the foil does not smear. Depending on complexity and type of material we can choose different types of knives and vary the motions which are generated by the booster."

"A robot which is equipped with a vibrating knife means that we can handle very complex surface very exact, with a tolerance of a few tens of a millimetre. We first made a simulation of the cutting contour , then we programmed the robot off-line," explains Anders Freding.

Gluing

"At the next production stage we join the two parts of foil togethern. Here it is important that the surfaces which are to be joined together, meet in the right way. We use robots to distribute the hotmelt which seals the partition line between the two foil pieces."

"Gluing foil is very much a question of trimming. It is vital to be in full control of the process so that we avoid spillage," says Anders Freding.

Foaming process

At the next stage the panel is "foamed" In this process a 20-year-old ASEA robot, equipeed with a mixing head is used. When the foil has been positioned in the tool, the robot distributes the foam following a specific path which distributes the foam evenly across the entire foil.

When the robot has run its programme the foaming tool is shut. Now the polyurethane foam begins to ferment and create the soft layer of the panel..

The foil has to be tightly sealed, otherwise there is a risk of leakage. Even if the foaming process might appear simple there is a lot of trimming work behind it.

Milling operation

At the next process stage two robots are used in parallel on a panel to drill holes and cut out undesirable surfaces.

"One problem in this context is that the milling is dirty and produces both dust particles and chips. Therefore the robots are places in a well sealed room. The planels are placed on a turn table and are turned to the robots. When the millling is finished the panels are rotated again and taken care of.

Inspection

The manufacturing process ends with assembly when the panel is equipped with amongst other things channels for air distribution, different consoles and knee protection for the driver. At the final production stage, the surface quality is also inspected. Operators make manual controls that the panel is intact, without any marks or traces of chips and dust. After this the panels are packed in containers or delivery to customers.

ABB and the Plastics Industry

ABB's wide range of plastics robots can handle most of the tasks involved in and around the production process, regardless of required cycle time or size of the machine.

Together with our partners, we provide automation solutions for manufacturing processes in the plastics industry.