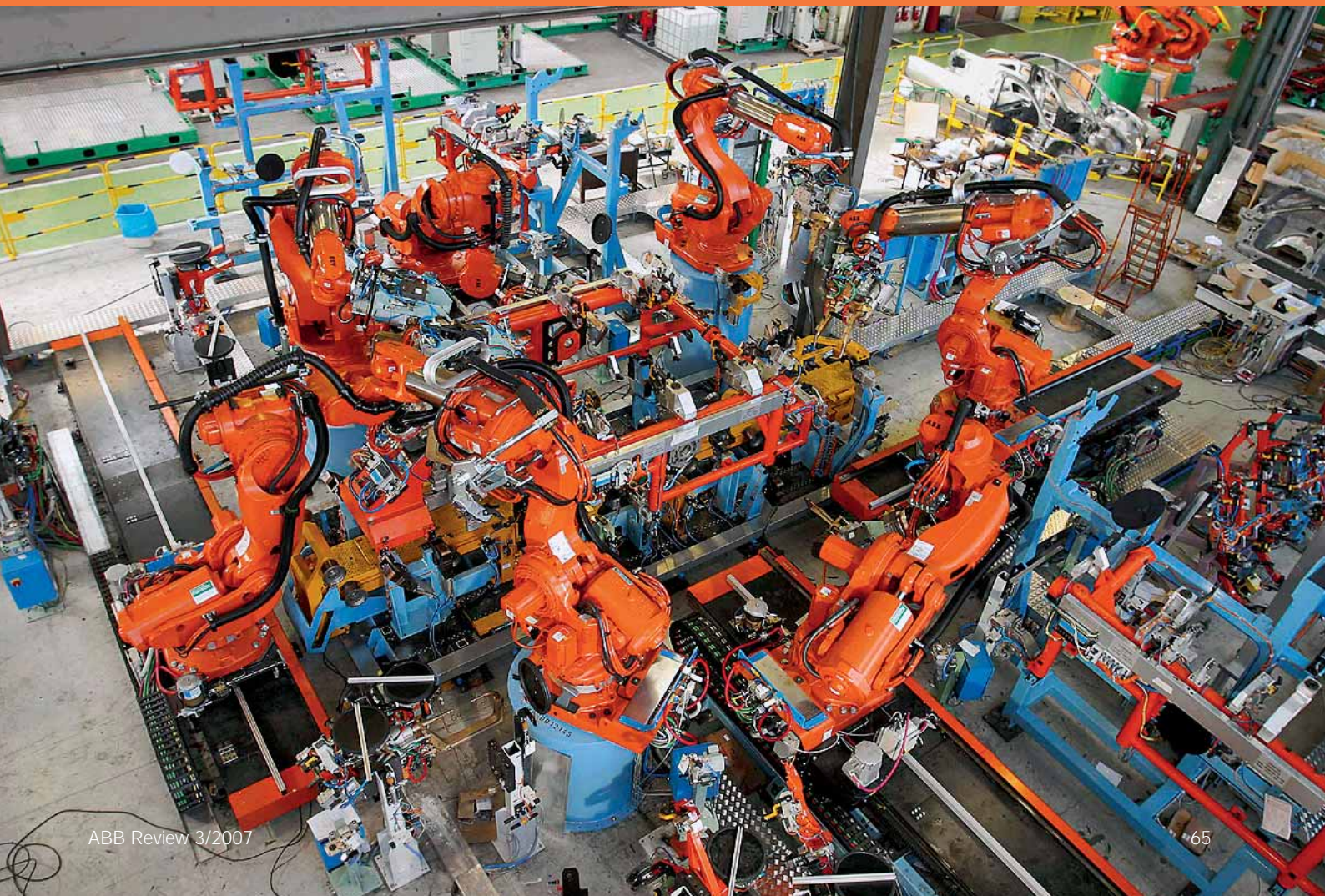


# Robotic specialists

The lean IRB 6620 for dedicated spot-welding operations  
Ola Svanström

Robots are multi-talents. They are built to perform a number of different tasks with high precision, high speed and heavy loads. When a specific task — and only this task — is required, it makes sense to use a customized version of the multi-functional robot.

ABB's FlexPicker is an example of this highly specialized expert robot, designed to sort different goods with very high speed. Spot welding in the automotive industry is another example where talented "professionals" are of high value.





Automation collaboration

Modern assembly lines for car manufacturing are filled with robots. Most of these robots look like the ones we are used to: they have a long arm with a “hand” that can bend forward and backward and turn around like a golfer in a full swing.

But there are also other mechanical movement systems in place that normally would not be called “robots,” even though they work in a way similar their more prominent relatives. These robots can weld, grip, move, lift, sort, paint, grind or hold parts of a car together to help other robot colleagues perform different tasks in an optimal way.

For a car manufacturer, it makes sense to install multi-talented robot types because these can be used for so many different tasks without making major adjustments.

Ten years from now, thermal welding technology will likely still be dominant when compared to mechanical joining or chemical methods.

When we look at the automotive support robots that join parts, it turns out that the majority of them today are there for thermal welding <sup>1</sup>. Thermal welding can be done with rather different technologies: conventional spot welding, laser welding, laser soldering or friction steer welding<sup>1)</sup>. Regardless of the specific technology, the same robot can be used to operate the thermal joining mechanism.

Ten years from now, thermal welding technology will likely still be dominant when compared to mechanical joining or chemical methods. Given this trend, and the growing requests from the automotive industry for higher flexibility and lower cost, it makes sense to complete the portfolio of robots in an assembly line with specialized welders.

<sup>2a</sup> shows ABB’s new specialist in welding, the IRB 6620, and the multi-

talented IRB 6600 <sup>2b</sup>. The innovative IRB 6620 is a much lighter version of its “big brother,” making it better suited for spot welding<sup>2)</sup>. As it is more compact, it saves valuable space in the production line, which can now be filled with two welding specialists – one may be hanging from the ceiling or mounted on a second working level in relation to the moving car body. Due to its agility, the IRB 6620 also can reach under a car frame to perform less accessible welding operations.

ABB recently developed robot controllers that allow for coordinated movement of several robots and simultaneous working on the same piece <sup>Factbox 1</sup>. If the new agile welding robot is connected to such a system, other robots can position the workpiece for welding. This compensates for the slightly shorter reach of the IRB 6620 (as compared to the IRB 6600).

Due to the flexible mounting of the welding robots, several of them can handle a car body at the same time and even reach below or into the car

<sup>1</sup> Spot-welding robot in car manufacturing



without disturbing each other. ABB’s safe movement concepts ensure a collision-free operation at all times.

While the robot specialists dance around the car body and weld with high speed in all corners, the multitasking IRB 6600 can concentrate on the manifold other operations.

**Factbox 1** MultiMove

MultiMove is a function built into ABB’s IRC5 robot controller. It permits the synchronization of up to four different robots or positioners, which means it calculates the movements of up to 36 servo axes.

Without such synchronization, a positioner might first have to move a workpiece into position and then stop. A welding robot would then approach the piece, weld and withdraw. Only when the robot had come to a halt could the positioner turn the piece to permit the robot to work on the other side. Using MultiMove, considerable time is saved by allowing many of these movements to take place simultaneously. For example, the welding robot can move towards the workpiece as the positioner brings it to the robot, and the positioner can slowly rotate the workpiece while welding is in progress. The resulting continuous weld would enhance the quality of the final product. The functionality can also be used to permit several robots to weld simultaneously. The resulting time sav-

ings permits cycle times to be reduced and throughput augmented.

See also **Bredin, C.**, Team-mates – ABB Multi-Move functionality heralds a new era in robot applications, *ABB Review* 1/2005, pp. 26–29.



2 The IRB 6620 **a** and the larger IRB 6600 **b**.



This combination of generalists and specialists opens up manufacturing to radically new concepts. Through this achievement, respot<sup>3)</sup> lines get shorter and faster with eight robots working simultaneously.

The assembly of body sides and roofs becomes more flexible and faster when spot welders and power robots help

each other. This increased flexibility is highly appreciated by the automotive industry. It supports the trend to manufacture more car models on the same line, which not only speeds up the process but also enables optimal use of the valuable assets in the production line. A modern assembly line cannot effectively work without specialists that support the multi-talented robots.

3 A FlexPicker handling meat packaging



ABB has also developed specialists for quite different applications. The Flexpicker **3**, for example, is a system with three very light arms and a gripper that can lift and transport light items such as chocolate pieces or pralines and sort them into boxes **Factbox 2**. The IRB 6600 would be too slow for this, even though it could perform more functions in the sorting process.

**Factbox 2** FlexPicker

ABB's FlexPicker is a so-called parallel kinematics robot: In contrast to conventional industrial robot designs, in which articulations are arranged serially along a single arm **2**, a parallel kinematics robot has three or more parallel arms supporting a manipulator **3**.

All of FlexPicker's motors and gears are installed in its base. This makes the moving parts very lightweight, contributing to the robot's agility – accelerations above 10g can be achieved and handling rates can exceed 120 items per minute.

The robot was designed with hygiene in mind: It has no painted surfaces and can be washed with low-pressure water and without detergents, making Flexpicker suitable for handling food.

The conveyor-tracking functionality of the IRC5 controller permits Flexpicker to pick and place on a moving conveyor, eliminating

the time-consuming need to start and stop the belt for every object. Furthermore, the PickMaster software permits the robot to identify and pick irregularly arranged and shaped objects, as frequently occur in food manufacturing.

See also **Andersson, H. J.**, Picking pizza picker – ABB FlexPicker robots demonstrate their speed and agility packing pizzas, *ABB Review Special Report Robotics* (March 2005) pp. 31–34.



The concept of specialist robots is gaining ground in industry. Whenever mass production of parts is required, a specialist may very well be the more flexible and more economic solution.

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**Footnotes**

- <sup>1)</sup> Friction steer welding is a welding process in which the head of a rotating pin is moved along the welding seam. The frictional heat and clamping pressure cause the parts to be forged together without melting the metal. The method is primarily used for aluminum.
- <sup>2)</sup> See also "Welding dedication" on page 63 of this edition of ABB Review.
- <sup>3)</sup> Respot is the process providing the final weld after initial welds have been used to hold parts in position.