

# Body Builders

**Robot-based Standardized Manufacturing Modules for easier and faster installation of new production assets**

Staff Report



**Robot participation in the manufacturing world is at its most visible in the automotive industry. Who hasn't seen pictures of robots clustered around half-built cars, spot-welding here, inserting rivets there, or just placing parts with perfect precision? They make the whole process look very simple as, with unerring accuracy, they repeat the same procedures over and over again.**

**The images, however, deceive: behind the simplest lift and place movement lies a remarkable amount of technology. And the complexity of the tasks continues to grow as the market demands more: shorter cycle times, more cost efficiency, and increased reliability and flexibility. Besides all this, technical evolution and innovation are forcing manufacturers to rethink the way robots are employed.**

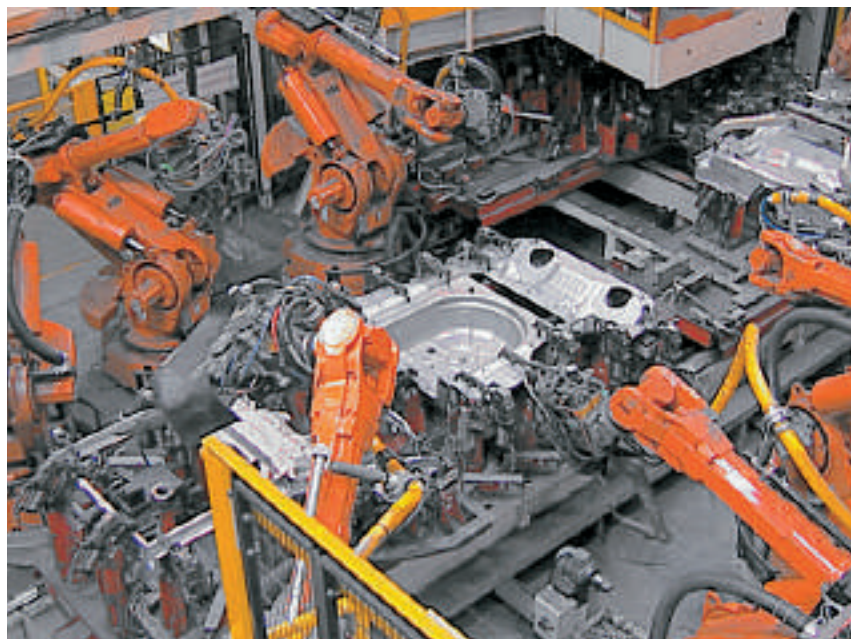
**A new approach to robotized production is offered by Standardized Manufacturing Modules from ABB. The concept is a milestone in the evolution of body-in-white technology, and simplifies every step in the car development and manufacturing process.**

**T**he rapid evolution of products and markets requires manufacturers to be very nimble. However, it also presents them with a dilemma: how to introduce more flexibility into production facilities without having to invest heavily in extra plant and equipment?

This dilemma is resolved by the definitive flexible and multi-functional automation factory system: the robot.

Robotics technology can now be economically applied across a wide range of industrial and commercial applications. And associated technologies, such as sensing, vision, mechanics, control and communication, have advanced in step, vastly boosting robot capabilities. This synergy results in an unparalleled lean, efficient and extremely adaptable production tool.

Many technical innovations are making their presence felt in the robot world: collision avoidance software allows robots to work elbow-to-elbow; new expert systems tools remove the mystique from



telling the robot what to do (and are used off-line, so production does not have to stop for re-programming); the use of common Internet technology makes every robot a website, which makes life a lot simpler; and improved man-machine interfaces have improved robot-human communication.

#### **Strong armed and well armed**

For many years, the automobile industry was restricted by the inflexibility of the frames used to build cars. Each car model required one of these massive steel constructions to hold the car parts firmly in place during assembly. Now, however, robots are strong enough to do



Photo: Nigel Hamman

the job, holding the parts in place while a spot-welder robot applies many dozens of spot welds to keep the parts solidly together before the car is passed on to a further station where thousands of fine welds are performed.

Robots have not only become stronger, they can also operate over larger working areas and can position parts with great, even sub-millimeter, accuracy. This geometrical positioning ability replaces specialized equipment

and greatly simplifies production cell design.

Tooling has also improved. Assembly lines manned only by welding, material handling or servo tool-welding robots provide an ideal basis for standardization. Lightweight tools and clever tool exchangers have also made their mark.

#### Standard Manufacturing Modules

ABB is a major supplier of equipment for the entire automobile production line,

including the so-called body-in-white stage. This latter term is used to describe a 'raw' car body, assembled in the 'body shop', before it has been treated or painted.

The technological changes described above have been accompanied by significant changes in the strongly competitive body-in-white market:

- Life cycle cost reduction
- Shorter lead times between design and production
- Increased uptime
- Increased flexibility
- Less part and product variance and better quality
- Simultaneous production start-up of the same model in different locations
- Simultaneous engineering – new ways to analyze and handle data.
- More product customization

In summary, the changes in the body-in-white market have resulted in huge pressure for processes to be fully standardized and for installations to be significantly less complex. It is simply no longer feasible to pursue plant investment strategies which call for capital-intensive, inflexible, customized automation solu-



## 1 Spot-Welding Cells



tions. The sophistication which makes robotic automation so powerful can be, at the same time, its Achilles' heel. A new approach, featuring standard solutions, is urgently needed in order to simplify, standardize and optimize body-in-white installations across a wide range

## 2 ABB Framing System



of assembly line types, such as framing systems, main subassembly and closure lines.

*Standard Manufacturing Modules are the answer.*

### Elements of standardization

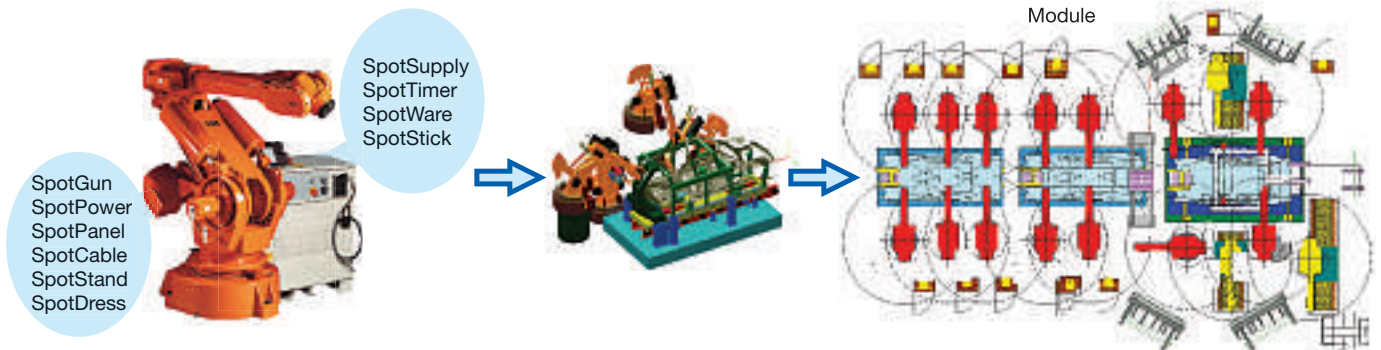
ABB has delivered over 100,000 robots to date and started many years ago, as demand grew for body-in-white equipment to be provided with higher reliability and flexibility in a shorter time, to develop manufacturing solutions based on robots which can address all the different areas of the body shop. These solutions are always worked out in close cooperation with customers so as to optimize investment and total production costs and also to increase reliability and flexibility.

A range of modular basic products is central to ABB's drive to standardize many different car manufacture processes. These exploit the latest technology evolutions, like high payload robots, modular concepts for grippers, and a simplified Human Machine Interface, and are put together to form mini 'assembly zones'. The setup is simplified by extensive use of geometrical tooling, which enables the robot to both handle and position parts all by itself instead of having to use dedicated machines or equipment.

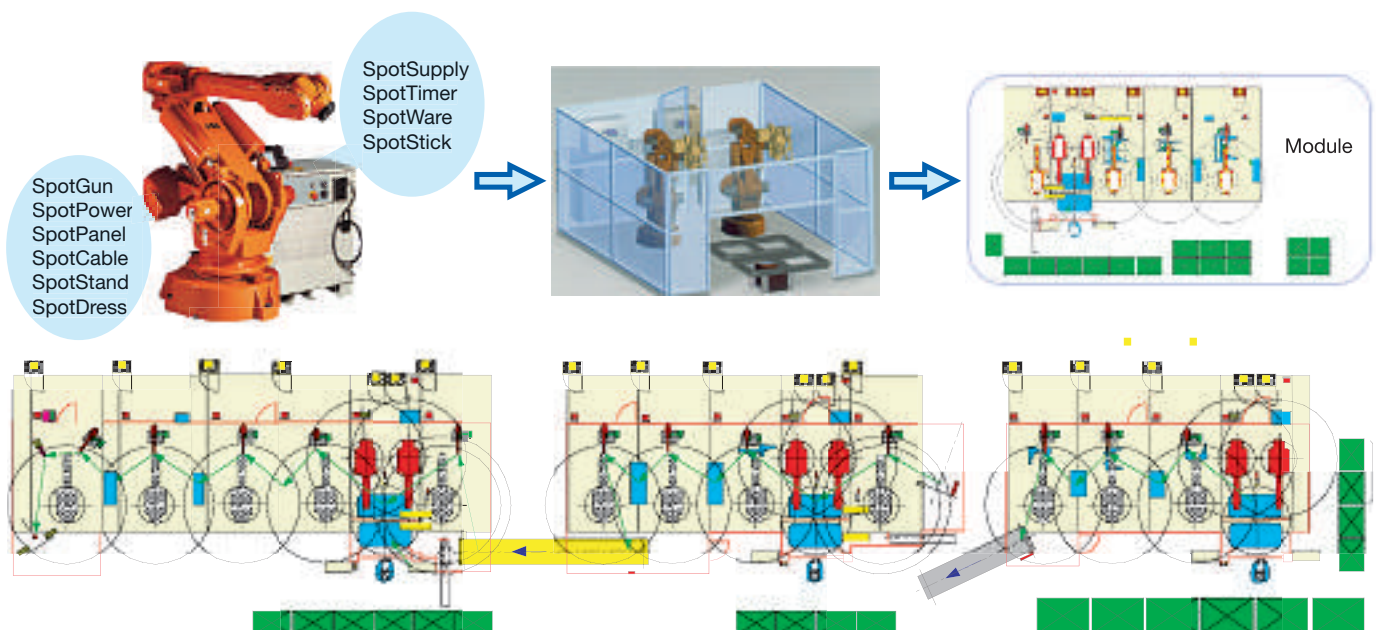
Three basic ABB systems can be used to provide complete Standard Manufacturing Modules for body shops:

- Spot-Welding Cells
- Subassembly Systems
- Framing Systems

3 Framing line module



4 Modules and complete line based on ABB Spot-Welding Cells



**Spot-Welding Cells**

ABB provides a range of modular Spot-Welding Cells for preparing body components and subassemblies.

Built from standardized components, these cells can be used independently or in combination with other cells to equip assembly lines and preparation islands.

Batch production is possible thanks to quick-change tools, and up to four robots can work in one unit performing as many as 4000 welds per hour. In each cell, one of the robot cabinets (master) synchronizes all operations within that cell. Each cell can be configured as a separate safety zone.

**Subassembly Systems**

These are ABB's standard systems for main subassembly units such as floors, engine compartments, side panels, closures (ie, doors, hoods, trunks) and roofs. The modular design allows quick adaptation to changing assembly requirements. ABB Subassembly Systems include a

high-performance tool-change system, so different tools can be inserted without disrupting the production flow rate. It can be adapted to different production volumes, from proto-type parts to large runs.

**Framing Systems**

Main assembly lines, constructing, say, complete cars, and which require geometrical grippers, can be equipped with ABB's new Framing Systems. A triangular interlocking tool ensures components are held firmly and accurately in place.

ABB Framing Systems use three robots to take the panels, place them in position and hold them tightly while welding robots apply the welds. The

systems are designed for extreme precision and can resist the jolt of the welding process.

**From systems to modules and complete lines**

The simplicity and modularity of these elements allows high-level standardization – effectively 'Plug and Produce Modules' – giving the same solution for any plant. In a real-life factory setting, individual modules are configured as shown in 1 to 3 .

**Simplicity for the future**

No more will dedicated rigs or complex equipment be required on the assembly line. These are now replaced by ABB's

standardized Plug and Produce modules, which can be configured in a simple and flexible manner.

Adapted and defined on a customer-by-customer basis, this concept will change the way body shops are implemented and organized 4, 5 . And they will change automakers' product strategies in terms of diversity, manufacturing capacity, simultaneous installation in different plants, and subcontracting of manufactured parts. Such a concept is destined to speed up the evolution of body-in-white technology and simplify the complete car development and manufacturing process. (ab)

5 Different standard systems are combined to form the complete body shop.

