Digital robotics solutions for the Automotive industry

Flexible and digital solutions enabled by ABB's technology are helping the global automotive industry and its suppliers meet the challenges of a digital future.

- Digital fleet optimization
- Automating the quality control and inspection process
- Disrupting the auto industry at a cellular level
- ABB Robotics help make sand core blowing digital
- Paint Technology 4.0

The $83,330 dollar article
Digital fleet optimization for robots

To combat the challenge of unplanned stoppages, ABB explores the potential of machine learning, advanced analytics and connected services.

— 01 ABB's new advanced services are based on actual production from the world's leading automotive brands, so they reflect the realities of a factory floor.

In an average large automotive factory, the cost of unplanned downtime can exceed $1 million an hour. This means in the five minutes it will take to read this story, unplanned downtime could bleed more than $83,330 from your factory. In addition to the high cost of unplanned downtime, many automotive manufacturers shoulder the burden of a high amount of planned downtime to prevent failures. This planned downtime is often scheduled on arbitrary factors such as operating hours or calendar days. While historical performance data can certainly be used to forecast maintenance needs, it can't take into account the realities of equipment health or provide actionable, predictive intelligence. However simply connecting a device to gather data is no longer a novelty. In fact, it is rather expected of everything from our mobile phones to our automobiles to robots on the factory floor.

Going beyond 'connected'

"In the past decades the focus was on connecting robots to gather data, part of the development of 'The Internet of Things,' said Jörg Rommelfanger, product manager for ABB Ability Connected Services.

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Now we are moving past that and looking more at how all this data can add measurable value. Today that means condition monitoring and assessing the performance of robot fleets. With new cloud-based applications that use the power of machine learning to do deep analysis, we are already moving beyond that to predicting performance and asset optimization.

ABB's Connected Services for example is piloting a machine learning-based algorithm that can detect and analyse abnormal robot behaviors that could lead to unplanned stoppages. Many robot failures, just like human illnesses, can be prevented with proactive treatment of early symptoms.

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Is it AI or AIn't it?

Machine learning is a subset of artificial intelligence (AI) where computers can 'learn' in certain ways without explicit programming – for example to make increasingly accurate data-driven predictions about robot performance and health through either real life or model-based inputs.

AI is starting to play an increasing role in industry, however its full potential is still in a very early state. Robots and vision systems can combine with AI/machine learning to improve a number of tasks. One early application is binpicking, where vision-equipped robots can find the correct path and gripper position to successfully pick up random parts in the unstructured chaos of a shipping bin. This removes the extra step of orienting the objects in a uniform way so the robot can 'find' them, and it removes the need for a person to handle heavy or sharp parts. In the future AI will enable more complex tasks, such as allowing AGVs to navigate the dynamic spaces of a factory while avoiding collisions with people or obstacles, such as if a worker leaves a skid of parts in an AGV's path. This will allow islands of automation that help automakers mass customize vehicles with greater flexibility than traditional, fixed assembly lines. Although robots will become more flexible, it is clear that they will also continue operating within strict parameters to ensure safety and process quality.

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Mechanical Condition Change (MCC) is an advanced feature that can detect manipulator problems prior to costly failures related to the inevitable wear on gearboxes and motors. By combining MCC information with information from the robot controller, ABB can provide tailored recommendations and service that optimizes total cost of ownership. Such MCCs are reported to ABB service experts, who analyze the data based on ABB's knowledge base of connected robots in over 750 factories, as well as the customer's specific historical performance. The result is that gearbox and motor failures can be detected and remedied before they occur and cause an unplanned stoppage.

ABB's new advanced services are based on actual production from the world's leading automotive brands, so they reflect the realities of a factory floor. Rommelfanger added "One of the big surprises to come from the analysis of robot behavior abnormalities was that the greatest inefficiencies were not coming from major failures – they were coming from micro stops. These are small one to five second stops that are often over so fast no one is even aware they are occurring. Identifying and resolving the root causes of micro stops increased productivity for our customer by one full percent, which represents a significant cost savings in a large, established production line."

What comes after 'just keep it running'?
One of the main advantages of advanced, connected robot analytics is that automakers are now able to look at the fusion of the physical and digital factories for more than just breakdown prevention. ABB's machine learning based algorithm can for example identify individual weak performers out of hundreds of robots scattered across many lines and even many plants.

This allows automotive OEMs to have a holistic view of how their entire fleet is performing, and to optimize the performance of robots which fall below their benchmarks. It also helps with more intelligent maintenance scheduling for automakers with a global supply chain approach, allowing them efficiently allocate production capacity across many sites while keeping all sites running at maximum uptime.

Big data, not just for the big user
Saint-Gobain Sekurit is a leading French glass supplier to many international OEMs, providing windshields, lights and sunroofs. Saint-Gobain Sekurit is monitoring 39 ABB handling, palletizing and gluing robots at its Noyon plant through ABB Connected Services. When MCC data led ABB to anticipate a failure in one axis of an IRB 6600, ABB was able to proactively inform Saint-Gobain Sekurit and explore the situation. This allowed ABB to validate that a motor failure was imminent which could have led to an unplanned stoppage. Breakdowns typically cost Saint-Gobain Sekurit around €4,000 per hour, and it can take a full eight hours to recover from unplanned stoppages. The local ABB service team performed a planned service intervention which was completed in one day to avoid the need of costly downtime.

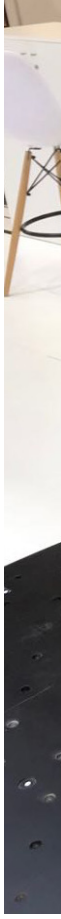
For some tiers the urgency of an unplanned stoppage is more about meeting business commitments. KOKI is a German maker of precision gear shifters and boxes for some of the world's leading automakers. These OEMs require just in time delivery from KOKI, so any unplanned stoppage could seriously jeopardize commitments. In the past KOKI often had to convert another cell with the same robot model to duplicate the lost production, which was a time-intensive process with risks.

KOKI decided to add Connected Services to its fleet of 60 robots at its production site in Glauchau, Germany. ABB Connected Services detected conditions which could have led to a shutdown of one of KOKI's welding robots. ABB was able to proactively alert KOKI, and also gave its operators actionable data through MyRobot, ABB's intuitive web-based application. Another benefit of Connected services is that it can give service experts snapshots of the system at the point of failure, so repairs can be more efficient and recover faster. The live data also allows ad hoc repair tasks to be planned quickly and service activities prioritized in order to keep the most important processes running smooth.

Many are discovering the potential of advanced analytics to reduce total lifetime costs while boosting uptime and performance.

The measure of success: automating the quality control and inspection process with ABB technology

BENTELER has invested in ABB's digital 3D vision and metrology solutions at its Vigo production plant in Spain, helping it reduce cycle times while raising quality and reducing the risk of quality control errors.



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01 The 3D vision and metrology solution from ABB allows up to five million 3D points to be inspected without touching the part.
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02 The 3D white-light scanning sensor technology (attached to the robot on the right-hand side) is part of ABB Ability™ solutions that connect customers to the industrial Internet of Things.

BENTELER is a leading global company that develops, produces and sells products, systems and services for the automotive, energy and engineering sectors. It's a family-owned firm now in the fourth generation. When the Automotive division of the BENTELER Group started operations back in 1935, it was an era when cars had long hoods and running boards and seat belts were by no means standard. Since then, much has changed in the automotive industry, with safety, environmental and design standards unrecognizable from these early days. The demands placed on individual components are also more complex, leading to refined production processes and enhanced quality control.

Meanwhile, BENTELER has also changed. The Automotive division of the company now has around 26,000 employees and 75 plants in 24 countries. Developing tailored solutions for some of the world's leading automotive OEMs, its products include automotive system solutions and modules for chassis, body, engine and exhaust systems as well as systems for electric vehicles.

Towards the factory of the future

One area in which the automotive manufacturer has evolved is quality control. BENTELER invests in the further optimization of its processes and uses digital technologies in order to be able to provide the highest quality to its customers. Its site in Vigo, Western Spain, was using a traditional approach to inspect the quality of parts via Coordinate Measuring Machines (CMM). However, BENTELER felt that the process could be improved – both in terms of time required for inspection as well as limitations with regard to the information captured – and decided to change its concept.

The company moved the process from the laboratory to the production area and opted for ABB's fully robotized automatic quality inspection solutions, which digitize the inspection process. They employ 3D white-light scanning sensor technologies, using digital scans to optimize inspection and quality assurance. The sensors can detect defects on a manufactured part with an extremely high level of accuracy (see box for more information).

The technology – which is part of the portfolio of ABB Ability™ solutions that connect customers to the industrial Internet of Things – enables a high level of automation with advanced data analysis, leading to more flexible manufacturing and moving BENTELER's production processes a step closer to the factory of the future.

As manufacturers increasingly aim to improve quality and productivity while accommodating greater product variation and customization in smaller lots, the ability to efficiently automate quality inspections offers the kind of competitive advantage that BENTELER was seeking to achieve.

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ABB's digital 3D vision and metrology solutions

ABB's digital 3D vision and metrology solutions ABB's solutions are based on 3D metrology, where a scanning system projects a grid of white light on a manufactured product's surface. It rapidly records highly detailed geometric and surface data to create a digital model of the manufactured part, which can then be compared to the part's original CAD drawings. This is a very precise and rapid process that does not slow down production. Automating the inspection of manufactured parts and pieces helps plants to reduce cycle times while raising quality and reducing the risk of quality control errors. It also allows manufacturers like BENTELER to validate that the quality of their products is equal to the high stands of the automotive OEMs.

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More measurements, higher speed
ABB's 3D white-light sensor-based solutions can be used for both off- and in-line inspection. BENTELER decided to install the off-line inspection solution. This system makes the typical measurements previously made with the CMM and generates control reports both internally and to the client. Integrating a robot with the 3D measurement technology allows a very high capture speed in addition to a large number of measurements.

The system works conceptually like a production cell, with emphasis on performing the maximum number of measurements in the shortest possible time. For this purpose, it has two measuring tables – and a second robot loads and discharges the mea-
suring tools, including the pieces to be measured, automatically according to the production queue generated by the operator. This concept allows continuous measurement, resulting in high productivity.

BENTELER also decided to install three in-line cells with equipment that measures structural safety parts such as the rear axle and the motor cradle. Using the same technology but adapting the functionality, systems are integrated at the end of the production line that are capable of measuring 3D geometry using optical, non-contact scanning, in place of more traditional mechanical control tooling. All parts can be put through a 3D dimensional control in continuous mode, ensuring that any defects can be identified quickly and efficiently.

Increased productivity, precision and quality
Checking parts in the course of the manufacturing process rather than at completion, and having the process integrated into the production area rather than separately located, allows industries to increase the productivity, precision and quality of their manufacturing. It also results in quality control for 100 per cent of finished parts, and significant cost savings. In addition, such solutions promote collaboration by optimizing the work of the control and supervision operator.

Compared with traditional methods, in the same time that it takes CMM-based technology to inspect a 3D point, the 3D vision and metrology solution from ABB allows up to five million 3D points to be inspected without touching the part.

Manufacturers can achieve higher quality at a higher speed.
Another major benefit is that every single part can be inspected. Today, production plants often rely on statistical quality control, a process whereby they take random samples. However, this means the same mistake can be repeated in many products until discovered, creating a lot of expensive rework and scrap. Continuous control of 100 per cent of the parts helps avoid such costly outcomes.

Seeing eye to eye
For Tier 1 automotive suppliers like BENTELER, whose processes are evolving with the times, technology such as the digitized 3D inspection solution lets them validate their quality to large automakers, whose quality requirements are similarly exacting. Such technology therefore allows all players to be able to see eye to eye on the question of quality.

And just as BENTELER has kept pace with an industry in which integrated fenders, fully closed bodies and seat belts as standard are now the norm, it is taking steps that move it into a digital future.

Disrupting the auto industry at a cellular level

Modular manufacturing cells, AGV-led logistics, and digitalization will be some of the key elements of the automotive factory of the future.

For more than a hundred years, we have been making cars the same way. Pressed sheets of metal, which make up the car frame, move along a transfer system where humans, and more recently, robots load these parts and assemble them. There is a reason this setup worked for so long. Assembly line production, made popular by Henry Ford, allowed carmakers to roll out millions of cars, at low cost. Mostly powered by an internal combustion engine, these cars usually had standard features and looked just like one another.

But all this has been changing.

The uncertainty of the world market, new emission regulations and a wave of new mobility trends are creating a fundamental shift in the way cars are made, sold and used. The need for high flexibility in volumes and models, but also in the manufacturing footprint becomes a must for the next generation of operations.

The most notable of these changes is a growing preference for electric cars over internal combustion engines (ICE) as sustainability takes on a more important role in the state and individual's agenda.

On the social side, car ownership itself could change with the development of car sharing. The ease of hailing cabs run by companies like Uber and Lyft is reducing the incentive for people, especially in crowded cities, to buy their own cars, while self-driving cars and increased connectivity could herald a permanent change in driving habits.

Our customers in the auto industry have faced many challenges before, but this time the change is more significant. There are many disruptive factors in the market today that will impact the way they want to produce, sell and approach the end car users.

For the automotive industry, these developments have added many layers of complexity in the manufacturing process. The conventional manufacturing line is simply not nimble enough to handle concepts such as batches-of-one manufacturing now demanded by the market. This has pushed up costs and dragged down productivity – two factors that are critical determinants of financial success in the industry.

Smart factory for smart mobility

Navigating this new reality requires a fresh look at how the auto industry has traditionally made cars. The automotive factory of the future will look very little like Ford's conveyor belt setup. Instead, concepts like racks-free production, being offered by ABB, hold the potential to dramatically increase efficiency and productivity while manufacturing a wider variety of cars at a faster rate. The modular assembly concept consists of autonomous cells that manufacture and assemble cars, supported by intelligent driverless transport systems or automated guided vehicles (AGVs) that supply parts directly kitted in the storage area to the cell and then transfer the assembled steps to the next manufacturing operation.

Unlike the transfer system technique, where the start of production of one unit is dependent on the completion of the previous one, AGVs in the modular cell concept can transport car bodies and sub-assemblies without being linked to the next assembly step. The cells are typically including from two to eight industrial robots, welding, joining or gluing equipment and a separate AGV that supports logistics tasks.

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While the production line has evolved from using many people (03) to many robots (01), the basic linear approach is the same, which creates challenge when dealing with mass customization.

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02 Assembly line production, invented by Henry ford, enabled carmakers to produce millions of cars at low cost.

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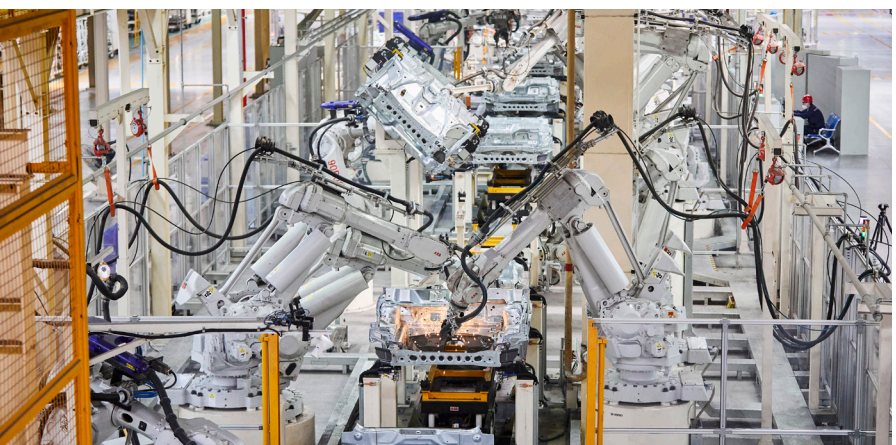

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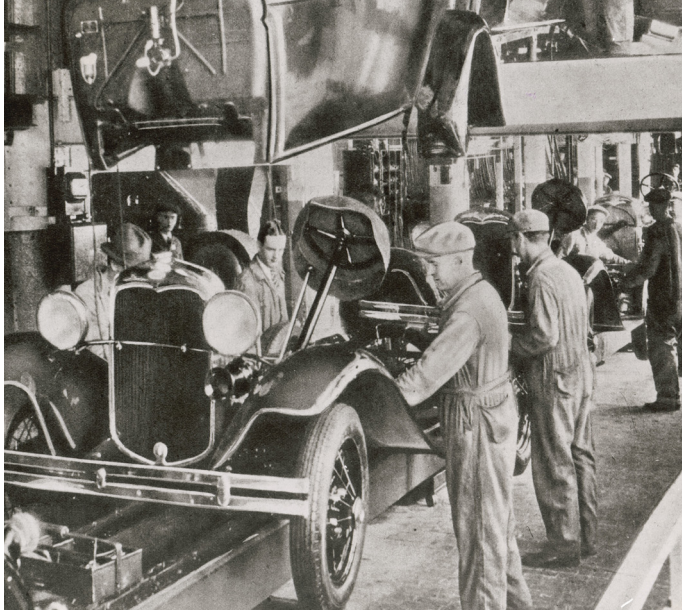

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Each cell is capable of executing a minimum of three consecutive process operations. One of these operations could be geometry or tooling equipment which ensures that the parts of the car are assembled accurately. This function is supported by automatic tool changes to enable customization so that different car models can be customized within one cell.

Knock-on effects
For companies that supply products to the automotive industry, current market trends are making manufacturing even more challenging. Not only do they have to create different sub-assemblies for different manufacturers, each of these OEMs now have their own specifications for each model. While some equipment like presses can be used for more than one customer, as you go down to the assembly of body parts or interiors, then the equipment becomes very dedicated to that OEM. In these conditions, the autonomous cell solution with an independent and automatic logistics structure, can add immense value by increasing flexibility and reducing time.

In the future, modular cell manufacturing will offer a host of benefits that will help companies in the auto industry boost productivity. As the cells are not dependent on each other, any downtime in one cell has a minimal effect on the entire production process, in contrast to a traditional assembly line setup.

Also, a manufacturer can easily add or remove cells with the minimum of disruption to the overall pro-duction process. This increases the ability of the manufacturer to quickly react to changing market trends without having to overhaul the entire manufacturing process each time.

Finally, modular cell manufacturing can positively impact worker utilization. Instead of waiting on one car after another to move along a transfer system, maintenance workers can move between cells. This will improve not only the operation but also the maintainability. A simulation by the Boston Consulting Group and simulation specialist IPO.Plan GmBH in 2018 showed that flexible cell manufacturing in-creased worker utilization by 12 percent, leading to a reduction in annual wage costs by the same magnitude .

Digitalization for increased reliability
The components of the automotive factory of the future are both autonomous and more connected at the same time. Industry 4.0 practices such as the use of sensors on every level and digitalization allow operators to have real-time control of all the processes that occur in the factory. Data flows through every bit of equipment, from AGVs to robots to tooling and fitting components to guide their actions seamlessly. For instance, sensors in the manufacturing cell can tell an AGV about the type of part need-ed to be transported from the storage area, instead of a human performing the task.

Cloud-based solutions like ABB Ability™ Connected Services can monitor a range of parameters that allow automotive manufacturers to predict maintenance schedules, save on costs, prevent unplanned downtime and increase overall productivity. In the future advanced technologies based on artificial intelligence, machine and deep learning have the potential to increase the autonomy of the manufacturing cells by enabling them to automatically adjust to evolving customization, self-diagnose and self-repair.

Where from here?
As mobility options evolve, the auto industry is faced with a future of ever-increasing complexity at the factory level. Embracing modular cell manufacturing offers a more efficient and flexible way of producing, built around an ecosystem of intelligent data used to improve current production processes and new solutions, such as the racks-free production concept. that can squeeze every drop of productivity from the factory by optimizing the logistic process.

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The future of the automotive factory will be an ecosystem of intelligent data used to improve current production processes and new solutions such as the racks-free production concept that can squeeze every drop of productivity from the factory.

ABB Robotics help make sand core blowing digital

Inacore creates casting cores for BMW using a cutting-edge networked, digital production system. Right in the middle of one of the world's most modern core shops, 18 industrial robots from ABB cope with harsh conditions as they handle and process the sand cores after blowing.

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01 Two IRB 1200 robots operating in each cell perfectly coordinated by MultiMove.
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02 Using a large gripper, the IRB 6700 simultaneously removes all sand cores from the core boxes.

Inacore in Ergoldsbach, Lower Bavaria, has created a completely new style of core making. The joint venture between Laempe Mössner Sinto GmbH and R. Scheuchl GmbH produces inorganically bound sand cores for the BMW light metal foundry in Landshut, 20 km away. In one of the world's most modern foundries, the carmaker manufactures structural components, engine blocks, cylinder heads and electric motor components.

Consistent digitalization
What is essentially new about Inacore's production is the 100 per cent part tracking and data transparency of all machines and systems, and Inacore is also completely networked with the BMW warehouse. Thanks to its consistent approach to digitization, Inacore is able to provide customer quality management with specific production and storage parameters for each individual sand core in real time if required meaning the high-tech core shop sets new standards in digitization and efficiency.

Six robot cells in a harsh environment
Fully integrated ABB industrial robots are an important part of Inacore's automation solution. They must function very reliably under the harsh external conditions in the production of inorganic cores: Temperatures of up to 45 °C are accompanied by the presence of abrasive dusts and an atmosphere with high humidity and a high pH value.

A total of 18 ABB industrial robots handle and process the freshly blown sand cores. Rudolf Wintgens, Managing Director Technologies at Laempe Mössner Sinto, explains: "Each of the six core blowers is equipped with identical but independent production cells, each equipped with an IRB 6700 extraction robot and two IRB 1200 deburring robots. The IRB 6700 simultaneously removes all sand cores from the core boxes with a large gripper. Inacore works with different core boxes; the complete core package for an engine block is assembled by BMW in the correct sequence when the cores are inserted into the moulds.

Flexible machining methods as required
Depending on the type of core, Inacore turns to three optional processing methods after removal: In the first version, the IRB 6700 places the cores on the deburring table on core specific support pallets. There, the IRB 1200 moves the dividing plane with a steel needle for deburring. The IRB 6700 then picks up the cores again and places them on the removal shuttle. The shuttle takes the cores out of the safety area of the cell and presents them to the operator for clearing into the core racks and for manual visual inspection. In the second operating mode, suitable for simple core contours, the removal robot removes the cores under a chain field for deburring. The cores are then deposited on the removal shuttle. In the third version, the IRB 6700 removes the cores from the core box and places them directly on the removal shuttle without an intermediate deburring step.

MultiMove reduces space requirements and costs
The IRB 1200 controls Inacore with MultiMove. "We will never operate the two deburring robots

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Core Blowing

The core blowing method is used in foundry technology to produce cores. They are needed to produce a casting with a cavity, for example engine blocks. The shape of the cavity to be produced is produced from a specially prepared material - sand of a certain grain size and binder - in the core blower. This means that the moulding material is introduced into the core box at a certain firing pressure - usually two to six bar. After curing, the sand core is placed inside the mould at the point where the cavity is to be created. After casting, the moulding material from which the core was made is removed through the openings provided in the casting construction.

per cell individually, so this configuration was the obvious choice," says Rudolf Wintgens. "In production, every cubic centimeter of space counts. Because we only need one robot control unit in the MultiMove, we reduce space requirements and costs".

Pioneer appreciates reliability

Andreas Mössner, Managing Director of Inacore and Laempe Mössner Sinto, explains: "We appreciate the reliability of the ABB robots in harsh environments and the good adaptability of the programming, especially during deburring. In addition, ABB was able to score with our other requirements and also with the price." The companies behind Inacore have extensive experience with robots for core making and casting; Laempe and Scheuchl implement ABB robots for customers worldwide. Laempe is a pioneer in the automation of sand core production using robots. Together with ABB, Laempe installed the first robot in a core-making application back in 1996.

Laempe is an ABB Authorized Value Provider. For many years, Scheuchl has relied on robots for casting production and raw casting machining. During the new installation for Inacore, the assembly team and the programmers from Laempe and Scheuchl provided all services for the implementation of the ABB robots.

An economically viable solution

Inacore believe that automation solutions with robots are the best method to produce with high reproducibility and quality. "We achieve shorter cycle times and lower personnel requirements and can thus reduce costs," says Dr. Udo Dinglreiter, Managing Director of Inacore and Scheuchl. "From a business point of view, ABB robots are favored for their low overall and implementation costs. In addition, the robot relieves employees of physically heavy, repetitive and dangerous tasks, thus increasing occupational safety".

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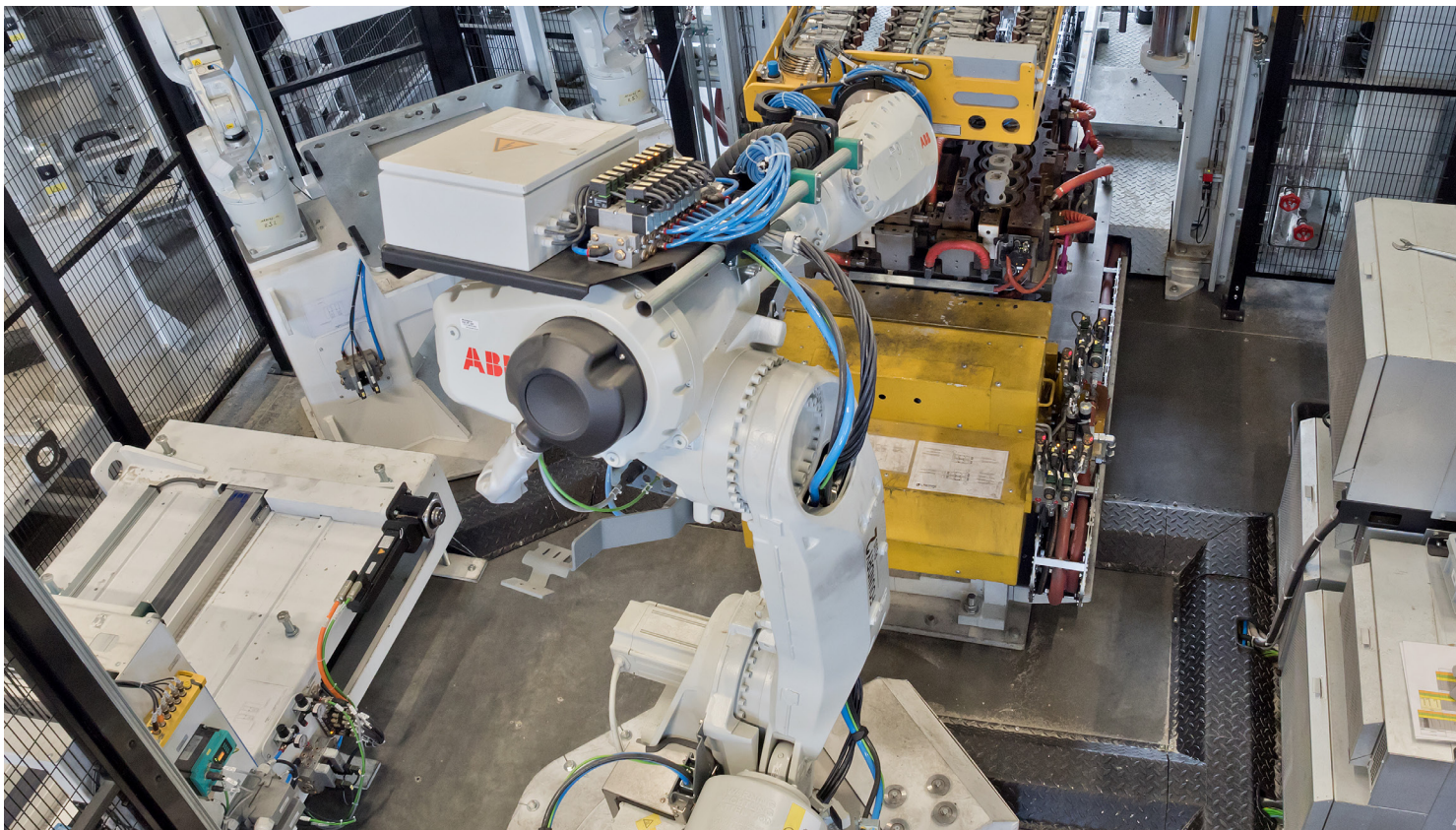

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Paint Technology 4.0: increased productivity and significant fault reduction

ABB Ability™ for Paint is a solution portfolio for automating and digitizing paint technology and paint lines. It enables car manufacturers to control the painting process in many ways.

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01 With ABB Ability for Paint, companies will achieve a first-run rate of almost 100 per cent with continuous availability thanks to early fault detection.

Today's automotive production is characterized by short product life cycles as well as a multitude of models and variants, which are manufactured on common production lines with a high degree of customization. Body painting is one of the key processes in the automotive industry to have a direct influence on the external appearance of a vehicle. Automobile manufacturers attach great importance to the quality of the final product, and invest in the most modern paint lines for their factories.

Data analysis for optimized painting processes
Within a paint cell with state-of-the-art conveyor and process technology, special paint robots take on various painting tasks, such as the homogenization of the surface and the subsequent application of topcoats and clear lacquers. An optimal interplay of all components must be achieved in order to obtain the best possible paint result. The range of different body variants and colors also entails new requirements for painting systems: intelligent programs can, for example, set the individual paint parameters for the atomizer's itinerary, which is determined by the color, the vehicle model and the factory.

By monitoring and analyzing the data from production processes and equipment, automobile manufacturers can now design their painting systems even more efficiently and thus increase productivity. ABB supports its customers through its technology and its ABB Ability for Paint digital portfolio, which allows them to optimize their painting processes, reduce material and energy consumption, and improve the end results of the painting process. The range of solutions is part of the entire cross-industry digital expertise falling under the umbrella of ABB Ability™. This includes an open, interoperable cloud platform that connects devices, systems, solutions, and services in order to increase performance, productivity,

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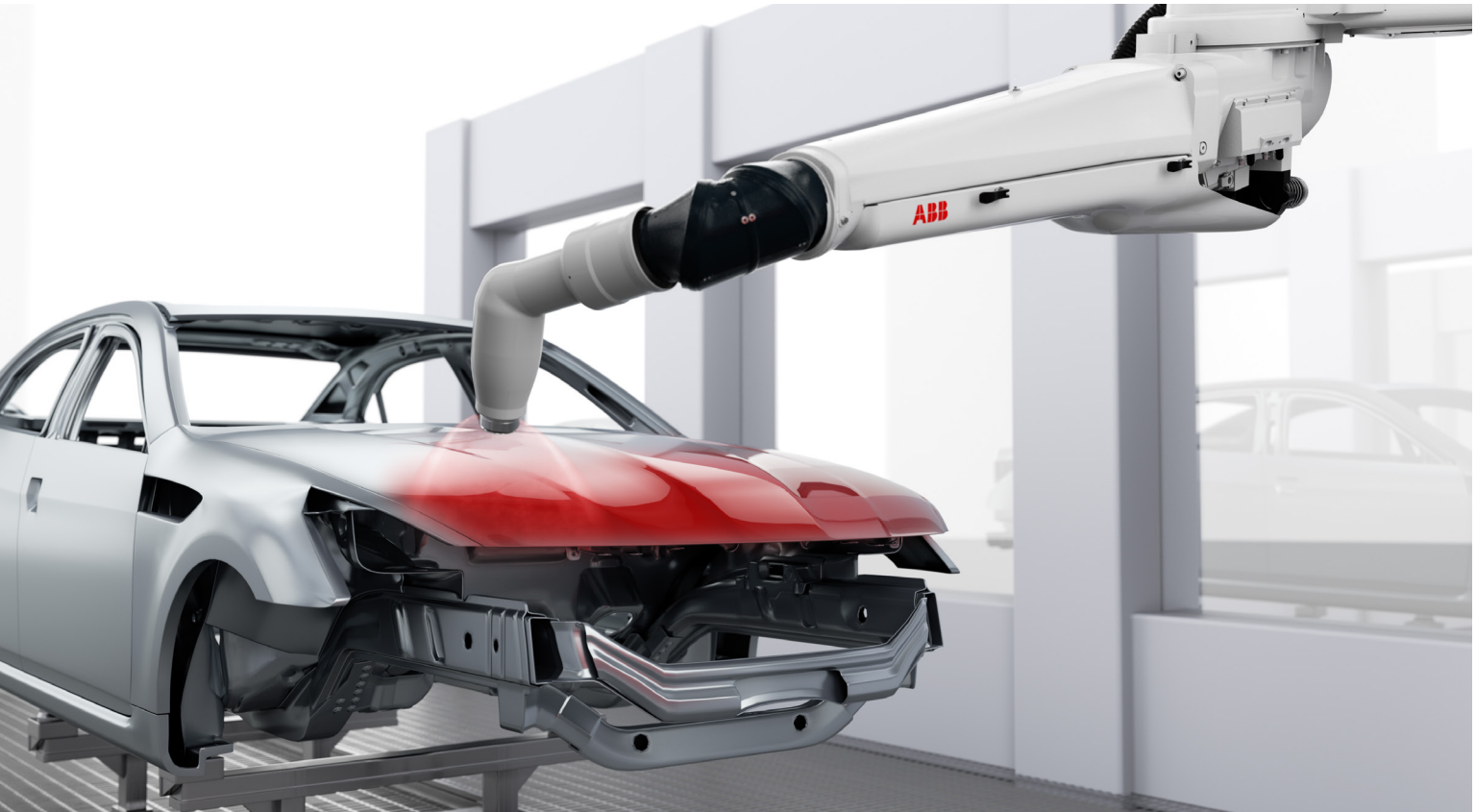

efficiency and security throughout the operational life cycle. ABB Ability™ technology products and services are used in a wide range of industries, helping to create significant added value through digitalization and closed-loop solutions.

Process and equipment data, which are obtained directly in the factory, forms the basis of the ABB Ability for Paint offer. ABB has committed to three core principles for handling data: ABB will not lay claim to any data – this will remain the property of the customer. Customers will also know what is happening with their data. Communication on which data is measured, collected and used to improve services and products is done transparently – the customer's consent is a prerequisite. No conclusions will be able to be drawn on production-specific processes; only general data such as temperatures and torque curves is recorded.

A more economical design phase with RobotStudio®
ABB combines its expert knowledge with the intelligence of ABB Ability Systems such as RobotStudio® for the rapid commissioning of painting systems. The RobotStudio® software simulates an exact copy of the paint shop in virtual space, including the automated processes. With virtual commissioning, extensive tests can be carried out prior to the actual installation of the line and all parameters for painting various bodies can be determined and tested. As a result, automobile manufacturers can accelerate implementation by up to 25 per cent, thereby significantly reducing the time between the investment decision for a new paint line and the actual start of production. In addition, with RobotStudio and the digital 1-to-1 copy of the paint line, adjustments can also be programmed and tested during operation, for example if body shapes need to be changed, or completely new vehicle models are to be painted on the system. The virtual programming environment allows for a fast and flexible adaptation of the system without first having to stop production.

ABB Ability ensures a higher factory availability
With ABB Ability for Paint, insightful information and data from the system, the robots, and the applications are transformed into valuable information on equipment and processes. Sensors integrated into the atomizer can assess the quality of the paint application, the correct layer thickness, the desired level of glossiness, and other parameters relating to surfaces and quality. Users can determine faults directly during an individual painting process, for example during the color application, and react accordingly. With a traditional visual inspection at the end of the paint line, the faulty color application would only be recognizable after a certain amount of time, and other vehicles would have been painted with the same defect. With ABB Ability for Paint, companies will achieve a first-run rate of almost 100 per cent with continuous availability thanks to early fault detection. As this reduces rework to a minimum, the material consumption will also be considerably lower. Furthermore, process optimizations reduce the energy costs of the paint shop, which accounts for more than 50 per cent of the total energy consumption in automobile production.

When maintaining paint robots and applications, users can also rely on ABB Ability Connected Services, the digital service portfolio that enables higher robot availability and better performance of installed systems. By means of RFID tags on relevant precision mechanical components such as the turbine, bell or steering ring, for example, component-related information such as life span or particular incidents is recorded. This also helps to ensure that the robot is re-equipped with the associated components even after regular cleaning or maintenance. This renders the maintenance strategy and service operations more efficient and enables activities to be prioritized so that production processes remain productive and available. Users will achieve up to 25 per cent fewer faults in their deployed robots and will be able to reduce the reaction and remediation time for problems by up to 60 per cent.

Conclusion
"With the extensive ABB Ability technology platform, automotive manufacturers will receive an extensive range of solutions to optimize their painting systems. This includes broad-ranging expertise on all painting processes and tools that enable you to improve the painting result through intelligent monitoring and analysis services," summarizes Karim el-Rikabi, Head Of Sales Europe Local Product Group Paint Automation at ABB. "With its services for virtual commissioning and maintenance, ABB rounds off its comprehensive portfolio of solutions that enable automotive companies to accelerate the construction of their paint systems and avoid unplanned production downtime."

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abb.com/automotive