ASIS
Automation Systems & Intelligent Solutions

Robotics

Solutions for your automation strategy

CONNECTING TECHNOLOGY AND PEOPLE

Abstract

Along with the shortage of skilled workers, the degree of automation continues to increase. This trend offers many advantages for companies: Robots can take over a wide range of tasks, relieve the workload on staff and help to increase productivity and quality. By using robots, companies can also free up their own staff to be deployed in other areas or to save costs. In this context, it is important to take a close look at the advantages and disadvantages of using industrial robots and make an informed decision about whether automation makes sense for your own company. We support you in this with our many years of expertise in robotics. We provide you with solutions that are targeted to the task, without unnecessary complexity.

Content

1. Standardized plants that are not standard

ASIS solves challenging tasks in automated plant engineering worldwide. The result for their customers are perfect coatings with the highest economic efficiency. The claim „Connecting Technology and People“ stands for perfect cooperation between man and machine and for sustainable value created in harmony with economy and ecology.

The company differentiates itself from its market competitors through its high level of expertise in control technology and the use of digital intelligence.

Fig. 1: ASIS Team

ASIS in numbers

- Founded: 01.05.1998
- CEO: Hans-Jürgen Multhammer
- Quality assurance: ISO 9001
- Information assurance: TISAX
- Export countries: > 30 worldwide

The wide range of competences includes turnkey plants in the field of coating, application technology, quality control, surface treatment, electron treatment, process automation technology and digital simulation.

The internationally positioned systems supplier exports from four locations in Germany and a subsidiary near Shanghai to over 30 countries worldwide.

TISAX® RESULT AVAILABLE

Qualitätsmanagement ISO 9001 DEKRA zertifiziert

2. Why ASIS?

ASIS combines technology and practice. Experts in surface technology, software and robotics are united under one roof at ASIS and are in lively exchange. This is how solutions are created that offer the user the maximum benefit. In the spirit of our claim „Connecting Technology and People“, we have made it our mission to optimally design the human-machine interface with a high level of solution intelligence in terms of simplicity and intuitive operation.

A good robotics solution is not the simple integration of an industrial robot. Only when automation, planning, safety, optics and operation interact optimally, it will generate maximum performance for the end user. Simplicity and intuitive operation boost the end user‘s skills and thus the ultimate utility value of the entire system.

We advise you independently of robot manufacturers. Since we do not develop industrial robots ourselves, we are not under pressure to sell these proprietary products. With a completely free view and overview of the entire industry, you get independent advice for your specific task. The result? The robot type that fits 100% to the job at hand.

Fig. 2: Plant for automatic loading of baking boxes with hangers and clips

VIDEO ON YOUTUBE

See the automatic workpiece pick-up!

https://www.youtube.com/watch?v=P2BHIwKexCQ

3. Robot selection

A robot should be ready for operation around the clock and at the same time perform its work safely and with consistent quality. That is why the selection of a suitable robot is essential for the safe and smooth operation of a production plant.

Why is a detailed robot robot selection important?

ASIS customers get a robot system perfectly tailored to their application.

On the one hand, the **reachability** is decisive, i.e. how large the robot must be dimensioned to reach all areas perfectly.

This question is clarified in a reachability study.

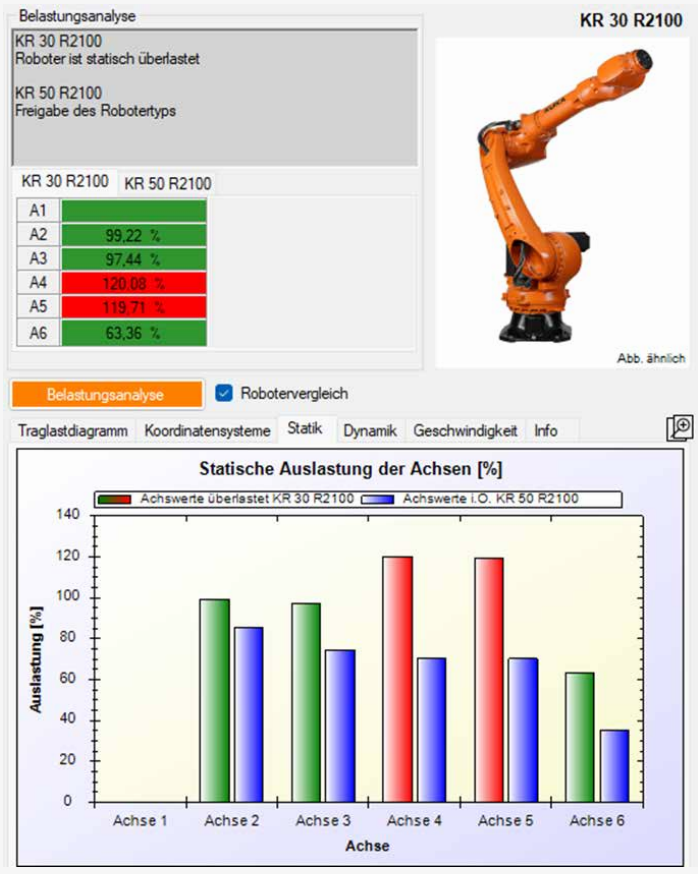


Fig. 3: Load data analysis Kuka

Advantages:

A robot that is correctly matched to the task has:

- a lower maintenance effort
- only the space required for its task space requirement
- a longer operating time and
- is more cost effective because only required „options“ are included.

Secondly, the robot is precisely designed for its **payload**. The center of mass, the expected load and the attachments mounted on the robot are included in the calculation. A robot that exceeds its maximum permissible handling load poses great risks to man and machine. On the other hand, an oversized robot will never achieve the same accuracy and speed as an optimally designed system.

Depending on the manufacturer, individual calculation programs are used for this purpose, which provide a center of gravity and load analysis.

4. Robot exchange

Plant operators are often faced with the challenge that their old robots are no longer supported by the manufacturers and therefore need to be replaced. In such a case, it is important to compare the old and new kinematics and to evaluate the integration effort in terms of translating the robot programs.

When planning the robot exchange, the technical specifications of the old and new robots must be carefully compared. Factors such as size, shape, movement patterns and control of the joints play an important role here. Only if the new robots are capable of performing the same tasks as the old robots a smooth exchange can be ensured.

Another important factor in robot replacement is the integration effort. The old robot programs must be adapted to the new kinematics so that the new robot can take over the tasks of the old one. Special software tools or converters that speed up and simplify programming are helpful here.

A successful robot exchange brings numerous advantages. Modern robots are more powerful, more precise and faster than their older predecessors and can thus increase manufacturing productivity. In addition, new manufacturing methods can also be introduced through the use of new robot technologies.

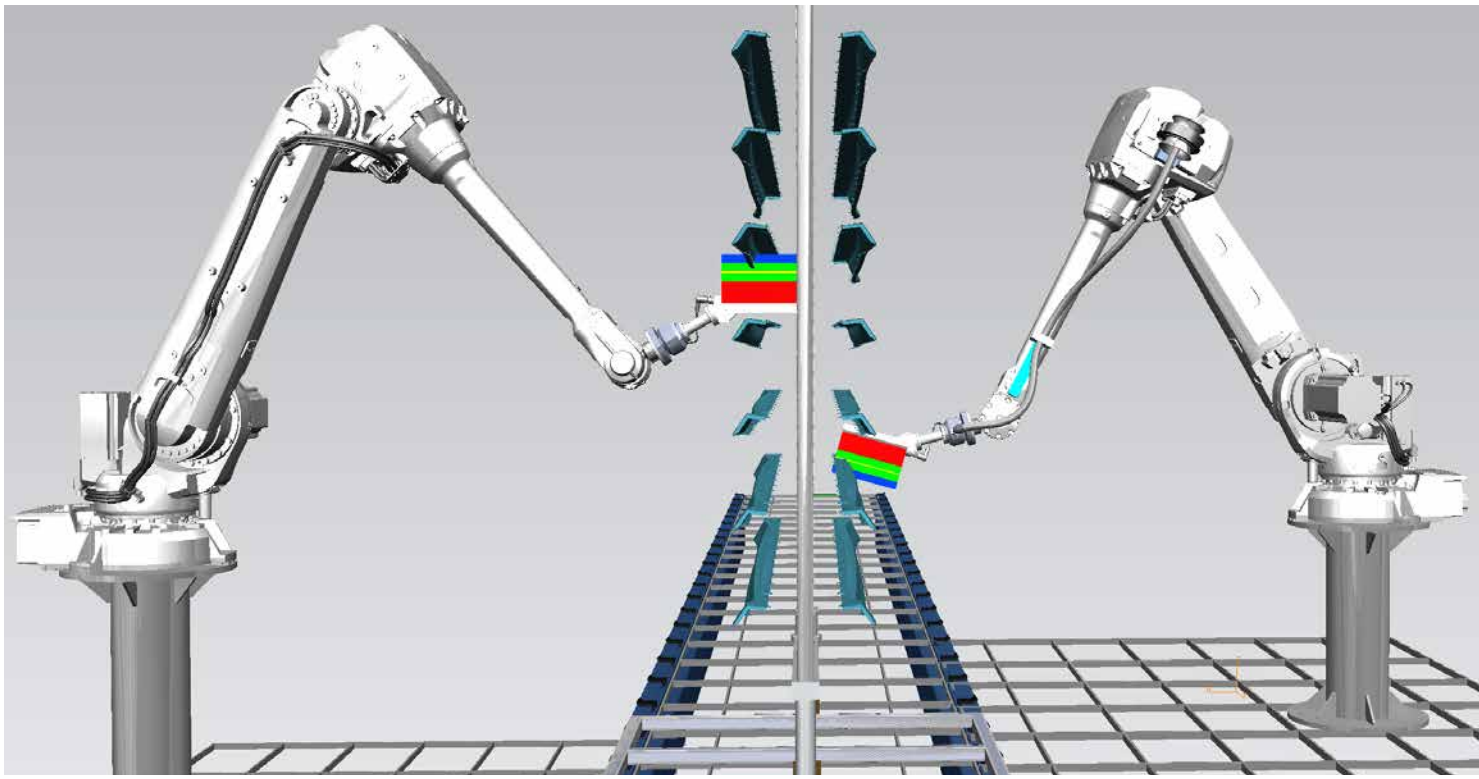


Fig. 4: Flaming robots

5. Commissioning of safety-related systems

Every robot manufacturer offers safety systems that create virtual zones or areas where robots are allowed to work. These technologies enable safe point-to-point collaboration between robots and workers on the production line. This involves permanently monitoring a robot and tool envelope against defined areas.

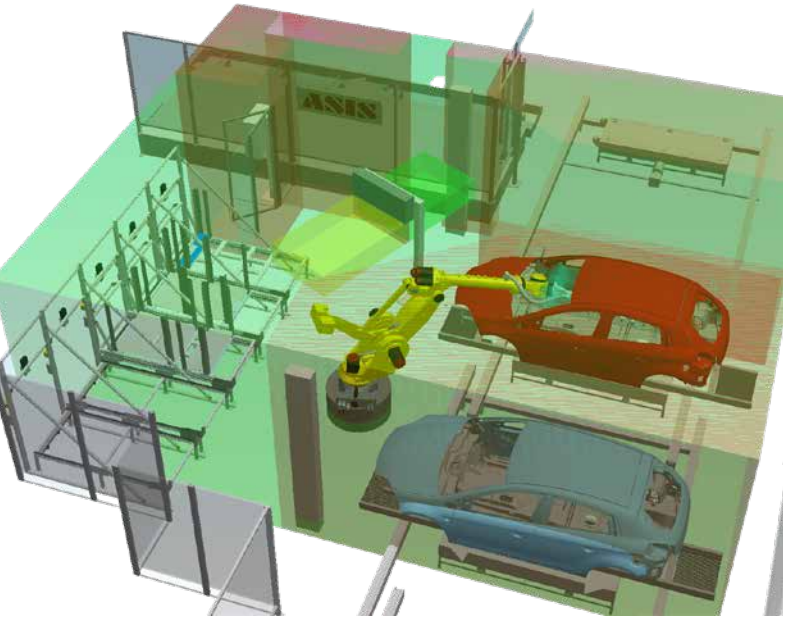


Fig. 5: Working/protection areas Fanuc System DCS

Where are these systems applied?

These systems are used in both personnel and machine protection. They are most frequently used for the permanent monitoring of protected areas. Here, a significantly wider field of application is offered.

In the situation of an open intervention area, for example, a restricted area can be dynamically activated in combination with sensor technology. The robot will in this case continue to work outside this area at its programmed speed and, as soon as it approaches the protected area, switch to reduced speed or stop safely.

Machine parts can also be permanently protected from collisions in the robot's workspace.

Why should ASIS do the commissioning?

Each of these robot-dependent systems must be parameterized differently and commissioned by a specially qualified and certified employee. ASIS employees are trained for the following common systems:

- Fanuc „Dual Check Safety"
- Kuka „Safe Operation"
- ABB „Safe Move Pro"

Advantages:

- No need for complex mechanical limitations of the robot
- Common protective devices such as safety switches, protective grids or doors can be partially left out
- Cartesian/spatial monitoring possible
- Protective areas can be dynamically switched on/off
- The area required by robot systems can be reduced to a minimum

6. Commissioning of robotic systems

Commissioning a robotic system is a critical step for reliable and long-term operation of the system. Proper commissioning is critical because robot manufacturers‘ systems differ in their control, programming environment and other features, and are constantly evolving.

Our experience and involvement in technologically advanced projects with well-known automotive manufacturers, suppliers and general industry keeps us up to date with the latest technology.

Supported controls

- Kuka KRC2, KRC4, KRC5, VKRC controls
- ABB IRC5 control
- Fanuc R30iA, R30iB(plus) controls
- OmniCore control (Training)

This know-how allows us to be flexible in the choice of robot type and to advise you independently of manufacturers.

Offline simulations enable us to apply the knowledge gained directly to the real system during commissioning. We can ensure that commissioning times are reduced to a minimum.

During virtual commissioning, the entire plant is set up digitally with all individual parts and processes as well as the control system. This detailed preliminary work not only shortens the time required on site, but the robot programs are also created and can be used in the final plant with minimal adjustments. All eventualities were digitally tested in this way, saving both time and money.

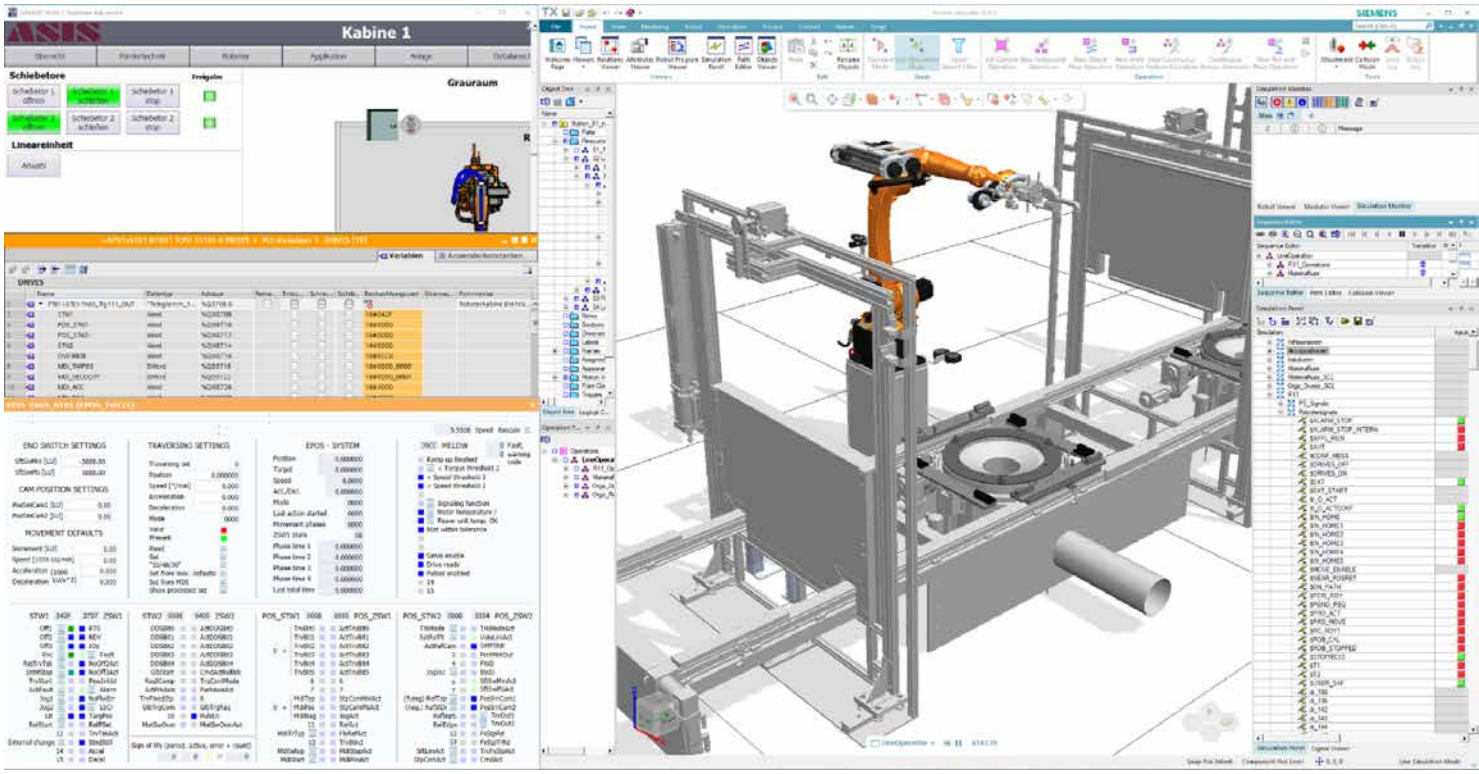


Fig. 6: Virtual commissioning reduces time on the real plant to a minimum

7. Process optimization for existing plants

In existing plants, there is increased potential for improving the process. Adjustments to programs, integration of robots or their replacement are relatively small interventions in the production environment, but they have a big impact on the productivity and resource consumption of the system.

7.1. Program optimization

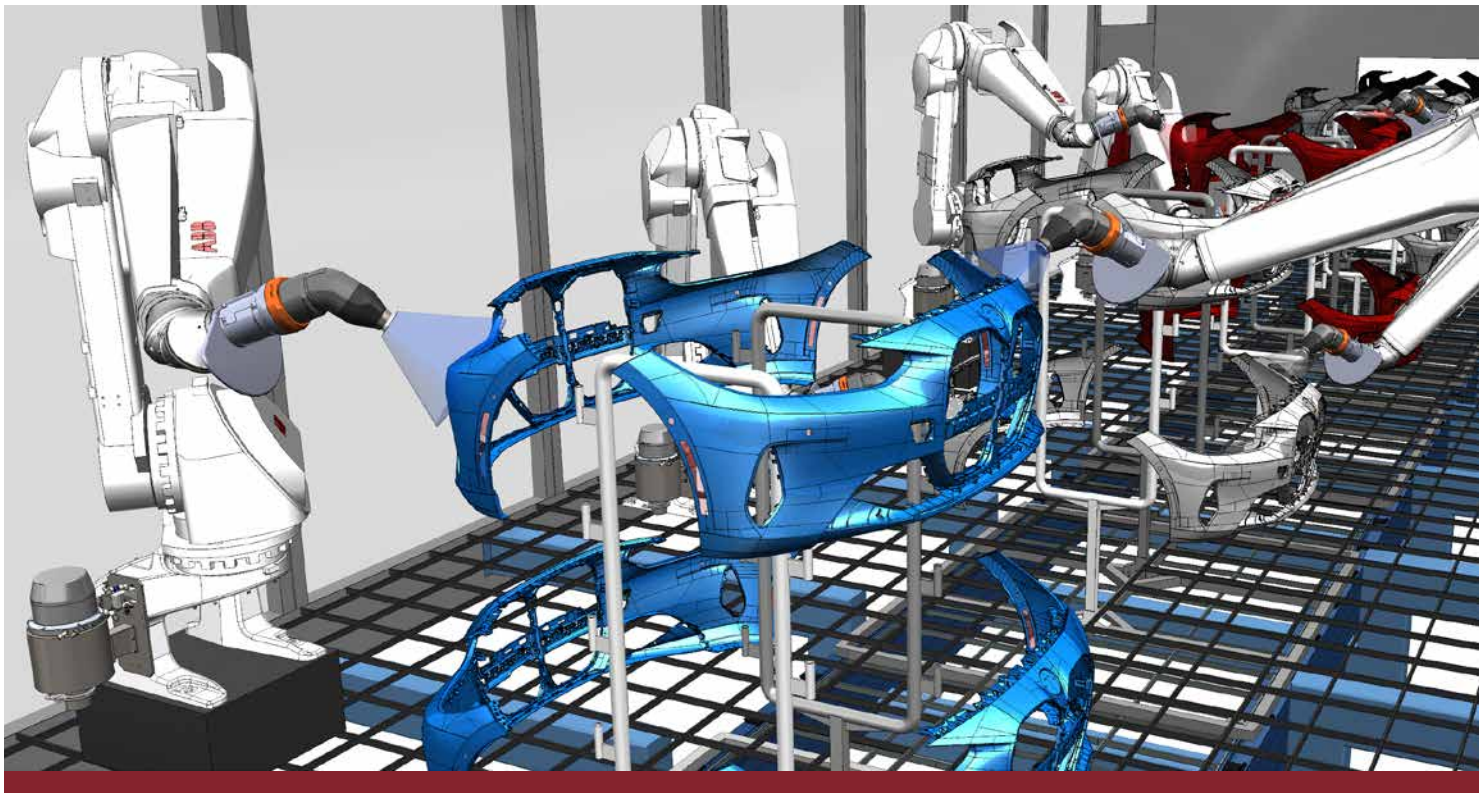
In existing plants, it is often necessary to quickly integrate new programs when changing products or introducing new products. At the same time, current production must not be affected. To meet these requirements, the web programs are created offline and commissioned on site at the plant during non-production times.

Offline programming allows processes to be planned and optimized precisely to ensure high production efficiency and quality.

The programming is based on CAD data or 3D models. An exact simulation of the robot's movements and the respective task, such as coating, is achieved in this way. To ensure that the integration of new programs runs quickly and smoothly, we use process specifications that we have developed ourselves and our many years of expertise through application engineers in production technology. Online time for fine-tuning is reduced to a minimum.

Due to the open source programming without black box, you will remain flexible and unbound from manufacturers in the future.

Fig. 7: Plastic parts paint shop



7.2. Exchange of vertical and horizontal axis systems

Linear axes are still widely used in many coating plants. In comparison to robots, they are significantly limited in terms of accessibility, flexibility and other factors. One possible solution to increase production efficiency and quality is achieved by replacing linear traversing axes with modern industrial robots.

Industrial robots offer a number of advantages over linear axes. Industrial robots are enormously mobile due to multiple axes and the combination with rails. This extremely long reach enables them to perform even the most complex tasks.

This flexibility continues when handling workpieces. While traversing axes are limited to a specific component shape or size, robots can optimally handle different components or products with different geometries. Plant operators benefit from an increase in flexibility and adaptability in production.

Fig. 8: Powder coating booth with robot and linear axis

Furthermore, industrial robots improve the quality of production. Due to their high precision and reproducibility, complex processes and tasks are executed precisely, reducing the error rate.

Our experience in the industry has shown that the combination of existing axis systems with industrial robots also work very efficiently. Axis systems have a high area performance and work very economically with 2D geometries. Together with the accessibility and precision of an industrial robot, an extremely wide range of parts from simple to complex components can be processed. In this way, the advantages of both technologies are combined.

8. Handling tasks

In production lines, many processes are still carried out manually by employees. This work is usually very monotonous and also error-prone due to human personnel. Furthermore, the health aspect plays an important role. ASIS supports customers in the changeover from manual to automated processes. The employee should not be replaced by a robot, but the work should be made easier and more reliable.

8.1. Layout planning

Layout planning for handling tasks of industrial robots is a key factor to ensure efficient and safe automation of production processes. Layout planning here relates to the positioning of the robots, their tools and the manufacturing components within the production environment.

At the start of planning, the requirements of the handling task must be defined, including the parts to be handled, the number of parts to be produced and the production rate. Then, the dimensions of the production area, locations of storage bays, machines and other production equipment are considered, ensuring that the robot has sufficient space to perform its tasks safely and efficiently.

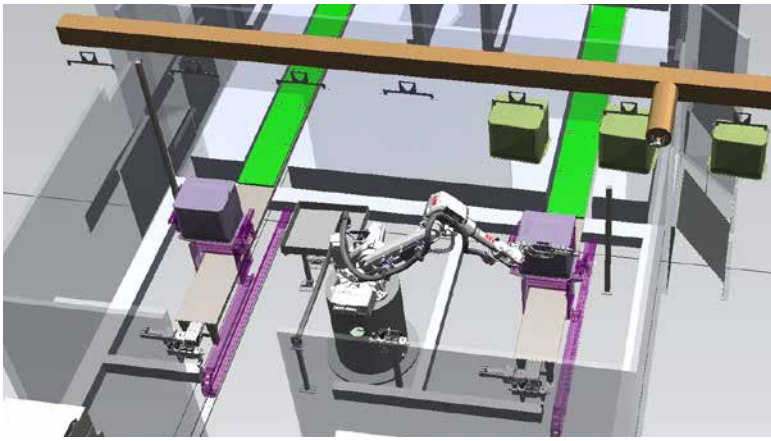


Fig. 9: Handling: rehanging workpieces

Another important aspect of layout planning is the ergonomics of the workstation. Here, care is taken to ensure that the robot is placed in an ergonomically optimized position to avoid unnecessary strain on the operating personnel and to ensure high production quality.

The integration of safety components is also an important aspect. This involves minimizing risks for operators and other persons, for example by installing protective fences, light grids and other protective measures to prevent accidents.

Layout planning must also take into account production requirements for the robots. This involves factors such as the size and weight of the parts to be handled, the number of axes of the robot and its reach, and the compatibility of tools and grippers.

Usecase:

Layout planning for automatic gluing in of cardboards

Task:

- In vehicle bodies, cardboards are to be automatically glued into the vehicle headliner.
- Different vehicle types are processed in the plant.

Realization:

- The cardboards are removed from holding jigs by a universal suction gripper and guided along a nozzle block.
- The nozzle block is equipped with variably adjustable adhesive nozzles that can be controlled individually to apply adhesive beads to the boards.
- The boards are then pressed onto the headliner in a single operation and are bonded to it.

Benefit:

- The process has been completely automated.
- The boards are precisely glued in place. A rework station for final inspection has been provided.

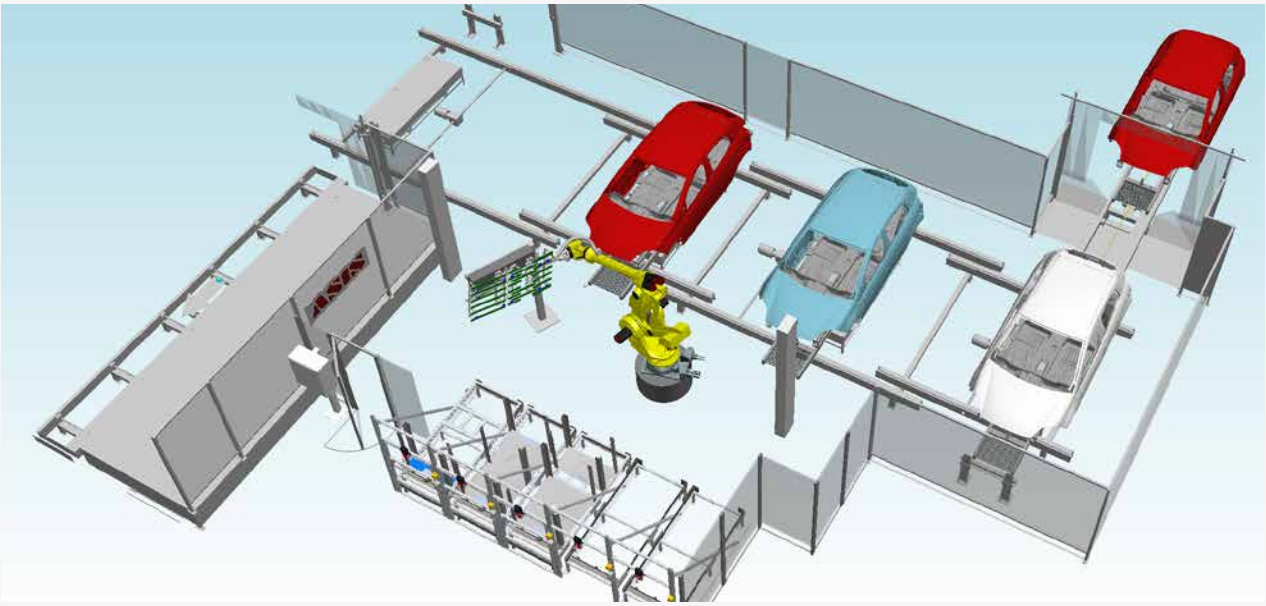


Fig. 10: Layout planning for automatic gluing in of cardboards

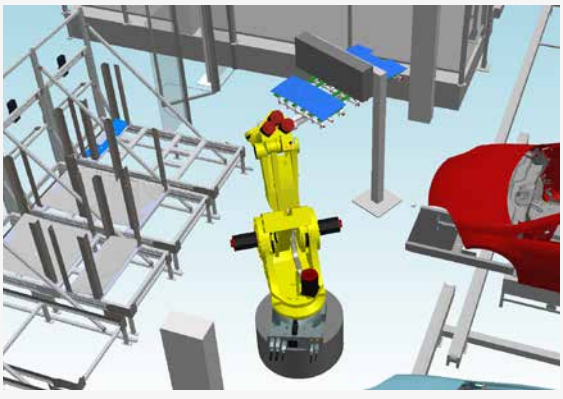


Fig. 11: Application on the nozzle block

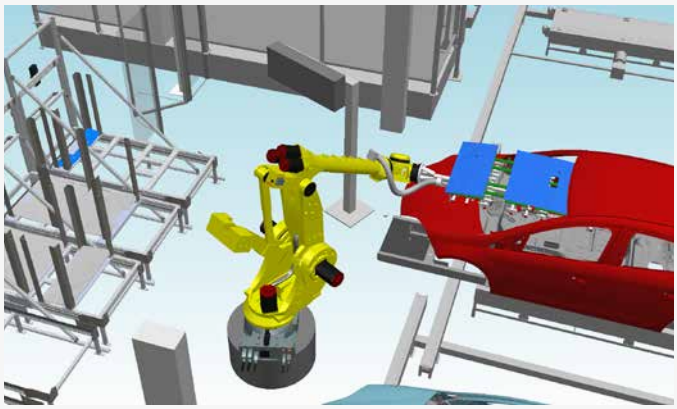


Fig. 12: Gluing into the vehicle headliner

8.2. Design and integration of handling equipment and parts

Handling tools are used to handle and position a variety of materials and components. Several factors must be considered when planning and designing handling tools. First and foremost, the requirements of the handling task must be defined, including the parts to be handled, the number of parts to be handled, and the production rate. Then, a suitable gripper technology must be selected to meet the requirements of the handling task.

There are different types of handling technologies, such as grippers, suction cups, magnets and clamps. The selection depends on the characteristics of the material to be handled, such as size, weight, shape and surface finish. Gripper technology should be robust, easy to install and maintain to minimize production downtime. A weight-optimized design minimizes the payload to be handled.

Handling equipment can also be equipped with sensor technology (camera systems, light/laser systems, and many more). Sensor technology makes it possible to monitor the status of parts and ensure that they are correctly positioned. This helps to avoid errors that could lead to scrap or damage.

On existing plants, part generation changes usually require adjustments to handling tools, robot programs and robot systems. Integration into the existing plant can also be handled by ASIS. Due to the previous offline programming and detailed load data analysis, the time of plant downtime is reduced to a minimum.

Fig. 13: Simple handling device for rehanging parts

Usecase:

Gripper construction for automatic gluing of cardboards

Task:

- The gripper must be compatible for multiple board types.
- Multi-part components must be picked up simultaneously
- Uniform pressing of the cardboard on the three-dimensional headliner

Benefit:

- Flexibility even with changing workpieces in the future
- Fully automated process
- Process reliable and repeatable

Realization:

- Universal gripper design for various components
- Safe pick-up of the components via flexible suction cups
- Uniform pressing of the workpieces against the three-dimensional vehicle headliner with flexibly mounted pressure bars.

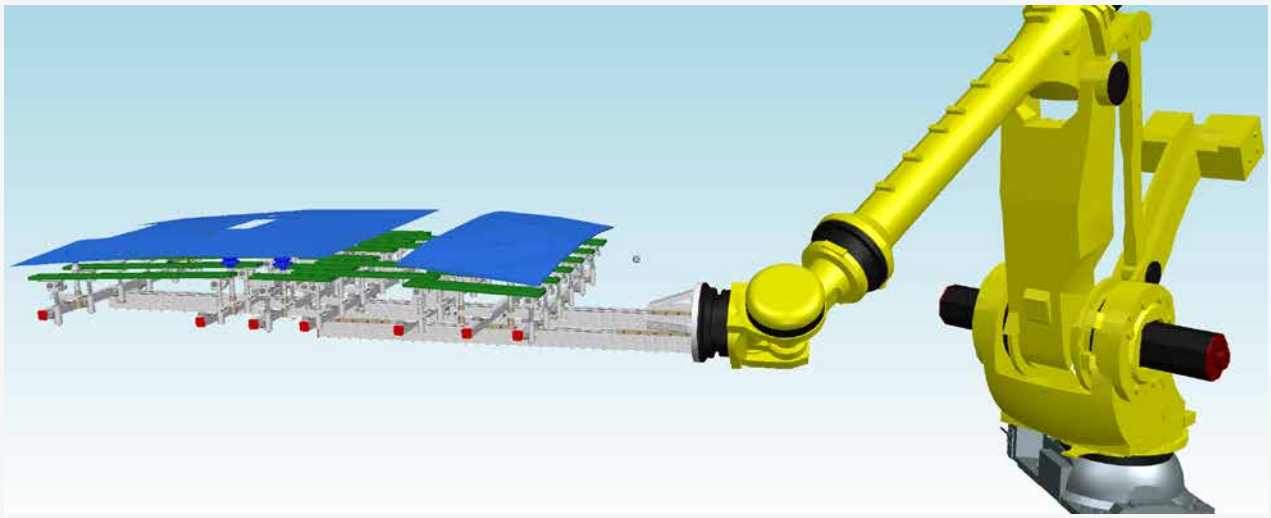


Fig. 14: Gripper to robot

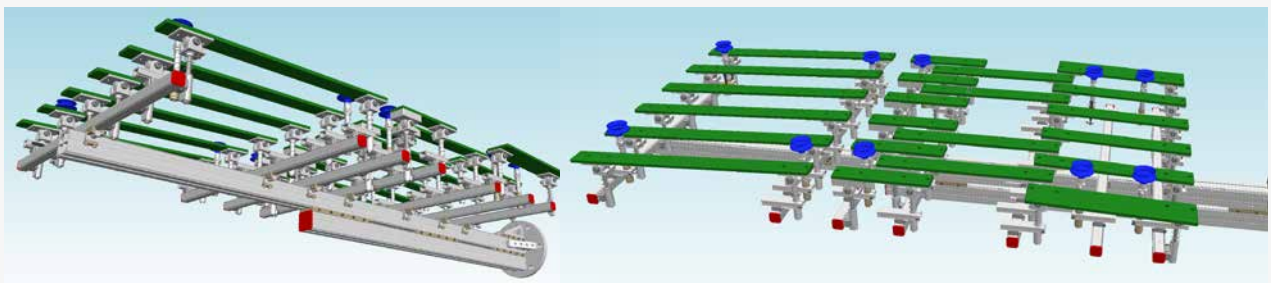


Fig. 15: Construction gripper

9. Summary

In order to increase the profitability and competitiveness of a production company, it is important to drive forward continuous process optimization. The lack of qualified workers can be compensated by a higher degree of automation. The use of industrial robots frees up the company's own personnel, who can then be redeployed elsewhere. At the same time, quality is achieved through the 100% repeatability of the robot systems.

The correct selection of the robot according to requirements is a decisive step for efficiency and safety. The selection as well as the dimensioning of the robot systems plays an a key role. Dynamic monitoring of the safety area ensures the protection of man and machine without compromising production performance.

High potential also lies in the optimization of existing systems. Improved programs or changes, for example due to the integration of new parts in the coating process, are programmed offline. This means that ongoing production is not disrupted. Updates are applied quickly and smoothly with minimal online time. Replacing linear traversing axes with industrial robots in coating applications delivers higher efficiency, flexibility, accessibility and quality.

In material handling, robotic systems create relief for workers performing monotonous, heavy or hazardous tasks. At the same time, error slip is prevented. Through a sophisticated layout, the targeted design of the handling device and its subsequent professional integration, almost every manual task can be automated.

10. Contact

For more information or questions about robotics, please contact:

Sebastian Gruber
s.gruber@asis-gmbh.de

Phone +49 871 27676-36
Mobile +49 1761 2767636

ASIS GmbH
Kiem-Pauli-Straße 3
84036 Landshut - Germany

www.asis-gmbh.de

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