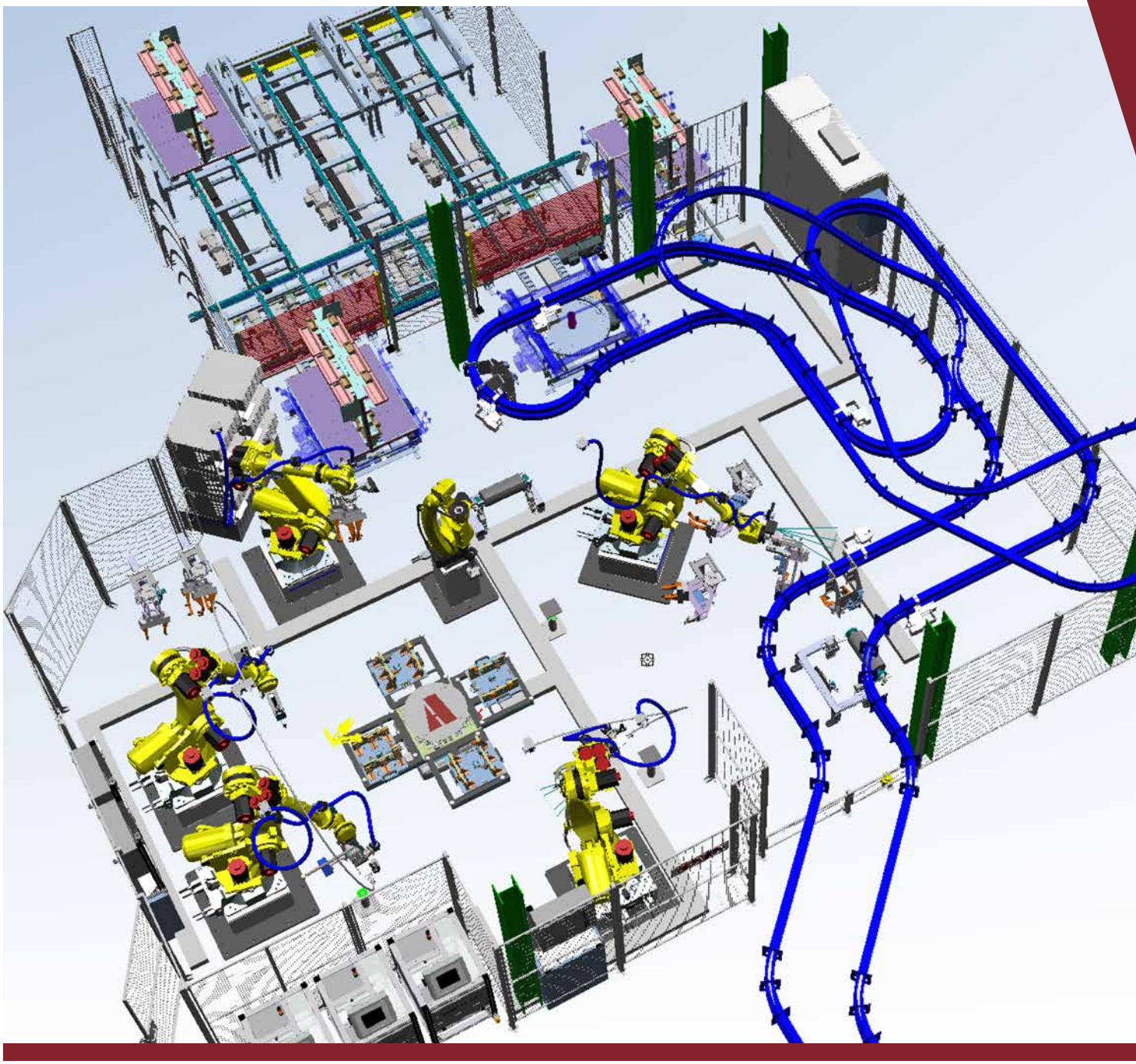
ASIS
Automation Systems & Intelligent Solutions

Virtual Factory

Digitization of automatic processes



CONNECTING TECHNOLOGY AND PEOPLE

Abstract

Hardly any plant is built today without first digitally checking the accessibility and determining the dimensions. The focus is usually on robot simulation with automatic generation of the robot programs (offline programming).

ASIS also offers a broad portfolio in the area of digital factory, which fully accompanies the customer from the acquisition of input data by means of 3D scanning to digital commissioning.

A precise and detailed digital pre-planning with all possibilities ensures a cost-saving and smooth commissioning and a flawless assurance of the forecasted throughputs.

Holistic plant planning is a basic principle at ASIS.

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. Painting and simulation experts are united under one roof at ASIS and are in lively exchange. This is how simulations are created that show a precise image of reality. For you, this means: You receive integrated planning concepts as early as the tendering phase and benefit from our comprehensive and manufacturer-independent expertise in the areas of pretreatment, coating, quality assurance and all related processes.

We operate our own competence center for simulation. Classic robot simulations, offline programming, material flow simulations, virtual commissioning or the use of state-of-the-art 3D scanning technology show the range of possibilities.

You know how well your plant will work before you even break ground and can optimize performance and functionality.

3. Virtual protection

3.1. Accessibility studies

So-called virtual protection is becoming increasingly important in plant design. This begins in the initial design with an accessibility study. Here, suitable robots are selected and their location is determined. In this way, a finished layout of the later plant is created.

What questions does the accessibility study answer?

ASIS customers not only get an answer to the question of which type of robot to use, but also whether it can perform its tasks optimally.

By reachability, our specialists always understand the so-called „process-related reachability“. It is not just a matter of reaching a certain point while maintaining axis reserves in space. Often, a certain angle of the applicator in space is also necessary at the point, or the point lies, for example, on a path that can be traversed linearly without running into a singularity.

What are the advantages of this?

However, the reachability study not only provides the right robot type and its location.

Other results include the design of adapters between rail and robot as well as hand axis adapters. A professional reachability study always yields the optimum ratio between robot size and the peripherals used.

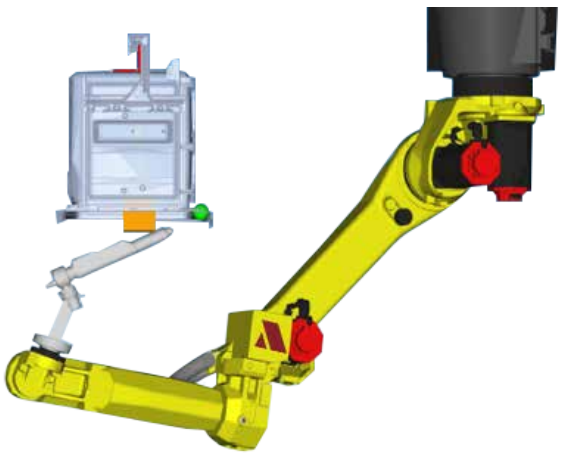


Fig. 2: Accessibility study powder coating

3.2. Cycle time studies

In the next step, the individual process steps are examined in a cycle time study. Here, the individual work steps of the robots are precisely represented with the aid of virtual replicas of the robot controllers.

Of course, the process knowledge must not be missing in such robot simulations. Therefore, we at ASIS always combine both worlds and have simulations, for example in the painting area, carried out by our experts with the corresponding painting experience.

Because only the combination of the robot movement and the ability of the applicator to perform the required task results in a functioning process.

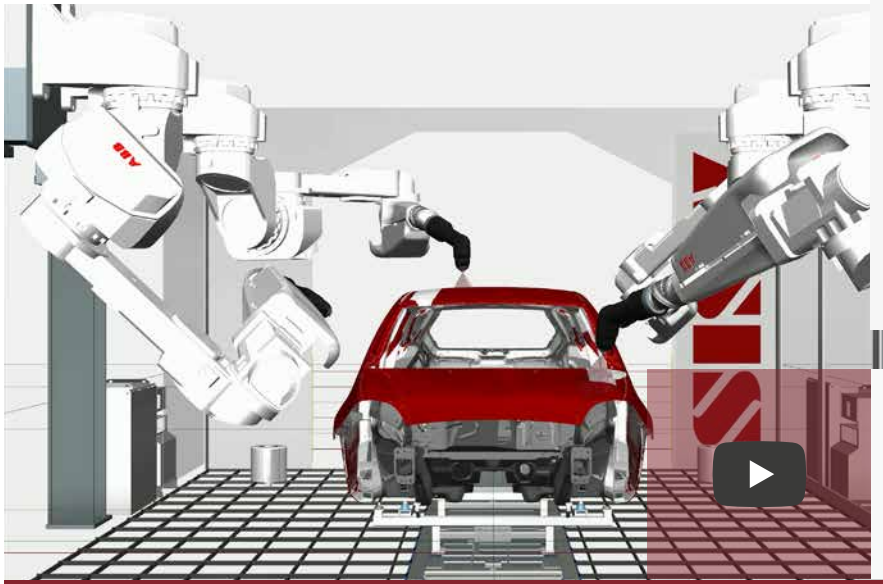
What questions does the cycle time study answer?

The cycle time is often made up of several components. Our customers are not only interested in the question of „whether it fits into the cycle time“, but also, for example, how much optimization reserve is still available in the painting process after program commissioning. In our cycle time studies, we therefore always take into account all non-productive times, such as conveying times, signal exchange with the PLC, or times for camera or plugging systems.

What are the advantages of this?

We schedule the remaining net cycle time on a process-related basis with the most uniform possible robot utilization, always retaining a reserve which can be used for appropriate optimization on the construction site after the programs have been commissioned. This ensures that a previously determined discharge rate does not have to be exceeded later.

Fig. 3: Top coat simulation of vehicle body



Usecase:

- Exterior painting of a car body

Task:

- In the robot simulation, corresponding paint tracks were placed on the car body.
- After program commissioning, it becomes apparent that additional pre-painting webs are still needed along the tornado line for structural improvement.

Benefit:

- These could be inserted without exceeding the previously planned cycle time or increasing the painting speed and thus the outflow rate on the surfaces.

VIDEO ON YOUTUBE

See a top coat simulation!

https://www.youtube.com/watch?v=hkclWUuD928

4. Offline programming

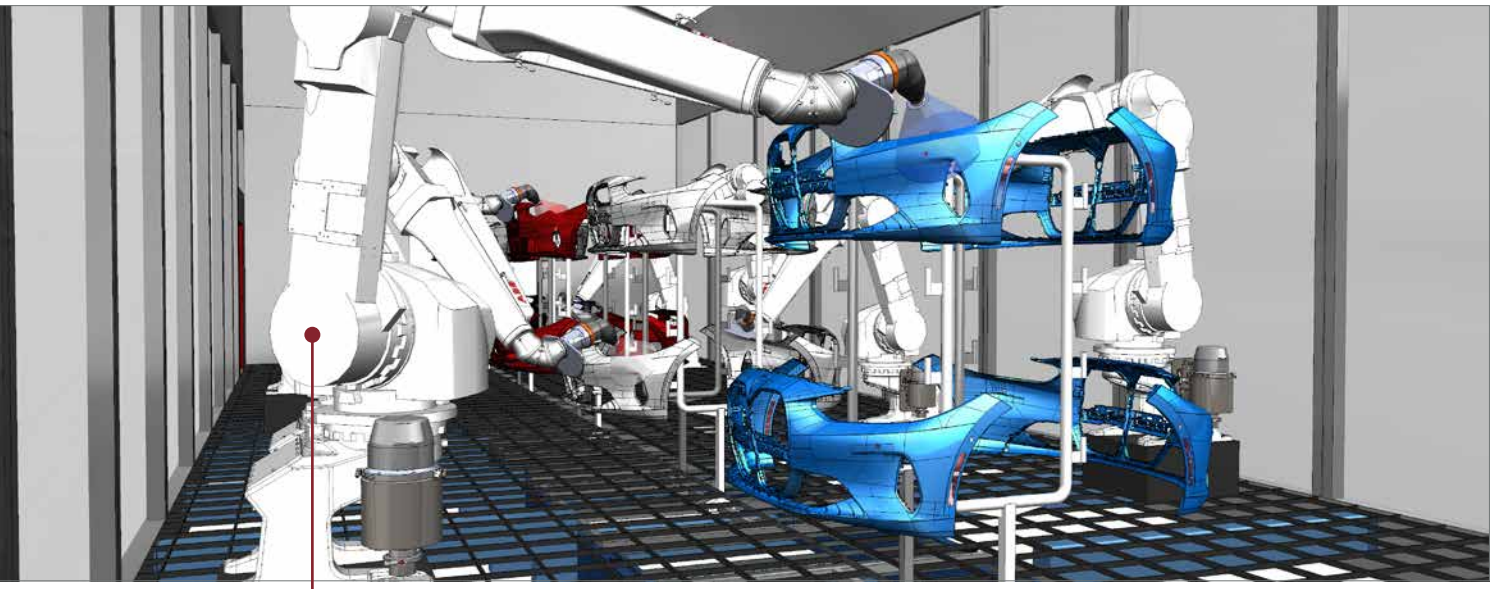
Of course, even the most detailed simulation is not an end in itself, but leads in the end to an implementation in a real plant.

We therefore see it as a matter of course that not only the knowledge gained in the simulation is reused in the plant, but also, for example, the robot programs robot programs already created there.

Advantages:

- Direct generation of robot programs from the simulation
- Acceleration of commissioning
- Saving of costs

Fig. 4: Simulation top coat plastic parts



These can be put into operation directly after appropriate setup of the real plant on site and deliver the desired results after a very short time.

Of course, it goes without saying that there is a certain need for optimization on site, especially in the case of application-specific applications. We keep this as low as possible by adhering to our self-developed process rules, which we already apply in the simulation.

Automatic generation of the finished robot programs:

```
PROC MainX761()
   MoveL lo_1,v600,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_2,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_3,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_4,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_5,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_6,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_7,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_8,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_9,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_10,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_11,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_12,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_13,v800,z50,tcp_100\Wobj:=wobj_flaming;
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   MoveL lo_19,v800,z50,tcp_100\Wobj:=wobj_flaming;
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   MoveL lo_21,v800,z50,tcp_100\Wobj:=wobj_flaming;
   MoveL lo_22,v800,z50,tcp_100\Wobj:=wobj_flaming;
```

5. Overall simulations

In most robot simulations, individual process steps are considered, for example the interior painting of a car body or the powder coating of a baking case.

In overall plant planning, many process steps are usually linked together and their process times can differ greatly for the various products.

Advantages:

- Linking of robot simulations and a material flow simulation
- Simulation of interlinked processes
- Ensure exact cycle times
- Avoid overdimensioning

In the automotive industry, customers like to examine the „largest car body“ here in order to be on the safe side. All the necessary applications must be completed within the required cycle time. In the end, with different processing times of the workpieces, this inevitably leads to an overdimensioning of the system in practice, since a fixed cycle time is calculated in each station during the design.

ASIS therefore offers a holistic plant design in which we link the pure robot simulation of the individual stations with a material flow simulation of the entire plant. The correct design of the connecting conveyor technology with its buffer sections and also the consideration of error possibilities in the individual areas up to the determination of the number of necessary zones working in parallel is in the foreground here and leads to an accurate design of the entire plant.

In such considerations, it has already been proven that if all the different processing times of the components are taken into account, the number of stations and thus the overall size of a plant can be considerably reduced.

This results in important findings and high potential for cost reduction both for new plants and for modernization, retrofit and conversion.

VIDEO ON YOUTUBE

See a material flow simulation!
https://www.youtube.com/watch?v=UlBtRGThEFo

Fig. 5: Overall simulation of the enamelling line

6. Virtual commissioning

One of the currently highest disciplines in the virtual factory is the so-called virtual commissioning.

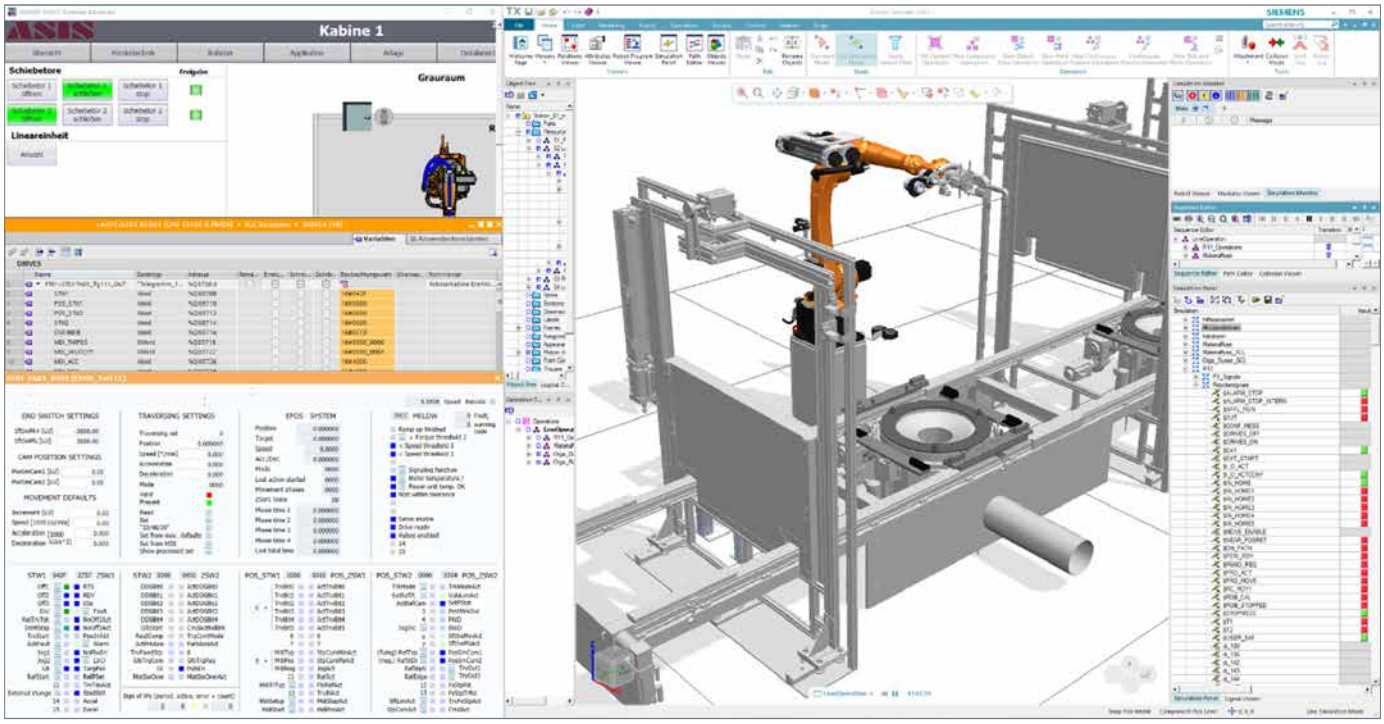

Fig. 6: Virtual commissioning

At ASIS, the various disciplines involved in the plant are directly linked to each other. Even before the first screw has been set, our employees sit together at the virtual plant and put it into operation.

The virtual image of the PLC including the program running there is connected here with the robot simulation and a parallel simulation of sensors and actuators to form an entire virtual plant in which every single functionality can be tested in advance.

The reduction of on-site times is a strong focus here.

Virtual twin

Virtual commissioning requires the creation of a virtual twin of the plant. Each sensor and each actuator is mapped with its real behavior and linked to the corresponding signals of the plant control.

Only in this way can real functional tests of the plant be carried out.

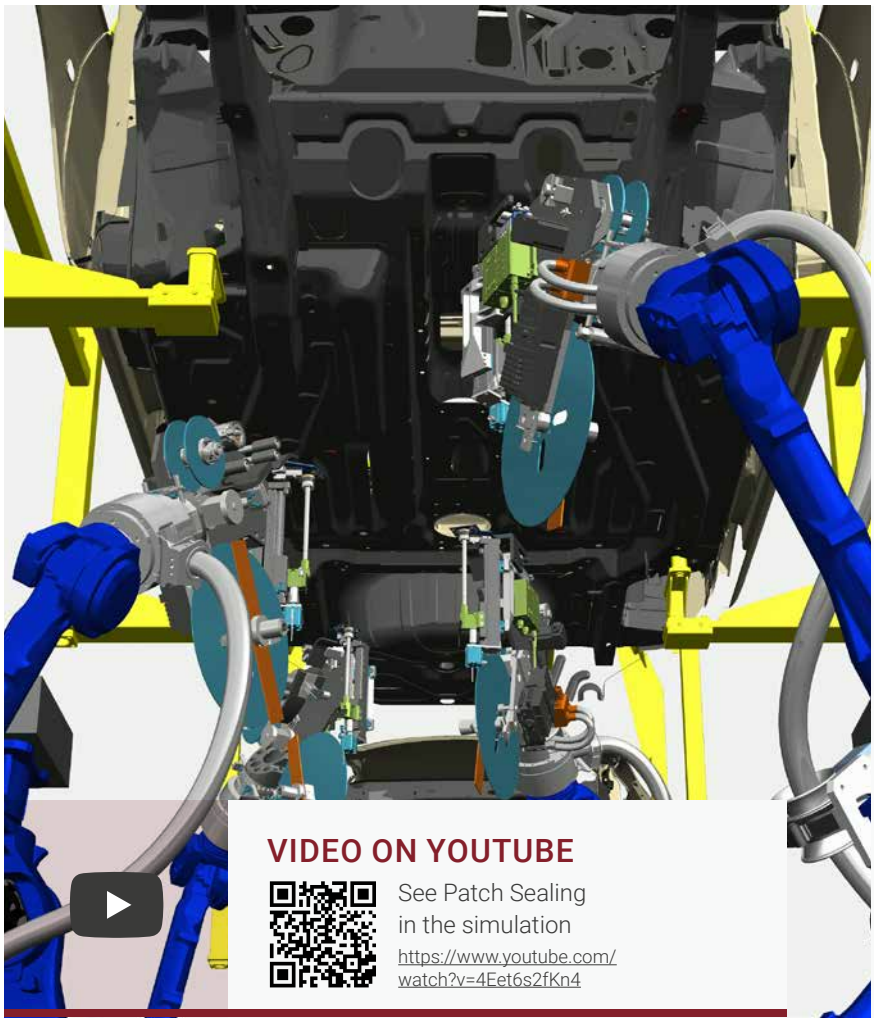

Fig. 7: Patch sealing

Usecase:

- Patch sealing (automatic hole sealing) for corrosion protection on car bodies

Task:

- In our simulations, the application head is represented with its real mechanical and also signal behavior.

Benefit:

- This results in much more accurate application times for different application distances, as the virtual twin of the applicator even takes into account the different movement times of the pad.
- This enables us to predict the number of possible pads within the required cycle time much better.

7. Virtual input data: 3D scanning

Especially the planning in the brownfield area requires an exact recording of the conditions on site. The measuring tools commonly used to date, such as laser measuring devices, meter sticks or measuring tapes, only cover a small part of the area. Re-measurements are often necessary, because in practice it is never possible to take into account all the dimensions and conditions on site in just one appointment. Re-measurements are additional work and cost time and money. There is also a lot of room for improvement in terms of precision.

ASIS has therefore invested in a modern 3D scanning process and now offers this technology both internally for plant planning and externally as a service.

Advantages:

- Use for all kinds of surveying tasks
- As a service or for internal planning
- Capture all data in one appointment
- Generates editable 3D volume data
- Powerful software for customers (walk-through)
- Ideal for documentation of existing plants
- Acceleration of commissioning

The great advantage of the procedure is that all conditions on site can be recorded in only one appointment. Every detail, no matter how small, that previously went unnoticed in the planning process and led to problems later on, is included in 3D scanning. A highly accurate digital image of reality is created and used as the basis for the planning process. The result is a smooth process across all interfaces.

The scan is performed using multiple measurement points that are combined to create an overall image. For each measurement, a 360-degree photo is also created and integrated into the model. Powerful software then converts the point cloud into surfaces and solids. The three-dimensional object can now be used in common 3D programs. The entire environment is thus transformed with little effort into a high-precision digital image in which all details are taken into account and any dimensions can be extracted.

The subsequent processing of the data leads, on the one hand, to a „virtual tour“ (walk-through) that is freely accessible to all participants and in which any point in the plant can be measured for one‘s own purposes.

Fig. 8: Digitization of the plant

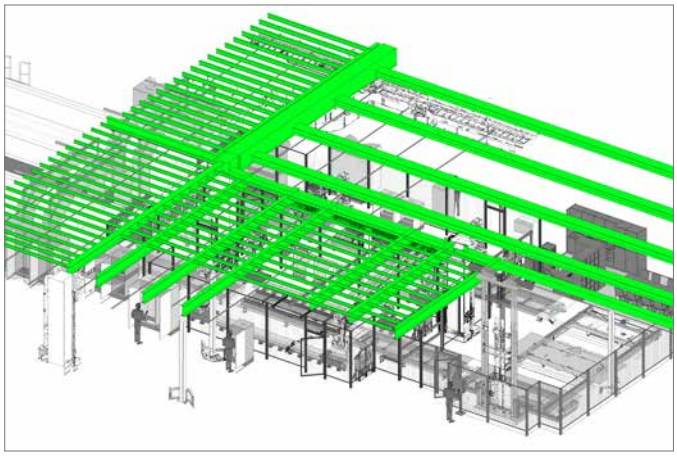

Fig. 9: Precise basic data for plant design

8. Video Links

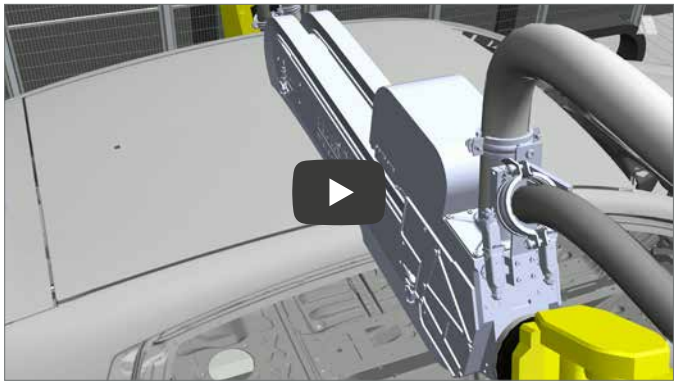

Fig. 10: Sword brush

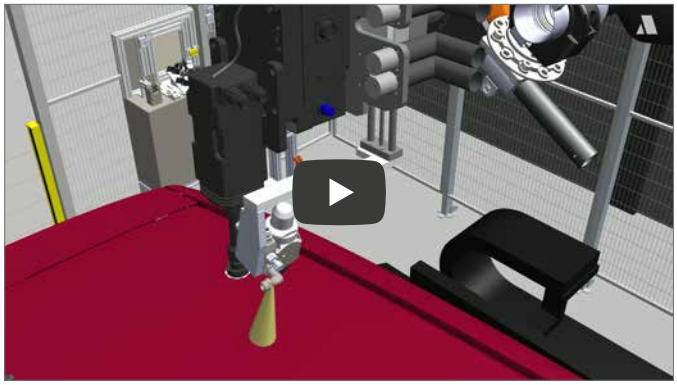

Fig. 11: Automatic finish

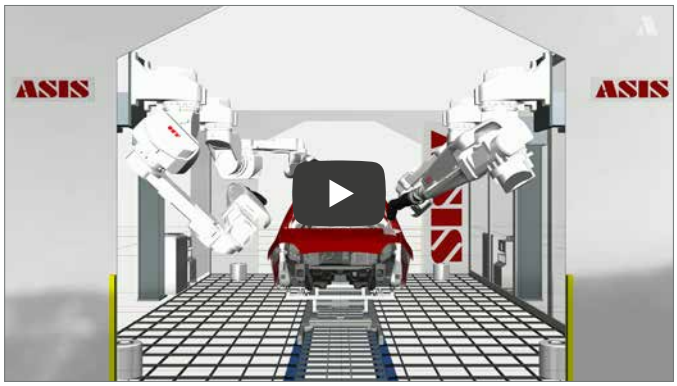

Fig. 12: Top coat

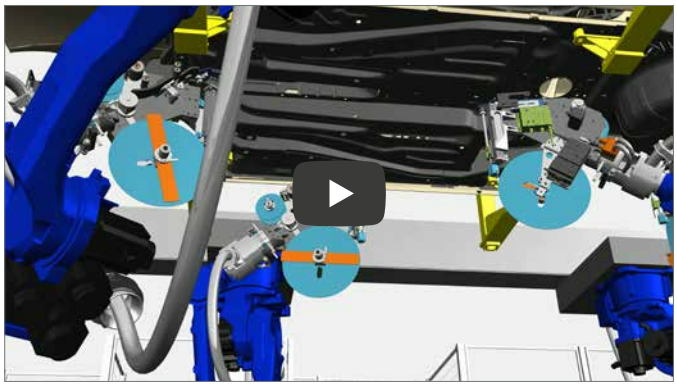

Fig. 12: Patch sealing

Fig. 13: Primer sanding

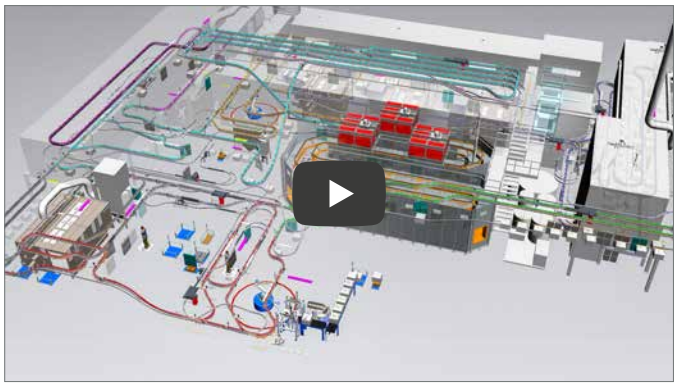

Fig. 14: Overall simulation

9. Summary

For us, intelligent planning services mean knowing you and your environment in detail. With an overview of the entire value chain of surface technology and the use of state-of-the-art planning technology, we can develop customized solutions for you that create long-term, economical and sustainable value.

We use the latest planning tools to ensure maximum safety and speed in the planning phase, smooth commissioning and predicted performance. For this purpose, ASIS operates its own site, which answers all your questions about the virtual factory and develops appropriate solutions.

10. Contact

For further information or questions about the virtual factory please contact:

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