Safely Automate Grinding, Polishing and Deburring

Grinding surfaces, polishing, or deburring edges are labor-intensive and cost-intensive work steps in almost all areas of industry. Employees are also exposed to high levels of stress. On the other hand, there are the advantages of automating the process. The absolute repeat accuracy of robotics enables consistent quality to be achieved. In times when there is a shortage of skilled workers, personnel become available that can be deployed elsewhere.

Matthias Gröll

Many companies are not faced with the question of whether a manual processing step can be automated, but rather how it can be solved for their specific requirements. These are factors such as integration into the existing process chain, limited space requirements, time constraints and, of course, the expected quality of the product. Except the quality, which requires a test under real conditions, all questions can be answered with the tools of the virtual factory.

3D-Scanning

Planning in the brownfield area requires an exact recording of the conditions on site. However, the measuring tools commonly used to date, such as laser measuring devices, meter sticks or tape measures, only ever represent a small part of the area. Existing plans often do not include all the details, such as pipelines, that are required for planning. It is therefore often necessary to re-measure. Re-measurements are additional work and cost time and money. There is also still a lot of room for improvement in terms of precision.

Using 3D laser scanning, a high-precision digital image of the entire environment is created in just one session, which can be integrated and further processed in all common 3D programs. Every detail, no matter how small, that previously went unnoticed in the planning process and later resulted in problems, is included in 3D scanning. The subsequent further processing of the data results in a virtual tour (walk-through) that is freely accessible to all participants, in which any point in the plant can be measured for their own purposes.

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Passive force control is particularly suitable for simpler geometries.

Accessibility

Reachability is not to be seen in the context of whether the process can be reached, but how well the robot reaches the area to be processed. The focus is therefore on selecting the right type of robot and its location. The reachability study not only provides an answer to the question of which type of robot is used, but also whether it can perform its task optimally. Secondly, the robot is precisely designed for its payload. The center of gravity, 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 a great risk to man and machine. Conversely, an oversized robot will never achieve the same accuracy and speed as an optimally designed system.

A robot that is correctly matched to the task at hand requires less maintenance and only takes up the space required for its task. It is more cost-effective, as it only contains options that are required and

has a longer service life, which in turn increases the availability of the overall system.

Cycle time

In the next step, the individual process steps are examined in a cycle time study. The cycle time study not only provides information on whether the process fits into the cycle time, but also how much reserve is still available for optimization. The individual work steps of the robots are precisely depicted with the aid of virtual replicas of the robot controllers. In such robot simulations, process knowledge from practice must not be missing. Ideally, the cycle time study is carried out by simulation experts who have practical experience in automated surface processing.

Offline programming

Even the most detailed simulation is not an end in itself, but ultimately leads to implementation in a real system. Of course, not only the knowledge gained in the simulation is reused in the system, but also, for example, the robot programs already created there. Thanks to offline programming, these can be put into operation directly in the real system and deliver the desired results within a very short time. Commissioning is accelerated and costs are saved as a result.

Editing tools

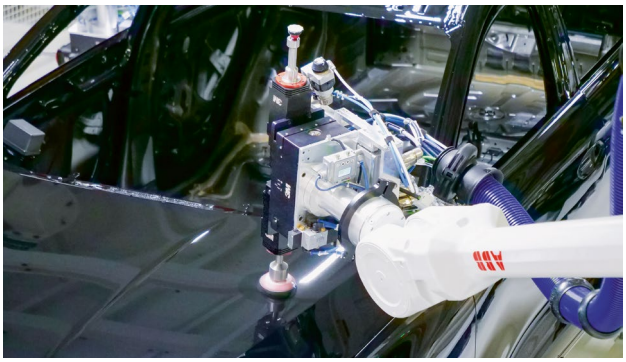
There are now many manufacturers of machining tools on the market. As the operator of the system, you benefit first and foremost from high-quality tools that can withstand long-term industrial use. In principle, an appropriate power reserve should be ensured, as permanent overloading will inevitably lead to failure of the device.
The robot servo spindles from US manufacturer PushCorp deliver a high power-to-weight ratio and high efficiency. The liquid-cooled motors always achieve 100 % capacity usage. Versatile mounting options and tool change via pneumatic mandrel or manual tool holder provide the necessary flexibility.

Force compliance

The tools are suitable for single or double mounting on the PushCorp force control. The sensitive force control ensures a constant contact pressure in every direction, independent of the robot arm. This can be applied on one or both sides. Active or passive force control can also be selected depending on requirements. With active force control, the contact pressure is set once, and the device regulates it independently in any position. This variant is used for complex three-dimensional contours and wherever maximum precision is required.
With passive force control, the contact pressure is set using external compressed air. The pressure is programmed for each position. Passive force control is particularly suitable for polygonal, flat workpieces and simpler applications such as smoothing weld seams. The advantage is a much simpler and therefore more cost-effective design. The leading manufacturer in the USA is now also available to end users and integrators in Germany and Austria via ASIS GmbH (Automation Systems and Intelligent Solutions), a supplier of complete solutions for the global automotive and supplier industry.

Partner

As an official PushCorp sales partner, ASIS also provides after-sales service. This includes a physical contact point at the company headquarters in Landshut (Germany) for repairs and technical support.
As a general contractor, ASIS also has further partnerships with 3M and CIT (Automappps) in the field of automatic finishing, the automatic repair of defects on painted or cathodic dip coating surfaces.
As an authorized service center for the 3M Finesse-It Robotics Paint Repair product range, the system provider is the point of contact for warranty, maintenance, repair or complete replacement products in an emergency. The products can be quickly repaired in the service workshop by specially trained personnel.
As part of a sales and integration partnership with CIT, inquiries about the Automappps software are handled directly by ASIS. Services such as the integration of new body types into existing software environments can be handled in full by the Landshut-based company's team.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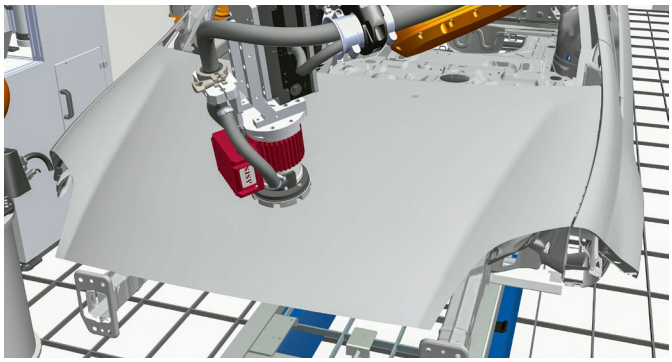
The finishing process is also automated.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Virtual pre-planning minimizes the risks during implementation.

Medium change and dosing

Sanding discs and polishing sponges are consumables that require an automatic change system. These components are crucial for the reliable operation of the entire system. If the sanding disc is not picked up, or is picked up at an angle or not exactly according to its hole pattern, this has extreme consequences for the workpiece, which in the worst case can become unusable. ASIS has been manufacturing changing stations for many years, which are used by the company itself or by various integrators worldwide. Sensors check the correct intake of the sanding and polishing medium so that the entire system can work smoothly. Some applications, such as the automatic finish, also require the application of polishing and sanding pastes. Products designed for automatic operation are also available for this purpose. ASIS can carry out the necessary live tests with its own workpieces and process material in several robot cells. In principle, the client remains independent and can continue to use existing suppliers.

Software platform

One of the latest topics in digital transformation is the collection and evaluation of data in production systems. The data usually lies dormant and unused on the plant's control systems. With Surface Analytics 4.0, ASIS offers a platform that transfers all relevant data from the PLC to a database and then prepares and visualizes it clearly in a web application. From the evaluation of system availability to the tracing of faulty components, all information is provided centrally in one interface. The graphical evaluation also provides information on productivity and energy consumption and calculates predictions for upcoming maintenance. The future-proof OPC UA communication standard was used here. The system is optional and can be omitted for smaller project scopes in order to present them economically.

Conclusion

There is enormous potential in automated processing. The trend towards automation will continue due to the tightening labor market. Precise virtual pre-planning avoids the risks of changeover. Field-tested complete systems and reliable after-sales enable predictable added value for the plant operator. //

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