

# Flexible Coating Process for Alloy Wheels

A new paint shop for wheels at SuperAlloy Manufaktur allows for a flexible and efficient coating process. The flexibility of the system is the result of the wheel database, which contains all the information and masking instructions for the wheels and all the process and target data.

SuperAlloy Manufaktur has begun operations with a new paint shop for wheels supplied by Rippert Anlagentechnik which has a material flow concept, a wheel database and a control unit that give it a high level of flexibility. The database is divided into two parts. The first contains the geometric wheel data and the masking instructions needed for handling the wheels. The second stores the

process and target data for each wheel. The process data includes everything from the powder formulations and the temperatures to the settings for the spray painting booths. The options that are chosen determine the target data for the wheels in the second area of the database. The flexibility of the paint shop means that an accurate definition and careful planning of the material flow are needed

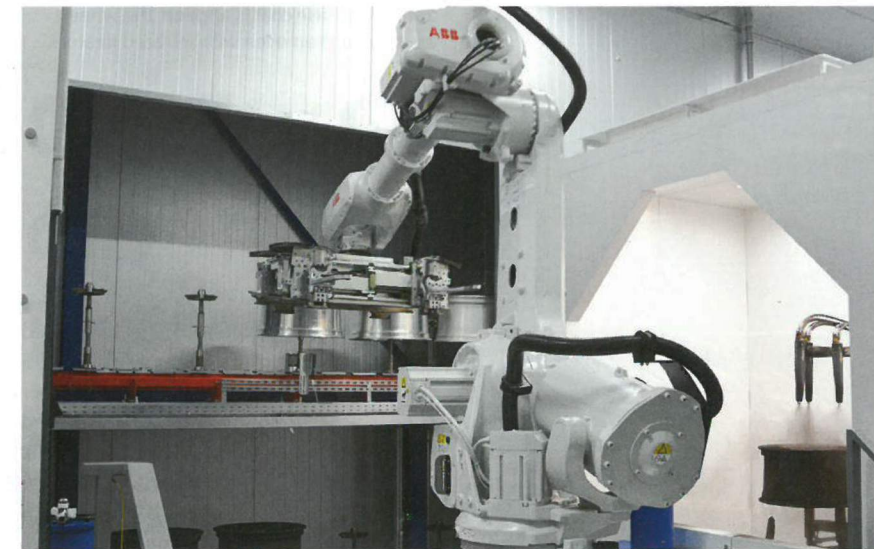
in order to enable it to operate as efficiently as possible. SuperAlloy draws up a daily painting plan. The pre-treatment phase is automatically adapted to the process that follows it. The pre-heating temperature and the cooling phases can also be individually adjusted. Before each stage in the application process an individual "recipe" is prepared which specifies the ideal settings for the spray guns, the paint quantities and the painting movements. This information is made available at the relevant locations inside the paint shop and allows quality assurance standards to be met and documented.

## Robots and automatic conveyors

The paint shop is highly automated. Robots and automatic conveyors make the painting process accurate and efficient. The high level of automation allows the wheels to be carefully tracked and enables detailed quality assurance checks to be carried out.

A specialised distribution conveyor fetches the wheels from the pre-treatment line and positions them in the individual coating areas. After the coating has been applied, they can be returned to the distribution conveyor, depending on the coating program. In this system the wheels do not need to be heated and cooled unnecessarily, which keeps throughput times and energy costs to a minimum.

The handling robots, which were supplied by ABB, can synchronise the conveyor while it is in operation. The speed



After the coating process, the wheels are transferred to the spindles of the powder oven conveyor.

of the conveyor is measured using conventional incremental encoders. The signal is split and passed on to the relevant robot. Laser barriers detect the precise position of each spindle and send the start signal to the robot.

## Pre-treatment in a system with 13 zones

Before the alloy wheels are coated, they undergo a pre-treatment process in a spray cleaning machine with a total of 13 zones. Firstly they are automatically transported to the overhead conveyor by an articulated robot with a one-part hanger gripper. The paint shop is informed automatically or manually about the type of wheel. The specific dimensions are requested from the wheel database which is integrated into the display. After this two wheels up to 22 inches in diameter are suspended from one hanger. In the case of larger wheels, which are 23 or 24 inches in size, each wheel is placed on a separate hanger.

The wheels come from the machine shop and pass through two alkaline degreasing processes with two rinsing phases. Then they move on to the deoxidation zone, where solutions in two different concentrations are available. After this they are cleaned with deionised water in a three-stage cascade rinsing process. Subsequently a conversion coating is applied to the wheels which acts as a bonding agent between the metal and the paint and also protects the wheels from corrosion.

In the blow-off zone, the water that has collected in the wheels is removed and they are then dried in a drying oven at up to 180°C to enable any remaining water to evaporate. This ensures that they are completely free of water and that no coating defects will occur. Finally the wheels are cooled to a temperature of 40°C in two stages.

## Powder coating in fully air conditioned booths

In the next phase, the alloy wheels are automatically moved in the T1 transfer area onto the rotating spindles of the distribution conveyor which connects the pre-treatment zone with the various processing areas. The wheels are coated with coloured powder and clear polyester powder in two separate, enclosed and fully air conditioned powder booths. A handling robot with a radial two-part rim well gripper moves the wheels into the powder booths where one wheel is always being automatically coated. The powder coating is applied using an electrostatic process and is between 80 and 100 micrometres thick. Excess powder passes through an air filter system and is returned to the powder container. Contamination is filtered out by a sieving machine.

After the coating process, the wheels enter the T2 transfer area where they are placed on the spindles of the SF2 powder oven conveyor. In an interim phase, any remaining powder is extracted from the hub and the flange surface by a cleaning

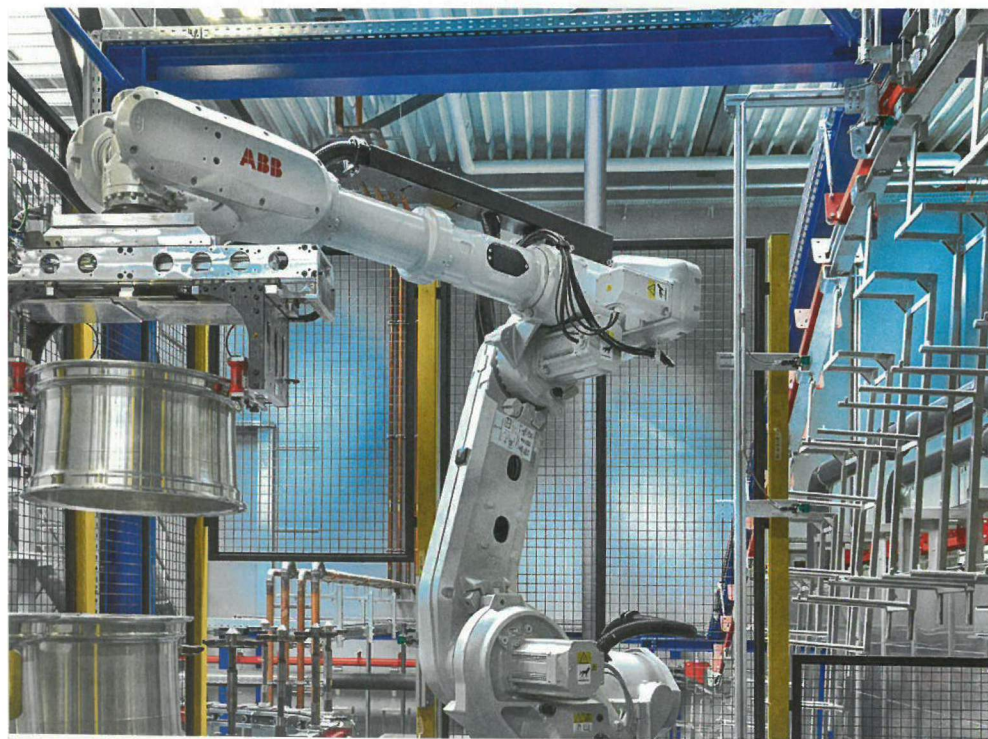
unit. The powder coating is then cured at temperatures up to 220°C.

In the cooling zone that follows the oven, the wheels are cooled to 40°C in two stages. In the inspection booth, each wheel is checked for coating defects. After this stage, they are automatically moved in the T3 transfer area from the powder oven conveyor to the paint conveyor by an articulated robot with an axial two-part outer gripper. They can also be transferred here from the paint conveyor to the connecting conveyor or vice versa.

## Application efficiency of around 80 percent

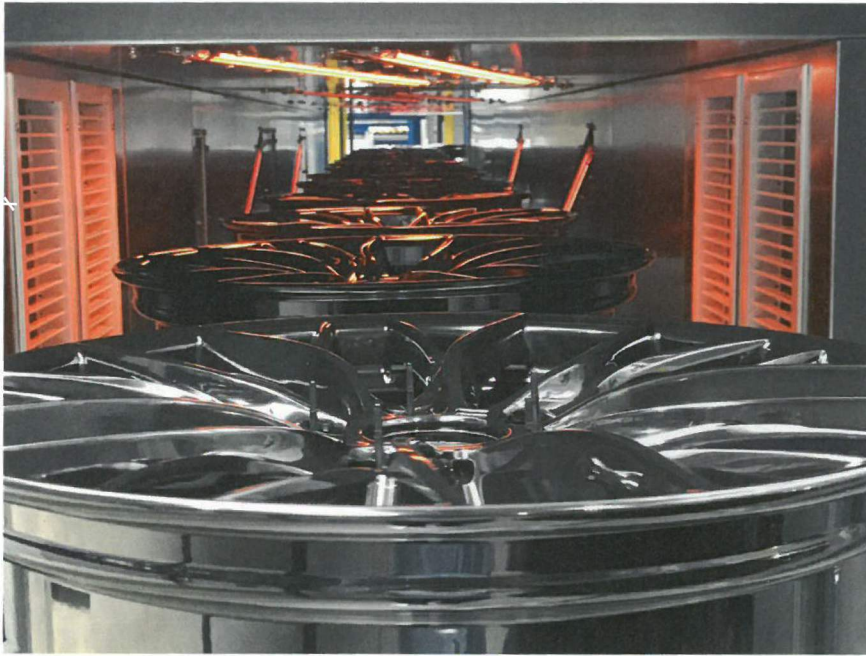
Before the painting process begins, the wheels are heated to a temperature of around 70°C in a pre-heating oven with infrared electric heaters. Afterwards they move into the first booth where the base coat is applied using electrostatic high-speed rotary bells for the larger areas and additional electrostatic guns to ensure that the paint penetrates into the cavities. This combination results in a high application efficiency of around 80 percent and a significant reduction in paint consumption. After the flash-off phase, the clear coat is applied in the next booth in the same way as the base coat. The wheels then pass through the second flash-off zone.

The base coat and the clear coat are cured together at around 170°C. In the subsequent cooling zone, the wheels are once again cooled to 40°C in two stages. Sol-



Robots and automated conveyors give the paint shop a high level of flexibility.





Before the base coat is applied, the wheels are heated in an oven with infrared heaters.

Here an acrylic powder coating is applied automatically at a thickness of around 45 micrometres. Because the layer of powder is relatively thin, it must be fully fluidised to ensure an even flow. After the acrylic powder coating phase, a divided conveyor automatically removes the wheels from the spindle conveyor and moves them on a roller conveyor to the final inspection area. //

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vent-based base coats and clear coats are used. The waste air is purified in a thermal incinerator which has a heat recovery unit that is used to heat water. After the three coats have been applied to the wheels, they are automatically removed from the spindle conveyor by a

divided conveyor and transported on a roller conveyor to the packaging area or the machining centre. Alternatively, they pass through the T3 transfer area and return to the distribution conveyor which takes them to the acrylic powder coating line.

## Contact

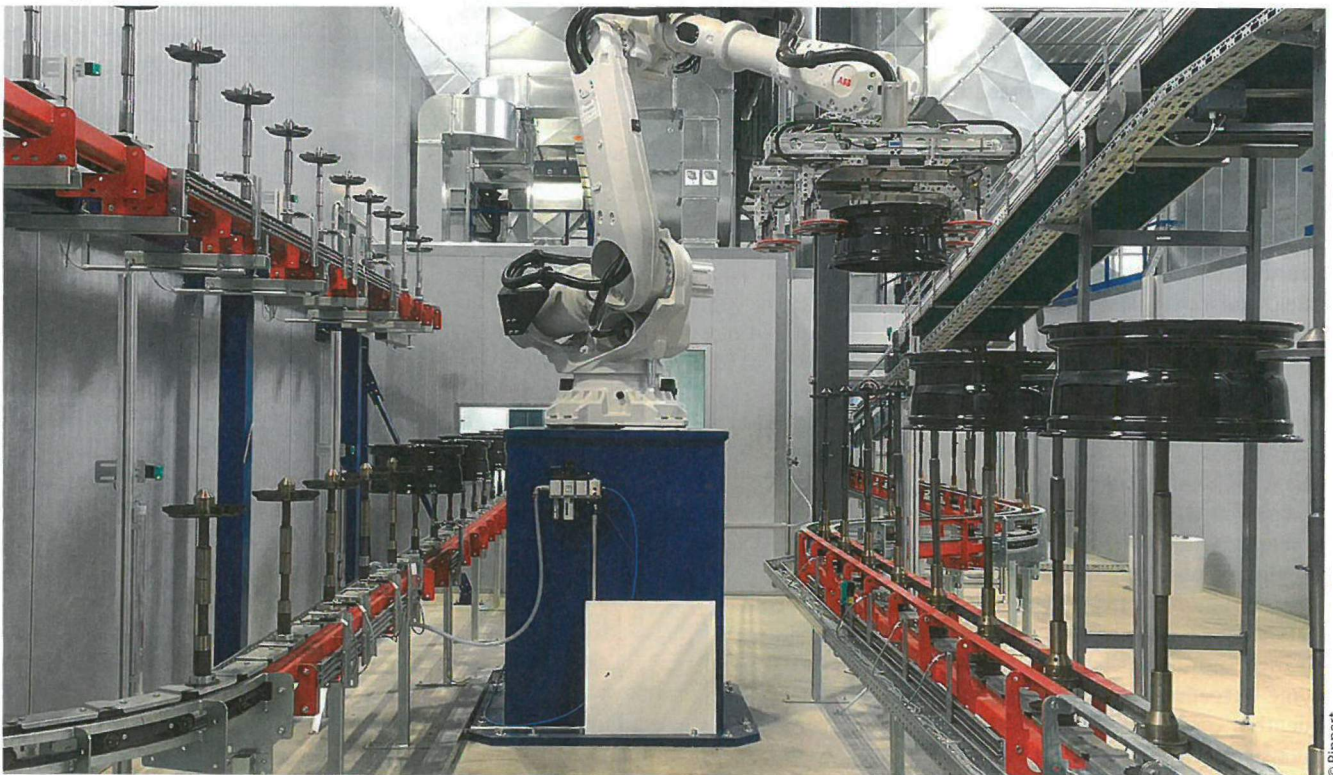
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An articulated robot with an axial two-part outer gripper transfers the wheels from the powder oven conveyor to the paint conveyor.

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