Real-Time Monitoring of Spray Quality in Adhesive and Coating Processes

A novel and automated control system uses lasers, high-precision optics and artificial intelligence (AI) to monitor spray quality in gluing and coating processes inline and in real time – an alternative to visual quality control that is faster, permanently accurate and in the long term more cost-effective.

Anyone who uses spray adhesive processes in production knows the problem. Despite complex technology and visual checks, errors in the bondings are detected late or not at all. This leads to the production of many missing parts that have to be disposed of at high costs or have to be reworked in a complex way. In the worst case, the error message only comes from the customer, which further increases the follow-up costs or causes compensation claims.

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Figure 1 > Laser light is used to detect even the smallest deviations from the target value in the spray.

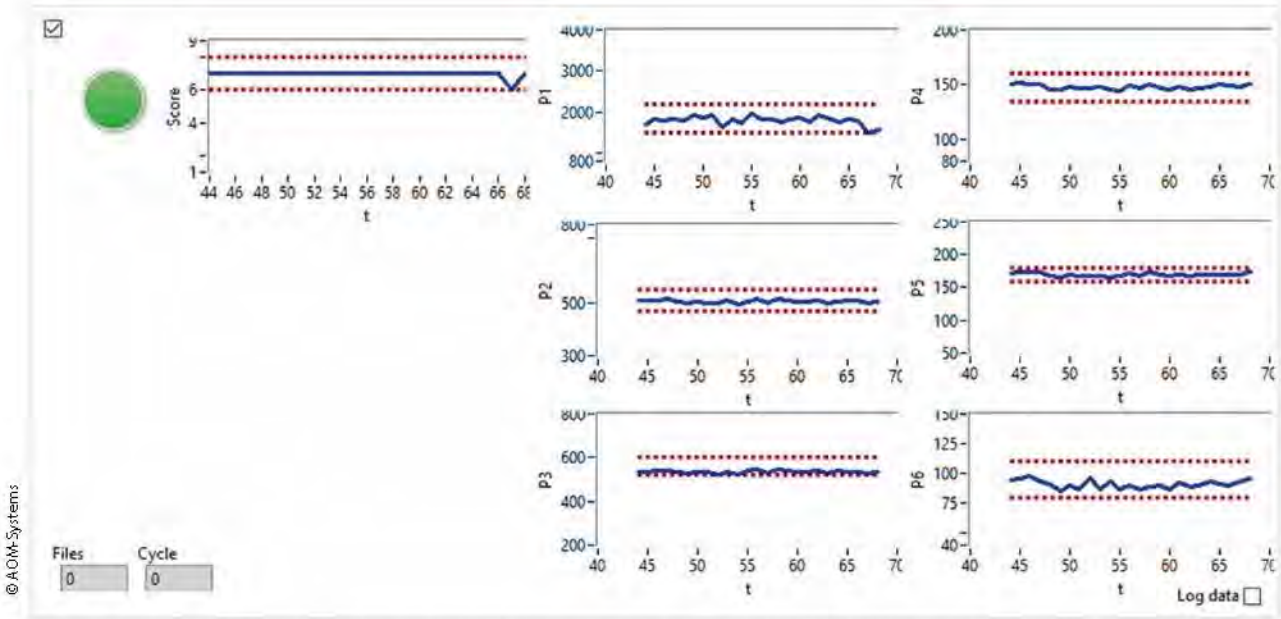

Figure 2 > Screenshot of the control software: If the blue measured values are outside the red setpoint limits, the spray medium is not in order (red signal light) and an alarm is triggered.

AOM-Systems has developed a novel and automated control system (SpraySpy Process Line) that uses laser, high-performance optics and sophisticated physics to monitor the application of the adhesive inline and in real time. "With the innovative laser-based SpraySpy technology, we can measure the droplets during the spray bonding process. The process is based on the light scattering of moving particles. The technology is used for quality control of bonding processes as well as for monitoring delicate production processes in surface technology," explains Meiko Hecker, Sales Manager at AOM-Systems.

Detection of dirty nozzles in fractions of a second

The system can measure size, speed and the number of drops in a fraction of a second. From this data, algorithms are used to generate data that provide plant operators and quality managers with valuable production information in real time (*Figure 1*) – for example, whether the coating meets the quality specifications or whether the production step is positive or negative. This is intended to enable early detection of defects in the spray medium or in the spray hardware as well as contamination of the system. This provides important information that can be used during the production process to decide on good products or rejects and can lead to significant cost savings.

The data obtained can also be used for industrial 4.0 applications. This enables pattern recognition of errors, predictive maintenance or an automated control loop of application parameters.

Reliable alternative to visual checks

At present, quality control is still carried out visually in many production processes, which means a great deal of manual and time-consuming effort. With SpraySpy,

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Figure 3 > Measurement of spray variance on an automated spray: If the spray variance is within the tolerance thresholds, the signal is green (top). If the spray variance deviates too much from the target value, the signal turns red (bottom). The red/green signal can be output via an optical signal transmitter or an interface port.

AOM-Systems offers an alternative that is faster, permanently accurate and in the long term more cost-effective. The control system measures the spray in production inline and in real time. Even the smallest deviations of two percent from the setpoint value are reliably detected by the built-in Artificial Intelligence (*Figure 2*).

If the SpraySpy measurement technology detects a deviation, the system can transmit an error message to the plant control or send an alarm to the mobile device of the process operator. In addition, all parameters are saved for ongoing quality assurance. The client can use this data in-house or as a quality management measure at a contract manufacturer.

Already successfully in use in practice

A practical example can be found at a producer of airbag components who recently switched to spray bonding in his production process. In this case, a precisely defined amount of adhesive must be applied, often also sharp-edged and without overspray. If the specified amount of adhesive is not applied or only applied inhomogeneously, for example due to a contamination in the horn air and the resulting deflection of the spray jet, the product quality is insufficient. If, as in this case, it is even a safety-relevant component, the effects can be life-threatening. Instead of a manual visual final inspection, the SpraySpy technology is used to check the coating. This means that deviations can now also be detected that would have been too fine for even experienced inspectors to detect visually. In this case, the system from AOM-Systems brings objectivity to a subjective inspection process. "It has been proven that in night shifts the inspectors find fewer defects than in day shifts. This is usually not due to poorer production quality, but rather to the reduced receptiveness of the inspectors on the night shift. Here SpraySpy can help. It is a permanently stable and objectively working system that carries out quality control at a consistently high level," says Meiko Hecker, explaining the core benefit for adhesive applications.

Another practical example is provided by Bosch. Here, a precisely defined minimum quantity of coating material must be applied for the coating of components. This could not be guaranteed in the existing plant, so the process ran with a safety factor of up to 20 percent. However, this meant that production was slower, more expensive due to the increased overspray content, and valuable resources were used inefficiently. Bosch decided to critically test the SpraySpy technology (*Figure 3*) and develop a new production process as part of a one-year research project. The results convinced Bosch, and the technology is currently being transferred to series production.

Quality of the bonding process always under control

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wherever complex visual or manual quality controls are necessary or a production process with spray processes is to be monitored. The system measures inline drop size, speed, the number of drops and, if desired, pulse and volume flow. According to AOM-Systems, the easy-to-use monitoring of spray quality and the detection of unwanted spray variance during the production process will measurably improve quality. At the same time, expensive production errors are avoided at an early stage. The user can thus reduce his production and follow-up costs, and the investment in the equipment pays for itself after a short time. //

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