airmatic

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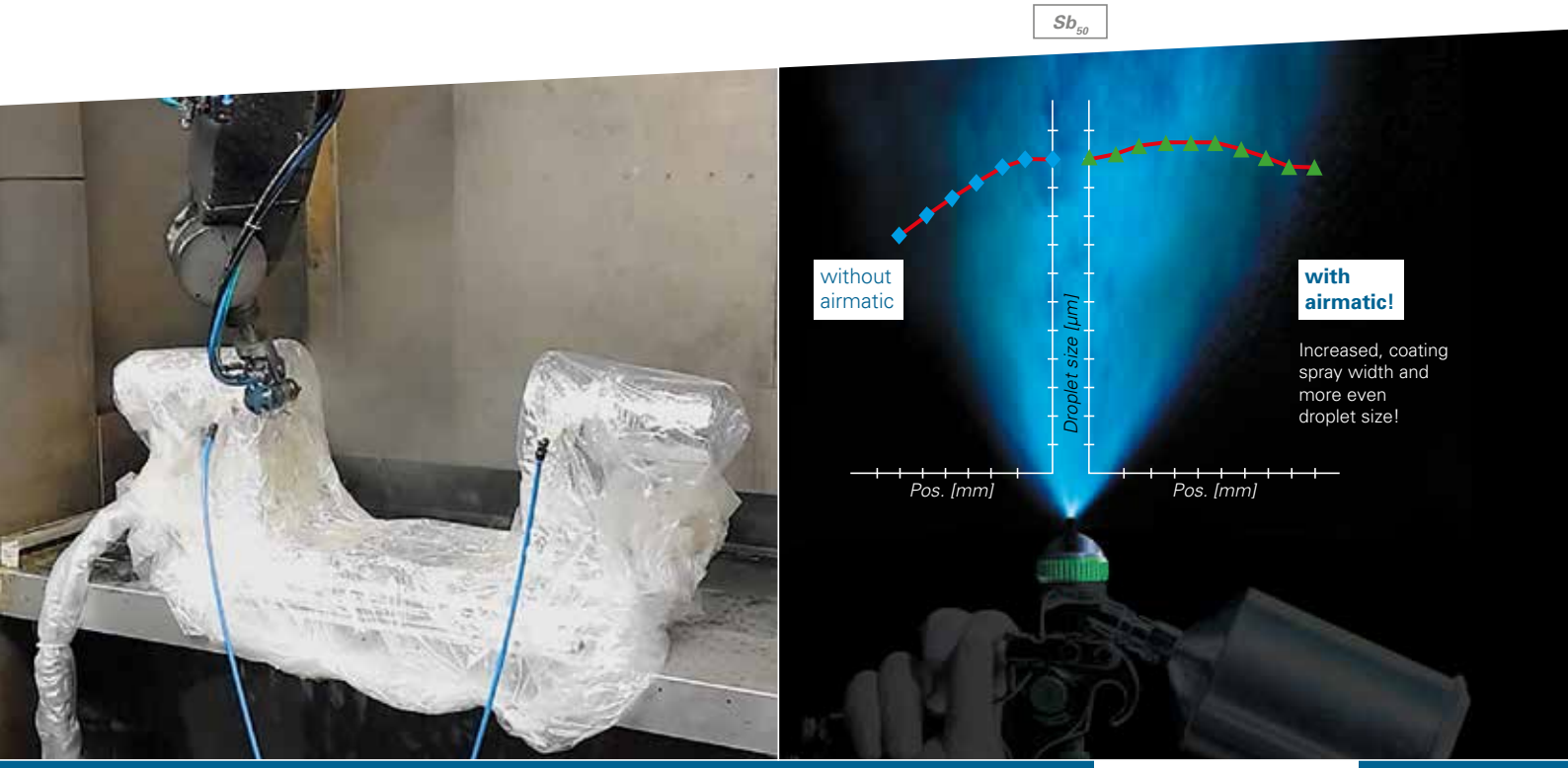
The effect on your application!

The airmatic spray optimisation system in a field trial.



A project supported by the German Federal Foundation for the Environment (DBU).

Examination of the effectiveness and determination of scientific findings by ensutec Products GmbH in collaboration with the University of Esslingen and Lothar Bix GmbH. Project period 2017 – 2018

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Hochschule Esslingen
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Objective of the DBU project!

As part of the technical and field trials, testing will be carried out to investigate the extent to which the application of the airmatic system can improve the paint application. Not just in terms of economical benefits but also in ecological. In addition it should be analysed to what extent further system optimisations can be carried out.
The university of Esslingen will take on the scientific support, the evaluation of the studies and will support any new developement in the future.

Results of field trial

As part of a field trial, the effect of the airmatic system on the practice-oriented application of clear paint on synthetic and metal substrates was scientifically determined.
The following parameters and target figures were determined:

primary paint atomisation properties:
- Change in the distribution of medium droplet size (Volume median Dv(50))
- Change to Sb_{50} (Spray jet width at half maximum coating thickness)
- Transfer efficiency (TE)

Properties of applied paint film:
- Change to medium coating thickness
- Appearance

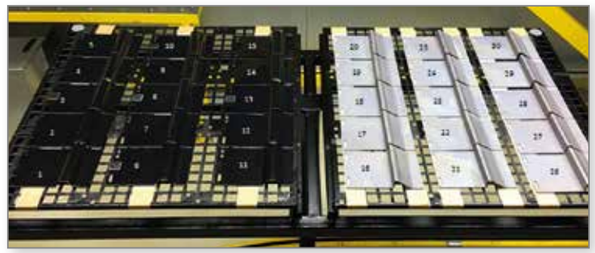
Air atomisers were used, whereby the quantities of air were used in the following areas:
Horn air: 88–106 Nl/min
Atomising air: 109-135 Nl/min
The colour quantities in the processed clear paint were kept constant.

Test set-up

Each goods carrier comprised 30 objects of which 15 were made of PC + ABS synthetics and 15 of metal.

Parts numbering is noted in the illustration.

The application was carried out by robots.



30 goods carriers for scientific evaluation

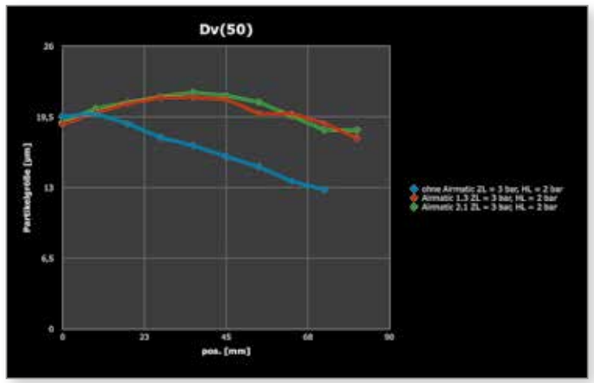
The results!

1. Distribution of medium droplet size Dv(50)

Measurement was carried out using laser diffraction spectrometry.

It was clear that with the use of the airmatic spray optimisation system the radial distribution of the medium droplet size was significantly homogenized.

Increased thinning of the spray towards the edges no longer takes place.



Equal droplet size distribution

2. Appearance/Structure

Measurements made using WaveScan demonstrated that the changes in the properties of the spray jet had no effect on the appearance.

Long and short wave values as well as DOI results correspond to the specifications without restriction.

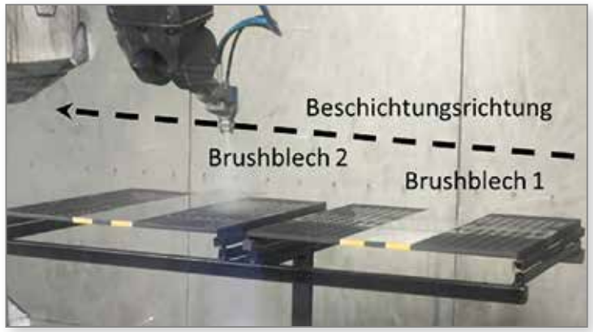
3. Coating thickness width at half maximum coating thickness (Sb_{50})

Due to the changes to the paint atomisation, changes also occur in the distribution of the coating thickness, i.e. the characteristic spray widths Sb_{50} of the retained dynamic spray patterns are increased by the airmatic spray optimisation system.

The spray patterns are measured automatically on a coating thickness measuring table using 3 tracks per substrate (a total of 333 measuring points). Errors in measurement could be minimised and the results statistically safeguarded due to the high number of individual measurements and double processing.

With the aid of parallel flow measurements it was possible to eliminate the possibility that changes to paint atomisation and to dynamic spray patterns were the result of changed air quantities.

Air quantities remained constant in terms of measurement accuracy (around ± 2%) when the airmatic system was used.

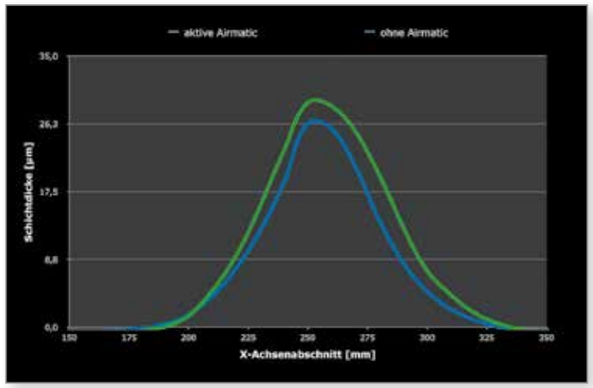


Dynamic spray pattern with robot

4. Transfer efficiency (TE)

Average improvement to transfer efficiency on synthetic substrates is between 5% and 6.5%.

As a result of changes to the spraying properties and despite the wider distribution of coating thickness the standard of transfer efficiency improved significantly.



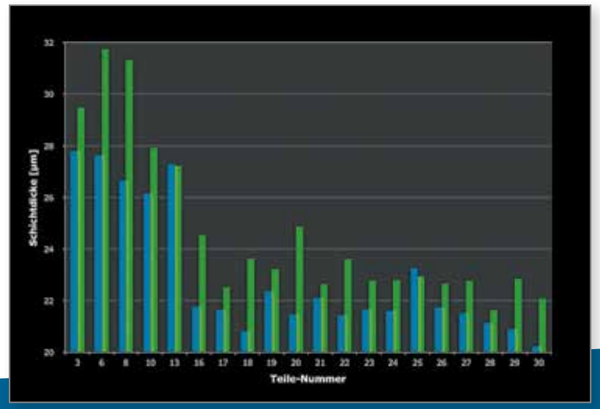
airmatic: Sb_{50} & TE

5. Medium coating thickness

In accordance with the obtained improvements in the application efficiency, an increase in the medium coating thickness in a range between 1 and 3 µm has also been observed, i.e. with a medium coating thickness of approximately 20 µm between 5% and 15%.

For identical target coating thicknesses, therefore, use of the airmatic system can reduce the amount of paint used by the same percentage.

Synthetic substrate ■ without airmatic ■ active airmatic
Metal substrate ■ without airmatic ■ active airmatic



airmatic: Coating thicknesses on various substrates

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Result!

The field trial revealed the following results:

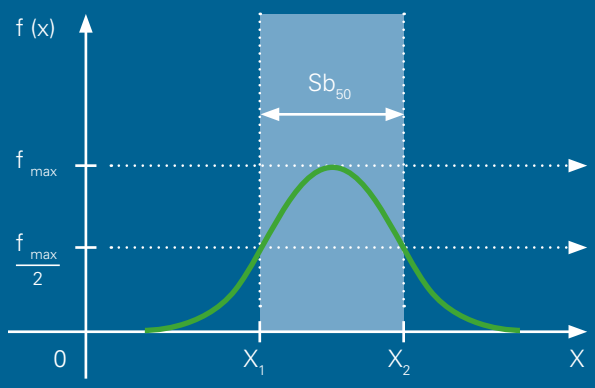
By using the optimisation system, which is delivered by the airmatic technology

- the paint spray is evenly in terms of average diameters
- dynamic spray patterns are about 15 – 25% wider
- transfer efficiency on synthetic substrates improves by 5 – 6.5%
- the average coating thickness on synthetic substrates is increased by 10% and on metal substrates by 7%,
- there is no significant change in appearance or paint structure.

- These results were achieved irrespective of the application parameters set.
- Installing the airmatic system does not cause changes to any pre-set airflows when pressure is regulated.
- Average coating thickness tested positive for statistical significance.

The overall result of the use of the airmatic spray optimisation system showed an extension of the dynamic spray pattern and at the same time a clear improvement in transfer efficiency.

Therefore potential paintsavings from 5 – 15% can result!



Characteristic spray width Sb_{50}

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