Press release

Dürr brings solution for digital paint layer calculation to the market

Digital twin simulates layer thicknesses directly in the spray booth for the first time

Bietigheim-Bissingen, 9 September 2020 – Uniform layer thicknesses are an important quality factor in industrial car painting. Until now, numerous test runs were necessary when launching new models to ensure the perfect painting results were achieved. Dürr has now succeeded in calculating layer thicknesses virtually, and is incorporating this module into the existing programming software for application robots. With the newly developed simulation software, car manufacturers can reduce the number of real-life tests. The DXQ3D.onsite software is available with the new process simulation module. The first beta site versions are already in use.

Each time there is a new project in a paint shop, for example, a new model launch, numerous processes and parameters require precise adjustments until the applied paint has the required layer thickness everywhere on the body. Until everything is properly adjusted, bodies undergo test painting in a complex parameterization process. With the new simulation tool from Dürr, manufacturers can now model and optimize this process virtually.

“It is now possible to reduce the number of test paint runs and test bodies by more than 50%,” explains Dr. Lars Friedrich, President & CEO Application Technology at Dürr Systems AG. “This makes commissioning more efficient, lowers material costs, and results in fewer poorly coated bodies.”

On the path to the digital paint shop

Simulating the painting process is one of many important steps on the path to the fully digitized paint shop. The objective is to make the painting process more economical with computer-assisted product and process developments from end to end, while delivering the same top quality. Simulations help even before the first vehicle prototypes get as far as production. Using qualified calculations, they anticipate where any problems might occur and provide remedies prior to manufacturing. In terms of the layer thickness, this also includes body parts that are challenging to paint, like joints in the trunk.

Visualizing reality in advance on the computer

The new DXQ3D.onsite module is based on a three-step concept. The first step consists of a virtual calculation of how much paint is applied at any point. The software runs its simulations exclusively using idealized, virtual spray patterns based closely on actual conditions. The spray patterns can be scaled dynamically in height and with different widths. The user can “play” with these two parameters to estimate and visualize what general effect different spray pattern widths and percentage discharge rates will have on the layer thickness distribution.

To model the reality in advance on the computer, the software module creates a digital twin of all key individual components in the form of electronic data. During the first simulation, the tool automatically converts the uploaded file formats into its own 3D file format of the body. This keeps all the necessary additional data ready and, at the same time, removes data of no significance for the painting operation. This has the effect of reducing the storage space required as well as the calculating time so that the program can also be used on a notebook directly at the spray booth in production. Once all the relevant data is merged for the final time, a virtual spray pattern along the robot paths programmed off-site is produced. It adds up the layer thicknesses and displays them in a 3D paint map. This enables different optimization solutions to be visualized in a transparent way, considered by the team, and improved upon prior to production.

Pre-optimized parameters for the first painting test

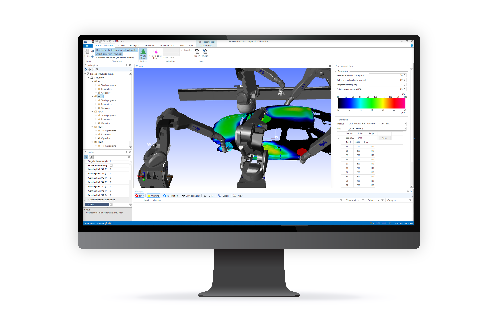
The software simulations do not take into account specific paints. For that reason, the process simulation concept includes a real-life test in the Dürr test laboratory as a second step after the virtual optimization. The customers’ chosen paint materials are used in this test. The values measured are used in the third and last step to translate the virtual parameters used in the simulation, such as spray pattern width and percentage discharge rate, into parameters for the paint atomizer. The real-life results are incorporated into the simulation program during this “translation”. As soon as the map is imported, the software automatically suggests atomizer parameters. The first real-life test painting of a body is then carried out with this set of pre-optimized parameters.

Simulations in just a few minutes

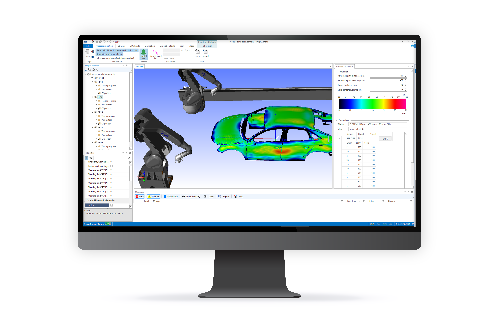
The software module’s short calculating times make it possible to simulate the paint layer thicknesses of complete bodies and estimate the quality within a few minutes on a conventional PC, not a mainframe computer. “This makes it easy to assess the quality of paint layer thicknesses, better interpret coating results, and optimize neuralgic zones with inconsistent layer thicknesses,” says Frank Herre, Head of Application Process Development at Dürr Systems AG, in summarizing the benefits.

The process simulation is available as an additional module to the DXQ3D.onsite standard software included with every Dürr painting robot. DXQ3D.onsite is the digital universal tool that can be used to program motion paths using realistic simulations of all robots at a station or to parameterize application processes.

Pictures



Picture 1: The DXQ3D.onsite simulation program quantifies the layer thicknesses and displays them in a color gradient on the body. Layers that are too thick are shown in red, layers that are too thin are shown in blue.



**Picture 2:** The visualization of the simulation shows the critical regions in the layer thickness distribution and enables targeted pre-optimization of the painting process.



**Picture 3:** Real-life results from the Dürr test laboratory are incorporated into the simulation program

The Dürr Group is one of the world's leading mechanical and plant engineering firms with extensive expertise in automation and digitalization/Industry 4.0. Its products, systems and services enable highly efficient manufacturing processes in different industries. The Dürr Group supplies sectors like the automotive industry, mechanical engineering, chemical, pharmaceutical and woodworking industries. It generated sales of € 3.92 billion in 2019. The company has around 16,300 employees and 112 business locations in 34 countries. The Group operates in the market with the brands Dürr, Schenck and HOMAG and with five divisions:

* **Paint and Final Assembly Systems:** paint shops as well as final assembly, testing and filling technology for the automotive industry
* **Application Technology:** robot technologies for the automated application of paint, sealants and adhesives
* **Clean Technology Systems:** air pollution control, noise abatement systems and coating systems for battery electrodes
* **Measuring and Process Systems:** balancing equipment and diagnostic technology
* **Woodworking Machinery and Systems:** machinery and equipment for the woodworking industry

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