



Modular, process-controlled electroplating plant on a 20-liter scale with integrated bath analysis and automated post-dosing.

Digitization in electroplating technology

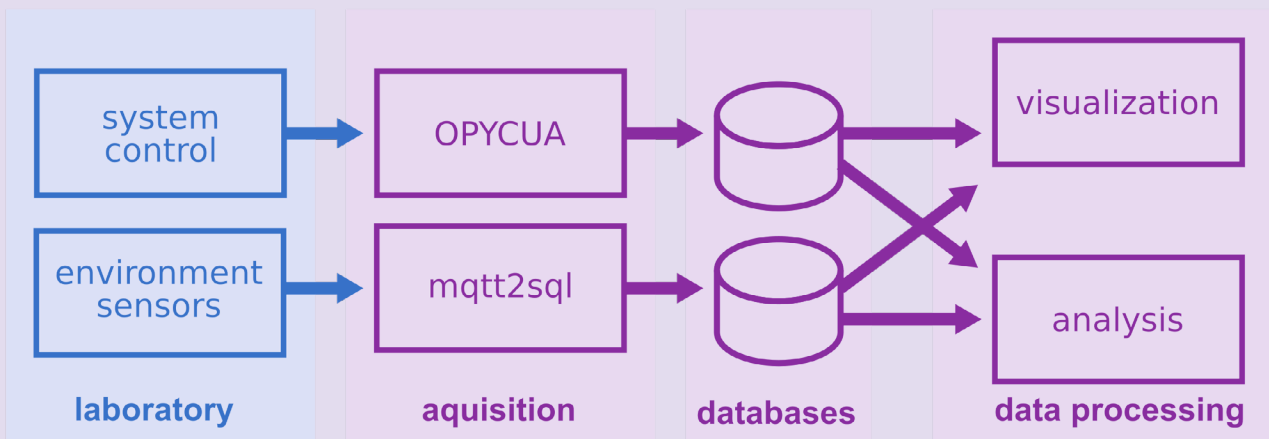
Electroplating is one of the most effective and cost-effective surface engineering processes and has the world's largest market share in this field. However, production technology is characterized by a high degree of complexity and depends on a large number of factors, both internal and external to the process. As a result, there is very high pressure to innovate in order to digitize processes and develop fully automated, environmentally compatible and energy- and resource-efficient process technology. This pressure is further intensified by increasing customer requirements and environmental legislation.

Challenges of digitization in electroplating technology

Implementing digitization requires the recording of all relevant process parameters to map the entire coating process chain in a digital twin. The availability of the relevant data as well as software for data acquisition and evaluation is an essential prerequisite for this. In industrial surface technology, however, there is as yet no suitable and sufficiently cost-effective measurement technology; even critical process parameters can often only be monitored offline. Product quality can therefore only be determined at the end product.

Automated data acquisition and processing

At the Fraunhofer IST, all research and pilot-plant-scale electroplating plants are currently being equipped with state-of-the-art plant control and in-situ analysis of the process baths and linked to automated data acquisition and processing. To this end, software is being developed which, for example, uses the OPC UA standard to access process data, compute it and store it in central databases. Central data storage makes it possible, among other things, to calculate the deposited layer thickness in real time during the coating process and make this information available to the operator.



Software tools for capturing, storing and preparing process-related data.

Innovative solutions in the field of sustainable process development and management as well as in quality management

The modular design of the system allows flexible processing of individual customer requests for setting a wide variety of layer functions on a wide variety of substrates. Continuous process-data acquisition provides transparent process and layer development with a range of evaluation and visual representation options. In addition, digital interfaces enable collaboration of manufacturer-independent measurement and production systems and thus automated electrolyte control. This means that the processes can be run with long-term stability and in a resource-conserving manner.

Outlook

The work described forms the basis for the development of a digital image of electroplating process chains. This means that within a cyber-physical system, i.e. the linking of the physical production process with the data from the digital image, innovative approaches to finding solutions can be provided, for example for real-time control, for predictive maintenance or for supporting decisions in sustainable process development, as well as for the training of employees.



Rowena Duckstein and Holger Gerdes discuss the real-time data on the dashboard which enables continuous quality control of the processes.



Contact

Rowena Duckstein M.Sc.
Phone +49 531 2155-619
rowena.duckstein@ist.fraunhofer.de

Dipl.-Phys. Holger Gerdes
Phone +49 531 2155-576
holger.gerdes@ist.fraunhofer.de