

Success factor surface cleaning – Cleaning 4.0

In terms of subsequent coating, surface cleaning is an essential process step that has a decisive influence on the success of the finishing process. Complete documentation of all relevant process and plant data as well as backup in a data warehouse provide new possibilities and approaches for the optimization of the existing cleaning processes and plant technology. For this reason, at the Fraunhofer IST the multi-chamber system for the aqueous cleaning and pre-treatment of components has been digitized and is now able to automatically document the cleaning process.



Multi-chamber system for aqueous cleaning at the Fraunhofer IST, with high reproducibility and flexibility with regard to the materials to be cleaned.

Building the infrastructure for digitization

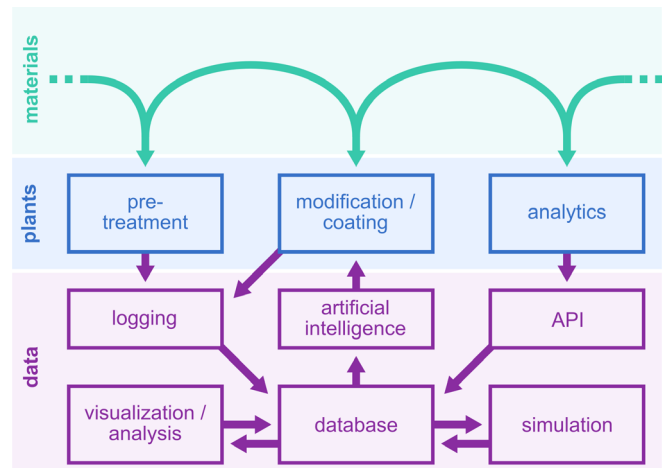
The key challenge in digitizing a wide variety of installations is to build a generalized and highly scalable infrastructure consisting of data loggers, databases, dashboards and interfaces for data analytics. In order to integrate the cleaning installation at the Fraunhofer IST, its control system was renewed and network interfaces were implemented. The result is that all plant and process parameters can now be recorded in real time and are available for data-analysis studies in the long term.

Solution approach

An infrastructure of this kind was set up and put into operation in collaboration with the Institute of Machine Tools and Production Technology (IWF) at the Technische Universität Braunschweig. In addition, five environmental sensors were installed in the cleaning laboratory in order to also record data on the room environment, such as temperature and humidity of the plant, thereby enabling the investigation of any possible influence of environmental conditions on the cleaning result.

Adaptation and transfer to customer-specific plants and systems

The aim of the project is to upgrade existing plants to cyber-physical systems. The cleaning plant serves as the first demonstrator here. The collection of all relevant system data offers the potential to optimize the plant as well as the individual process steps with regard to their resource consumption in terms of energy and material and to make the coating or cleaning processes more efficient and robust. The overall goal of digitizing the cleaning plant is to increase the robustness and precision of the processes while reducing resource consumption.



Structure of process and material data processing.

Furthermore, the developed concept can also be transferred to plants and (measuring) instruments that are also to be digitized in order to use their data for visual representation and the construction of digital twins.

Outlook

The project provides the basis for the digitization of all relevant processes that play a role within the surface-technology process chain and is thus an essential building block in the institute's digitization strategy. The integration of further processes enables the digital mapping of the entire process chain as a digital twin and permits the efficient design of processes and their linking to the point where they form complete production scenarios on the digital level.



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Real-time data from the digitized cleaning plant at the Fraunhofer IST.