# Electric Impulses Clean Industrial Water and Paints

**Innovative Process for Decontamination in Paint Shops**

*Painting in an immersion bath: Industrial water and paints can be sterilized with electric impulses. (Photo: Eisenmann)*

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**Most paints for households or industry are based on water and, hence, are environmentally more compatible than paints based on solvents. Water-based paints, however, have one drawback: Microorganisms, such as bacteria, feel very comfortable and spread. This also affects paint shops of automotive industry and other sectors. Sterilization of industrial water and paints with electric impulses is the objective of the DiWaL cooperation project funded by the Federal Ministry of Education and Research (BMBF). This project is coordinated by researchers of Karlsruhe Institute of Technology (KIT) and executed in cooperation with partners from research and industry.**

Whether brightly colored or classic gray or black: Before a car is painted, the body is cleaned, pre-treated, and provided with a corrosion-resistant coating by surface pre-treatment and electrophoretic immersion painting. The latter is an electrochemical process to produce a homogeneous paint coating by a DC voltage field in an immersion bath. “However, bacteria can reproduce well in the water and paints used and then adversely affect the quality of surface coating.

To control these bacteria, biocides have been used so far. The new electric impulse technology works without chemical additives, reduces water consumption, and even contributes to water protection," says Dr. Wolfgang Frey of KIT's Institute for Pulsed Power and Microwave Technology, who coordinates the cooperation project "Dekontamination von industriellen Wässern und Lacken" (DiWaL, Decontamination of industrial water and paints).

By means of electric impulses, cells or microorganisms are exposed to an electric field. The cell membrane is polarized, which means that electric poles form and aqueous pores open. This eventually results in the death of the microorganisms. This phenomenon is used on a large scale for the effective extraction of cell constituents and for killing microorganisms ("cold pasteurization").

As the electric impulses have a purely physical effect, bacteria are not expected to develop resistances, as they do in the case of biocides. "We control microbiological contamination and can achieve an optimum coating quality and prevent rework at the same time," Dr. Frey says.

In automotive industry, painting of the body is the activity with the highest water consumption (up to 600 liters per car body). For this reason, the electric impulse technology is integrated into a new, automated, and resource-efficient water management and plant concept for pre-treatment and immersion painting developed by research and industry partners under DiWaL. By means of this process, the water cycle at the factory is optimized and freshwater consumption is to be reduced. Technical implementation focuses on the aspects of quality, costs, and the environment. The user perspective also is considered highly important. That is why DiWaL analyzes the requirements of the users as well as potential obstacles. The results will then be incorporated in design and technical development.

DiWaL pools the expertise of partners from research (Karlsruhe Institute of Technology and Pforzheim University of Applied Sciences) and industry, namely, a plant manufacturer (Eisenmann SE), two paint producers (Emil Frei GmbH & Co. KG and PPG Deutschland Business Support GmbH) as well as an automotive manufacturer (BMW Group).

The project focuses on both surface treatment for automotive industry (cathodic immersion painting) and applications for general industry, e.g. painting of industrial goods by anodic immersion painting. Technical, economic, and ecological framework conditions and requirements are taken into account.

The project “Entwicklung eines ressourceneffizienten Wassermanagement- und Anlagenkonzepts für Vorbehandlungs- und Tauchlackieranlangen unter Nutzung der Elektroimpulstechnologie zur Dekontamination von industriellen Wässern und Lacken (DiWaL, Development of a resource-efficient water management and plant concept for pre-treatment and immersion painting systems using the electric impulse technology for the decontamination of industrial water and paints) is funded by the Federal Ministry of Education and Research (BMBF) under the WavE program.

More information on the WavE program of BMBF: **http://www.bmbf-wave.de/** (in German only).

**Karlsruhe Institute of Technology (KIT) pools its three core tasks of research, higher education, and innovation in a mission. With about 9,300 employees and 25,000 students, KIT is one of the big institutions of research and higher education in natural sciences and engineering in Europe.**

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