



# LACOLOR - INVESTIGATION FOR EMISSIONS OF PAINT LAYERS BY MEANS OF LASER TECHNOLOGY

## Ideas on utilisation

Polychlorinated biphenyls (PCBs) are chlorinated hydrocarbons (Fig.1) of anthropogenic origin. Due to their toxicity, however, they are considered carcinogenic and mutagenic. Since 1989, therefore, the manufacture, placing on the market and use of PCBs have been forbidden. PCBs have been widely used in industry until their prohibition, e.g. as a plasticizer and flame retardant in paints. In nuclear power plants (NPP), varnishes serve to protect concrete structures against the inward diffusion of radioactive isotopes. PCB as a component of these decontamination paints is available to all German nuclear power plants and must be removed from the walls and disposed of as hazardous waste. State of science and technology in the removal of PCB-containing paint layers is a mechanical manually performed removal (decontamination), which with high loads for the executing staff due to the restoring forces on the tool is connected (Fig.2). Common methods are grinding, milling or abrasive blasting (Fig.2). These decontamination processes cause a higher mass of primary waste due to their low precision as well as a significant amount of secondary waste from the tools used as well as dust production and associated secondary contamination.

The aim of the LaColor project is the low-emission removal of the PCB-containing lacquer layers by means of laser technology in the case of decomposition of the toxic structures directly at the wear surface without the formation of toxic products. A 10 kW high-power diode laser achieves process temperatures (Fig. 3) that ensure complete decomposition of the PCB. Thermal quenching causes the formation of toxic products such as polychlorinated dibenzodioxins and dibenzofurans (PCDD and PCDF) prevented.

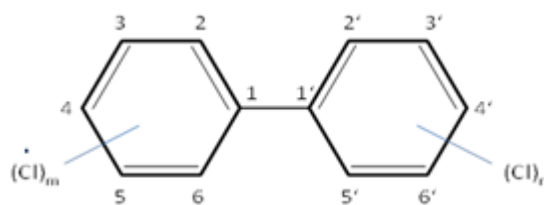


Figure 1



Figure 2

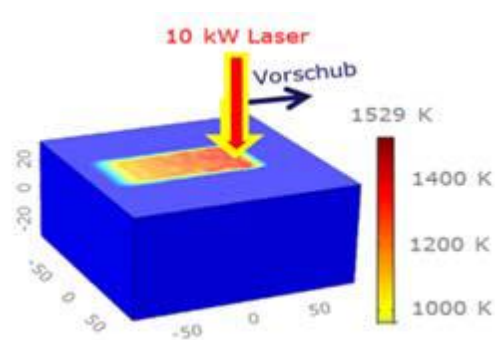


Figure 3



## Potential adopters of technology

The application and exploitation of this system is aimed at all operators of technical installations in which PCB has been incorporated as part of decontamination paints:

- Manufacturers and developers of resource-efficient demolition and recycling technologies
- Operator of all nuclear research and pilot plants and all power reactors
- Demolition and disposal company for conventional building demolition

## Advantages of technology

- Complete paint removal and neutralization of the toxic substances in one step.
- Avoiding the production of toxic waste mass and thus the time-consuming treatment or disposal.
- No dust production and thus increased occupational safety for the executing personnel.
- Automation possibilities by means of manipulator-controlled laser ablation and exclusion of personal danger due to toxic or radioactive material.
- No restoring forces when using laser technology.
- Development of on-line monitoring by means of laser-induced fluorescence for the decontamination success and the decomposition of the PCB.

## Market and context of technology

- Objective: Reduction of primary and secondary waste masses and increase of occupational safety.
- Current status: Completion of proof of complete paint removal and decomposition of PCB as well as avoidance of parasitic formation of PCDD and PCDF.
- Current status: Completion of the development of a LIF procedure for real-time monitoring of the chemical reactions during the experiment by the partner TU Bergakademie Freiberg.
- Maturity level: Registered patent for Proof of Procedure.
- Further development: Construction of a prototype and deployment in the nuclear power plant

## Preconditions in adopting enterprises

- High-power diode laser with associated peripherals.
- Hardware and know-how for the handling of toxic substances during decontamination (housing, suction, respiratory and full protective equipment).
- Provision of trained personnel with regard to the use of laser technology and the handling of toxic substances.