

Plasma Air Cleaning System Control

Regelung einer plasmabasierten VOC-Abluftreinigung

Graduate



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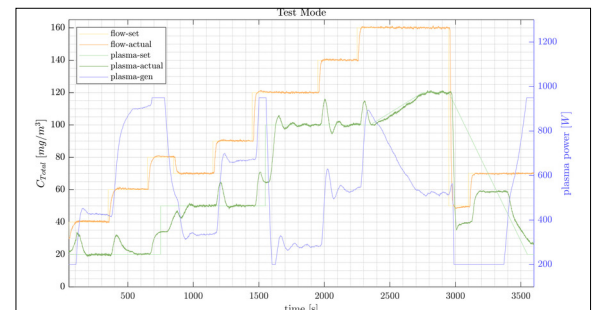
Introduction: Industrial air cleaning is the process of removing pollutants and contaminants from the air in factories and warehouses. It is critical to maintaining a safe and healthy environment, reducing emissions, and meeting regulatory requirements. Industrial air cleaners can handle large volumes of air and remove contaminants such as chemicals, dust, and volatile organic compounds (VOCs). Typical options include flame oxidizers that burn and capture particles. However, a more effective approach is plasma oxidation, a chemical process. It uses plasma ignited by high-voltage arcs and controlled by varying the frequency and power levels. Increasing the power input increases the energy available for VOC removal. This power can be adjusted to control the plasma oxidation process, which currently relies on manual intervention. The objective of this thesis is to implement control techniques that will allow a shift from manual to automated control systems.

Approach: The approach is to use the Speedgoat rapid control prototyping platform to address the challenges in the air cleaning system. Step response analysis improves understanding of system dynamics while existing actuators and sensors are leveraged for control system implementation, ensuring compatibility. Various PID tuning design methods are used to optimize control performance, improving system reliability and efficiency.

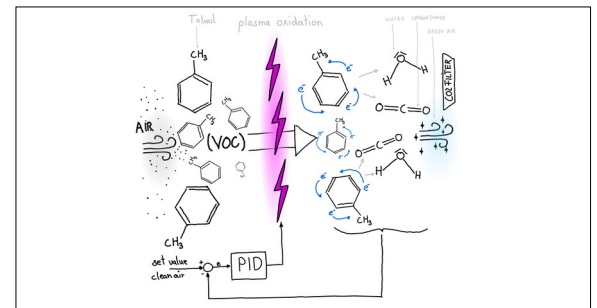
Conclusion: This study demonstrates the automatability of the air cleaning system. The implementation of PID control shows its adaptability to variable pollution levels and its ability to achieve energy savings. This work lays the foundation for the engineering and automation of plasma air cleaning, utilizing its advantages to provide efficient solutions

for air pollution control, contributing to environmental sustainability, and paving the way for the development of functional and efficient systems capable of testing different pollution combinations.

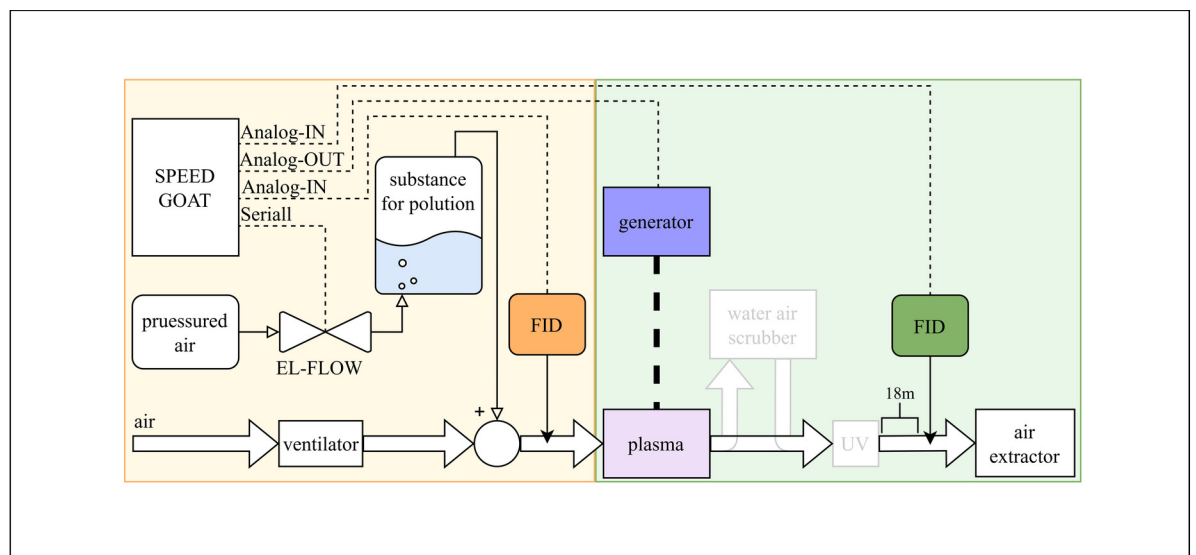
Evaluation of the effectiveness of the plasma system in reducing carbon pollutants at various concentration levels.
Own presentation



The figure shows Toluol being treated by plasma oxidation, controlled by a PID controller, to achieve clean air.
Own presentation



Air cleaning system with essential components for effective pollution control.
Own presentation



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Subject Area

Regelungstechnik / Control Theory

Project Partner

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