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## Problem

The increasing use of woody fuels impacts air quality due to emission of gaseous and particulate products, which have been associated with environmental health problems. Recent legislation in Europe sets stringent emission limits for particles and of CO from small wood facilities.

## CAROLA® Electrostatic precipitator



**Operation principle:** In the precipitator particles are charged by a compact corona discharge ionizer and charge particles are collected by brush-electrodes installed inside of the grounded collector. The agglomerated particles are removed by periodical rotation of the brush-electrodes and fall into the ash box, from where the fly-ash is disposed.

**Design:** The precipitator is constructed from stainless steel and durable materials to prevent thermal and corrosive damage. Long-term performance of the corona discharge ionizer is ensured by automatic cleaning devices. The ESP and high-voltage system are regulated by electronic control systems, which assure optimal performance even under difficult combustion conditions:

1- ionizer, 2 – collector, 3 – high voltage electrode, 4 – brush electrodes, 5 – cleaning device, 6 – ash box

## Way for solution

The application of electrostatic precipitators (ESPs) could be the effective solutions for reduction of particle emissions. The ESPs ensure high collection efficiency for particles of various sizes, especially of sub-micron ones and are characterized with low pressure drop.



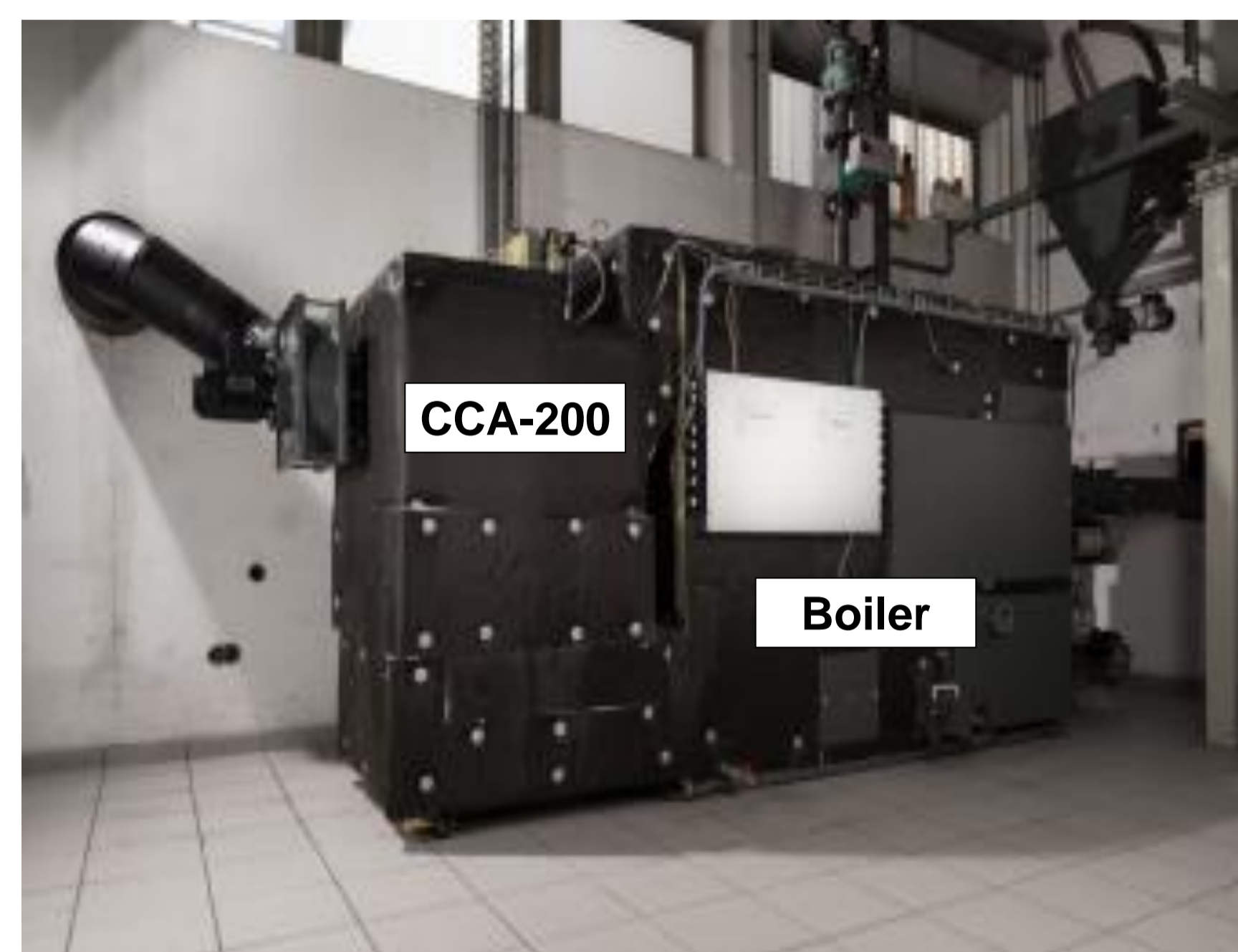
**Focus of field tests:** The Carola®-precipitators have meanwhile been installed at various test facilities and private customers. In the focus of these tests are long term performance and availability at various fuel and operational conditions.



**CCA-100 is mechanically adapted to wood-combustion boiler**



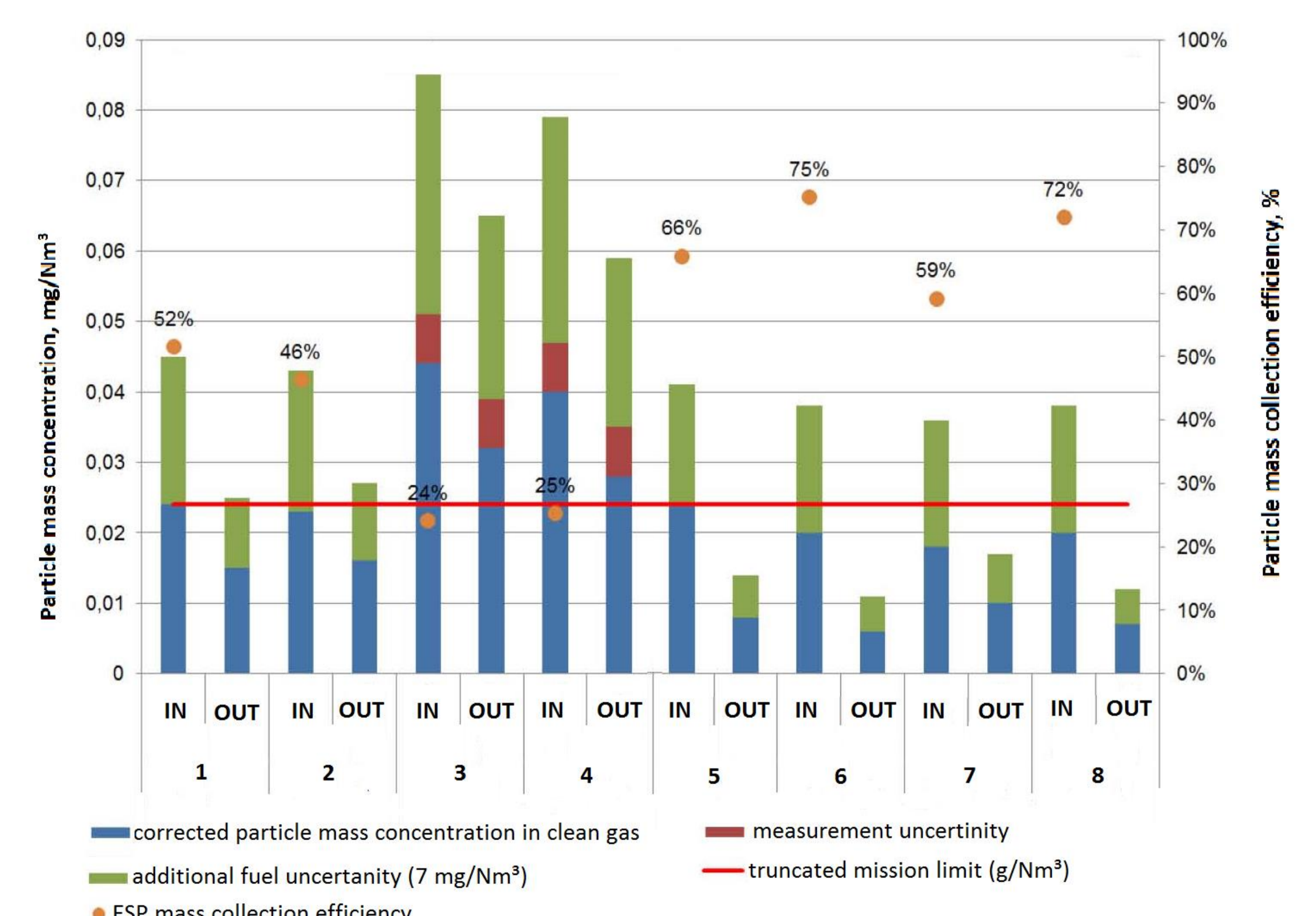
**CCA-100 is mechanically and electronically adapted to wood-combustion boiler**



**CCA-200 is mechanically and electronically integrated into wood-combustion boiler**



**Long-term operation parameters of CCA-100 :**  
1-voltage (kV), 2-corona current (mA), 3-pressure drop (Pa), 4 - gas temperature upstream ESP (°C), 5 - gas temperature downstream ESP (°C)



**CCA-200 mass collection efficiency and particle mass concentrations upstream (IN) and downstream (OUT) of ESP**

## Conclusions:

- A total of more than 30.000 h of operation has been achieved, without major defects of electrostatic precipitators.
- Removal efficiencies range between 70 – 90 % during long term operation.
- The German emission limits are met reliably for various fuels and boilers.
- Stable operational performance is achieved by automatic cleaning of the ESP ionizer and collector.
- Besides cleaning of ash box every 500 hours; other maintenance or exchange of spare parts is not required.