

**>> Development and Test of an Electrostatic Precipitator for Small Scaled Biomass Boilers: Options for Application and First Operation Results**

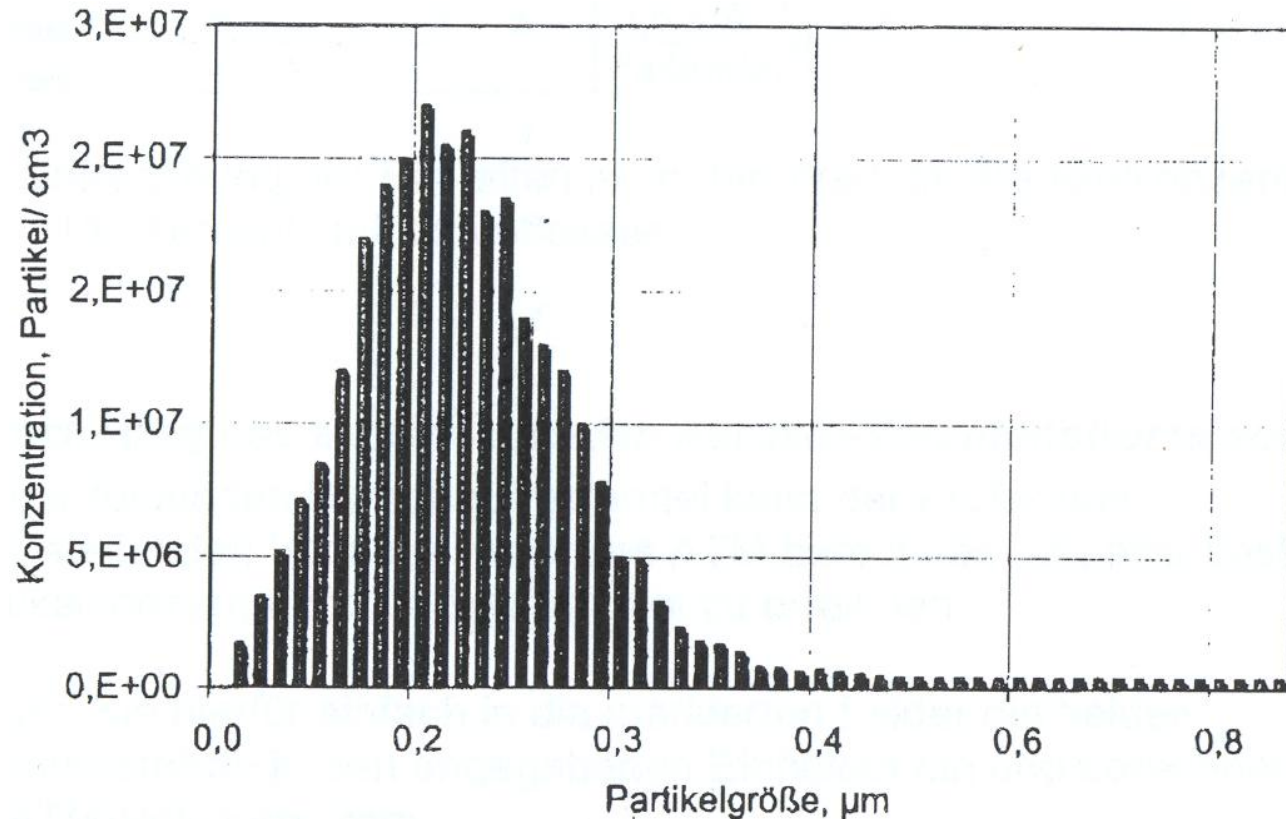
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- 1. Development of a First Prototype for Single Room Furnaces**
2. Further Development of a Second Prototype for Central Biomass Boilers up to 100 kW Thermal Output

## Call for projects of the federal Ministry for Food, Agriculture and Consumer Protection

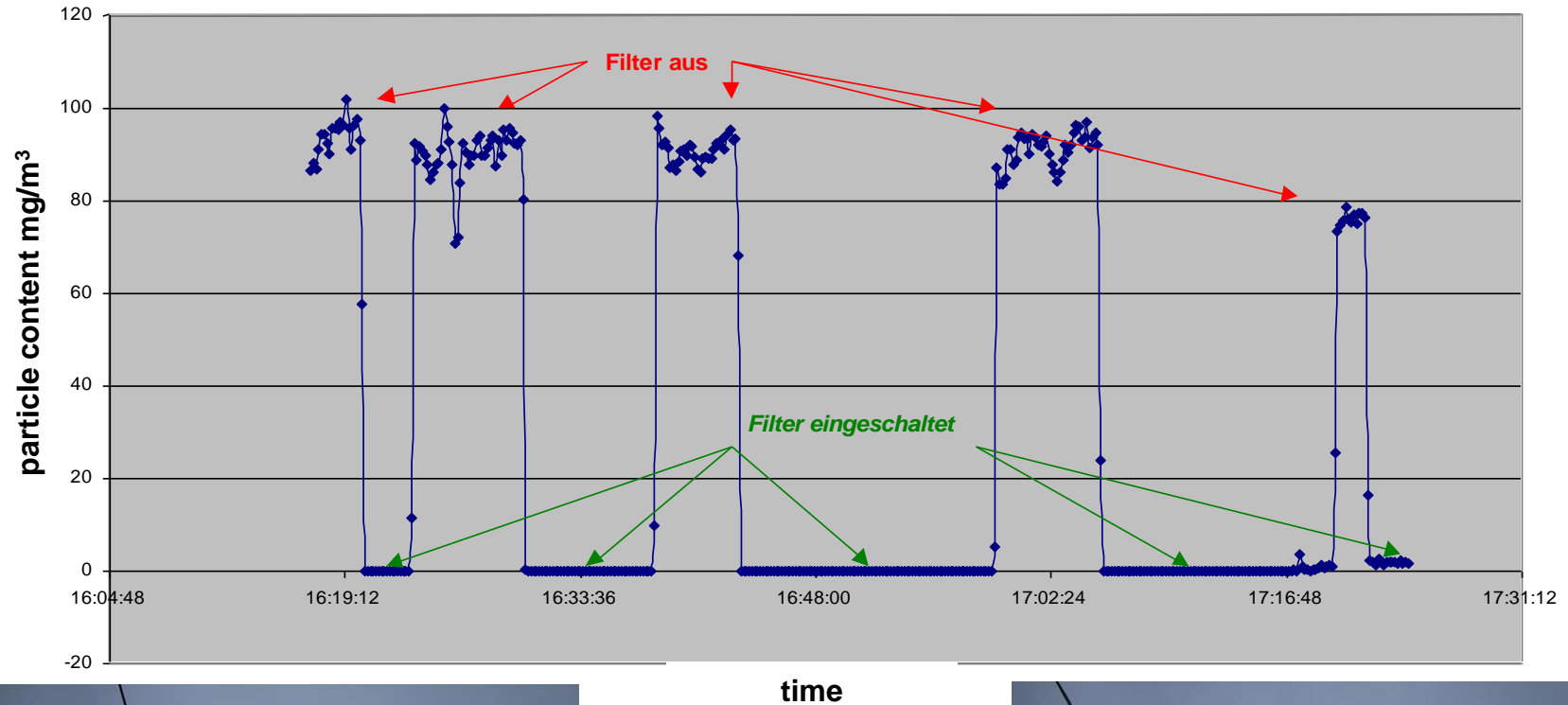
- a) Date of publication: 11th October 2006
- b) Thematic priority: Technical innovations for the secure of the use of biomass – reduction of dust emissions for biomass furnaces within the scope of the German 1. BImSchV (Federal Immission Control Ordinance)
- c) Project title: Monitoring and optimisation of a modular process combination for the precipitation of aerosols and dust caused by small biomass furnaces
- d) Duration of the project: 01. April 2007 – 31. August 2008

- DEHS: Di-2-Ethylhexyl-Sebacat  $C_{26}H_{50}O_4$



- Defined particle size distribution can be generated using a standard aerosol generator
- The size distribution of DEHS fits with respirable dust emissions from the combustion of biomass, especially woody fuels like pellets, wood chips etc.

# Laboratory (using DEHS) and Field Test Results



precipitator off

precipitator on



## Identified optimisation potential

- a) Control unit must be upgraded
- b) Automatic cleaning mechanism is necessary and must be developed
- c) Disposal concept for the condensate must be developed
- d) Reduction of the costs is necessary for a successful market entry



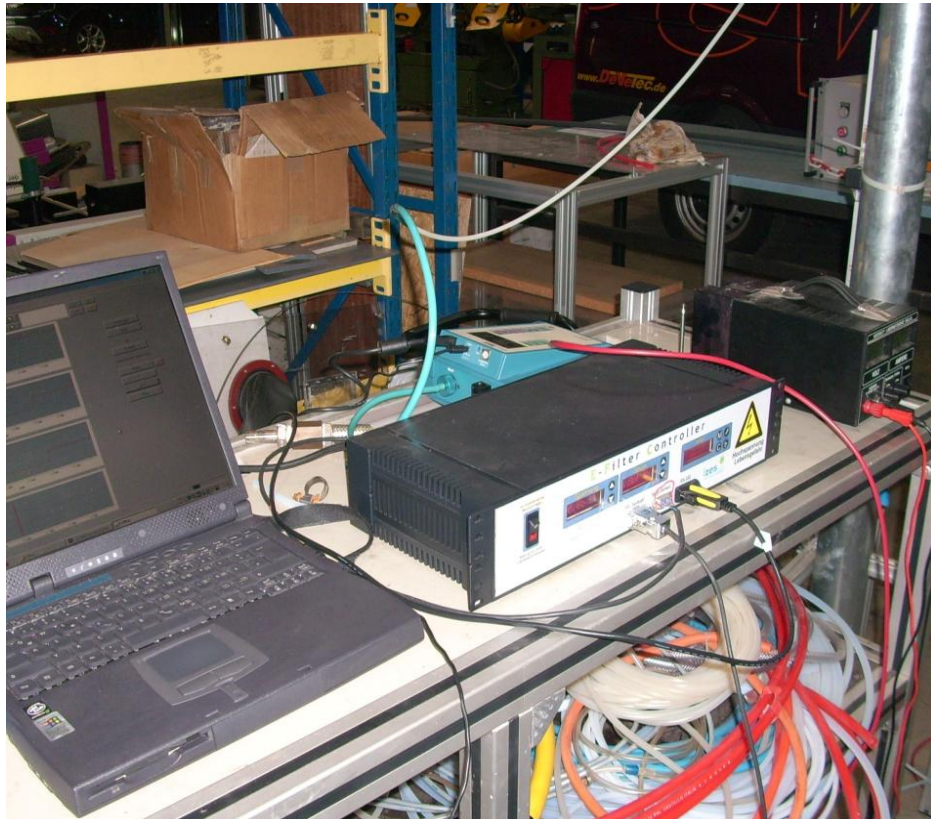
1. Development of a First Prototype for Single Room Furnaces
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## Motivation

- a) Two boiler manufacturers are interested in the development of an internal precipitator (integration of the electronic and the precipitator itself into the boiler)
- b) After the development of the first prototype the ministry enlarged the program concerning now also central biomass boilers

## Goal

- a) Development of an all-purpose application for integration into a boiler (primarily into the heat exchange area) as well as into a chimney (primarily connected direct following the boiler), respectively. Both applications should be developed without a condensate trap and for the use within the hot gas area
- b) Transferability to other applications

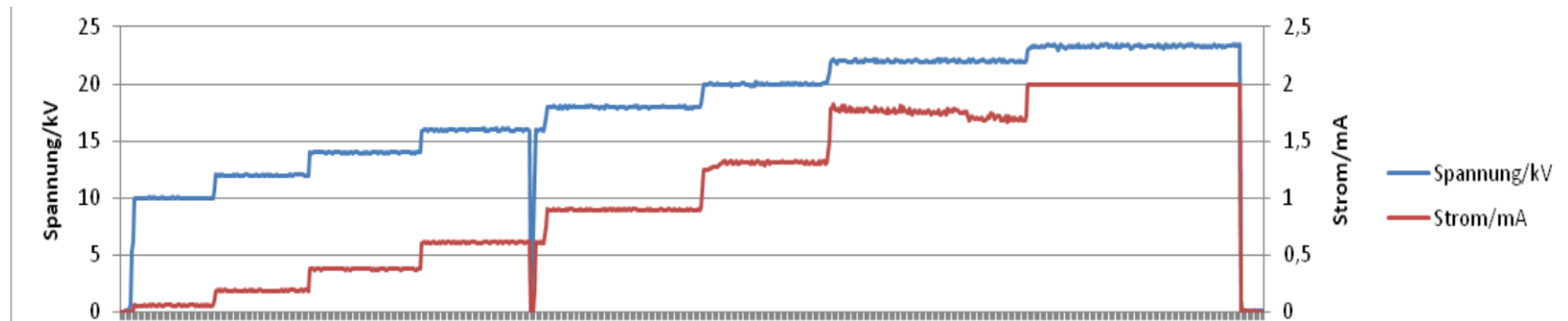


- In house development of the new high voltage source
- Maximum Power: 60 W (30 kV @ 2 mA)
- Automatic high voltage damping in case of a current flow of more than 2 mA
- Integrated data storage
- Integrated operation display for electric current and high voltage
- Front panel for the adjustment of the operation mode, especially for the manual regulation of the limiting values for current and high voltage

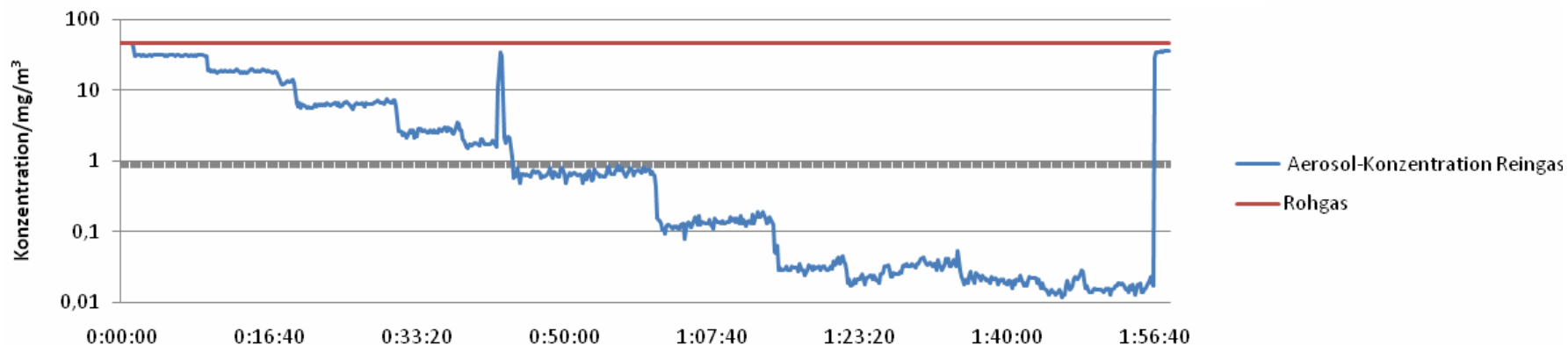
# Results for a single HV electrode, cylindrical tube

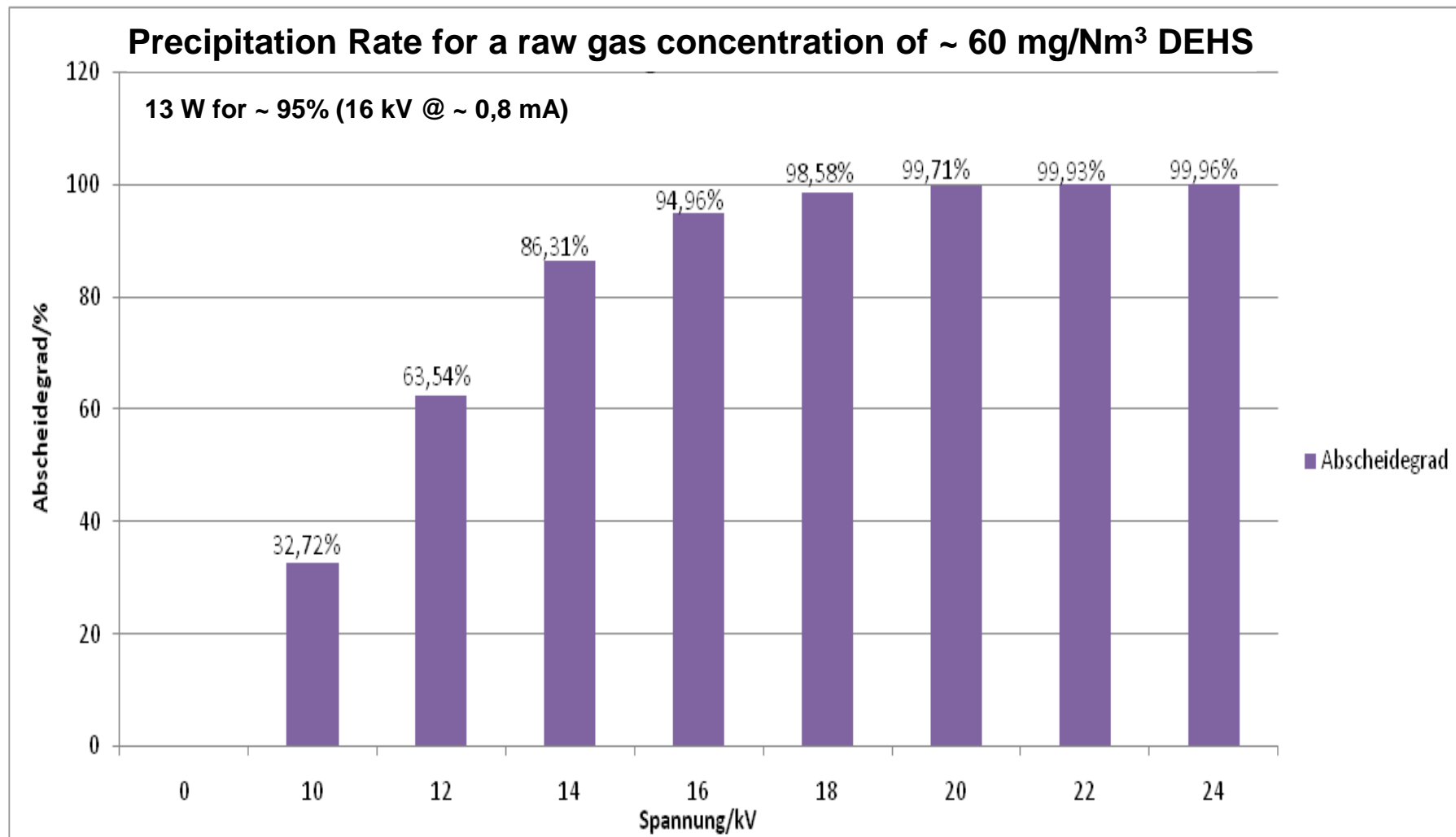
DEHS concentration in the raw gas :  $\sim 60 \text{ mg/Nm}^3$  @ Volumetric flow:  $50 \text{ m}^3/\text{h}$  ;  
diameter of the tube: 110 mm ; precipitator section: 1200 mm ; High Voltage  
parameters: 7 steps à 2 kV ; maximum current of 2,0 mA @  $\sim 23 \text{ kV}$  ;

## Experimental Parameters: High Voltage and Electric Current



## DEHS Concentration: Raw gas & Clean gas

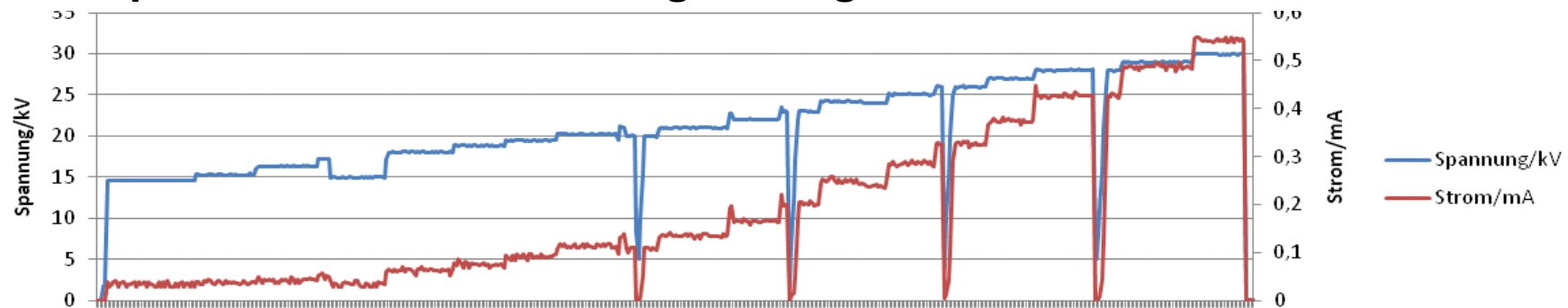




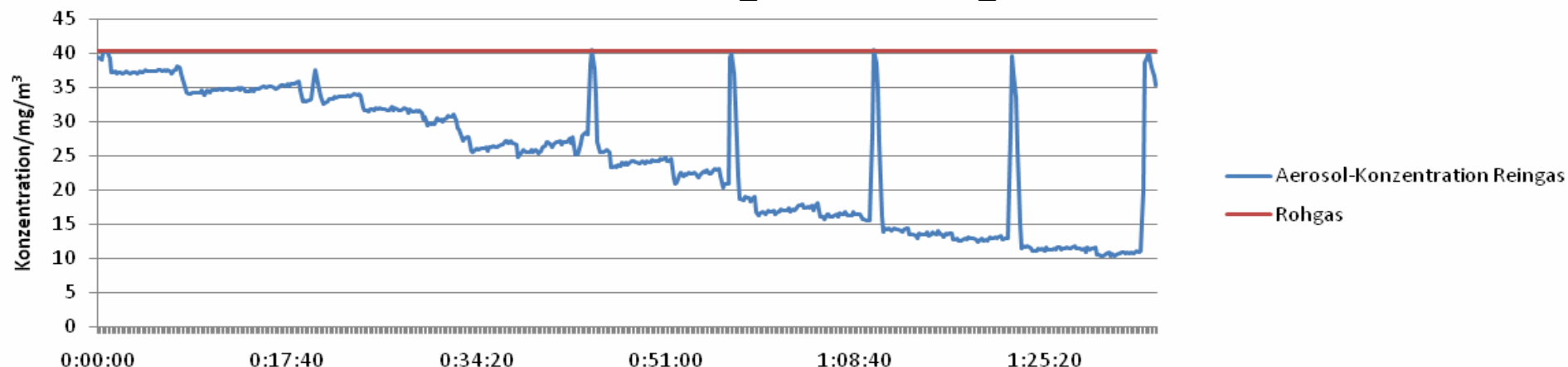
# Results for a horizontal plate filter with five HV electrodes, cubic tube 120 mm x 250 mm

DEHS concentration in the raw gas:  $\sim 41 \text{ mg/Nm}^3$  @ Volumetric flow:  $50 \text{ m}^3/\text{h}$ ;  
distance of the single electrodes: 60 mm; precipitator section: 360 mm; High Voltage parameters: 16 steps à 1 kV; maximum current of 0,6 mA @  $\sim 30 \text{ kV}$  ;

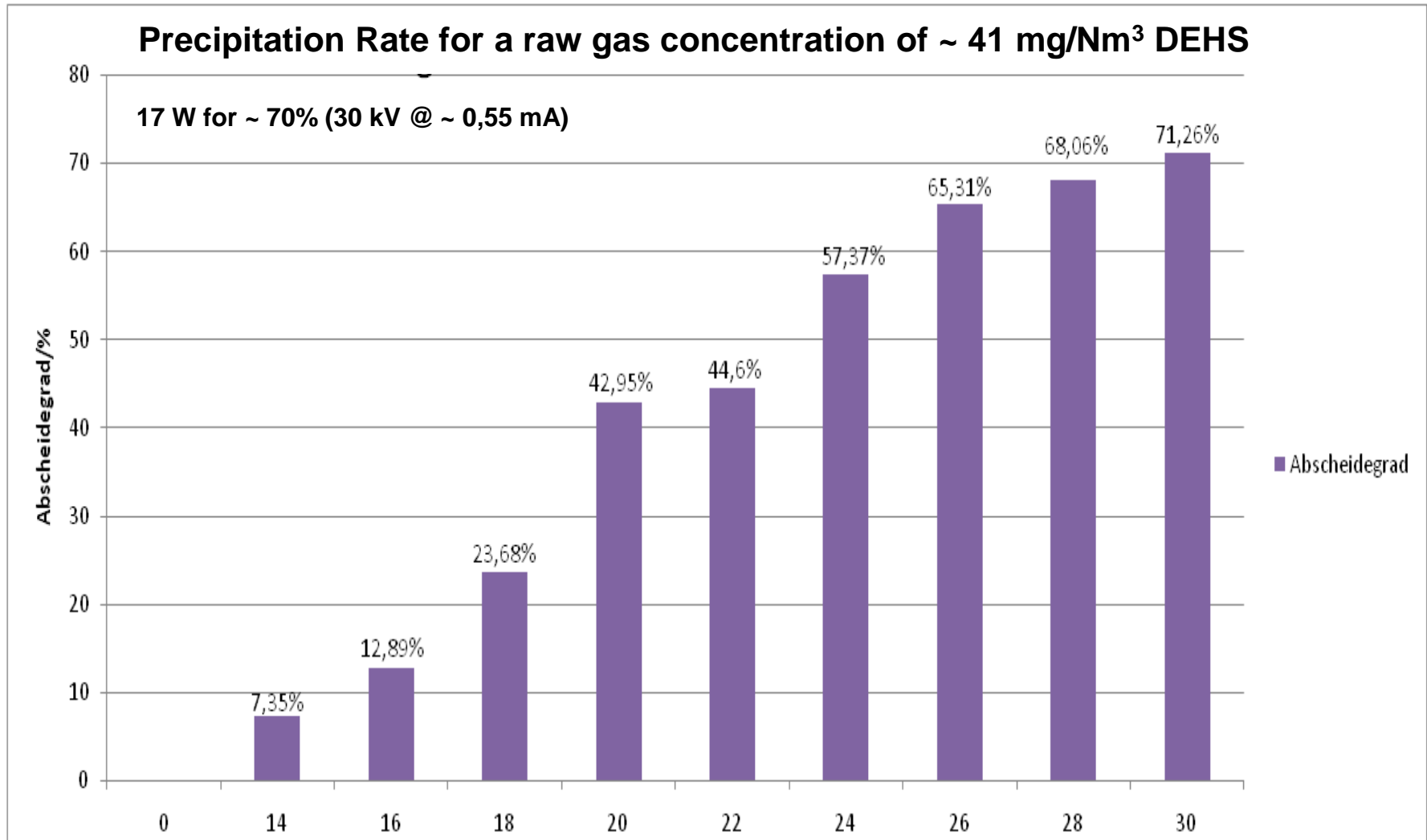
## Experimental Parameters: High Voltage and Electric Current



## DEHS Concentration: Raw gas & Clean gas



# Results for a horizontal plate filter with five HV electrodes, cubic tube 120 mm x 250 mm



## **Thank you for your attention**

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