

Ultra low dust emissions for residential heating systems

Project homepage: www.ultralowdust.eu

Project Coordinator:

BIOS BIOENERGIESYSTEME GMBH (Austria)
office@bios-bioenergy.at, www.bios-bioenergy.at

Project Partners:

WINDHAGER ZENTRALHEIZUNG TECHNIK GMBH (Austria)
info@windhager.com, www.windhager.com

TECHNISCHE UNIVERSITÄT GRAZ (Austria)
thomas.brunner@tugraz.at, http://ippt.tugraz.at

RUFTEC AG (Germany)
info@ruftec.com, www.ruftec.com

TECHNOLOGIE- UND FÖRDERZENTRUM IM KOMPETENZZENTRUM FÜR NACHWACHSENDE
ROHSTOFFE (Germany)
poststelle@tfz.bayern.de, www.tfz.bayern.de

SUPRA SA (France)
info@supra.fr, www.supra.fr

EUROPÄISCHES INSTITUT FÜR ENERGIEFORSCHUNG EDF-KIT (Germany)
contact@eifer.org, www.eifer.org

WUPPERTAL INSTITUT FÜR KLIMA, UMWELT, ENERGIE GMBH (Germany)
info@wupperinst.org, www.wupperinst.org

New small scale electrostatic precipitator (ESP) technology

**with high efficiency and
automatic cleaning system**



Presented by:



TECHNOLOGIE- UND
FÖRDERZENTRUM (TFZ)
STRAUBING



The research leading to these results has received funding from the European Union's Seventh Framework Program (FP7/2007-2013) under grant agreement N° ENER/FP7/268189. All information in this document is provided „as is“ and no guarantee or warranty is given that the information is fit for any particular purpose. The user thereof uses the information at its sole risk and liability. For the avoidance of all doubts, the European Commission has no liability in respect of this document, which is merely representing the authors view.

The project

Within the **FP7 project** EU-UltraLowDust, performed by a consortium of eight partners from three EU-countries, a European approach for **ultra-low emission small-scale biomass combustion** was made. Three novel technologies which cover the whole range of residential biomass heating applications (ultra-low emission pellet and woodchip boiler; new stove technology based on optimised air staging and on automated control system; new ESP system for old stoves and boilers fired with biomass fuels) have been demonstrated within the project.

These three technologies have been evaluated and optimized within comprehensive **test stand tests** and **field tests over two heating seasons**. They **define a new state-of-the-art** regarding ultra-low emission biomass combustion covering an intelligent combination of primary and secondary measures.

Moreover, market studies as well as techno-economic analyses and overall impact assessments based on the results of the field tests have been performed. Additionally, the project aims at the development of recommendations for **future emission limits** under consideration of the results achieved, which shall then be discussed with national and EU authorities active in legislation making.

The new ESP technology

- The amount of particulate matter (PM) emitted by biomass stoves and boilers (e.g. fueled by logwood, pellets or wood chips) is still significantly higher compared to applications fired with liquid or gaseous fossil fuels. The Ruff-Kat ESP with its innovative technology offers a promising solution to reduce these emissions.
- The electrostatic precipitator (ESP) is mounted on top of the chimney where it can be operated with existing boilers, stoves, and cookers as retrofit unit as well as with new installations. The precipitator is suitable for all types of small-scale residential wood combustion systems up to 40 kW.
- With its automatic cleaning system and an automatic controlling unit no additional user effort is required. Due to negligible pressure losses any disturbances to users are avoided.

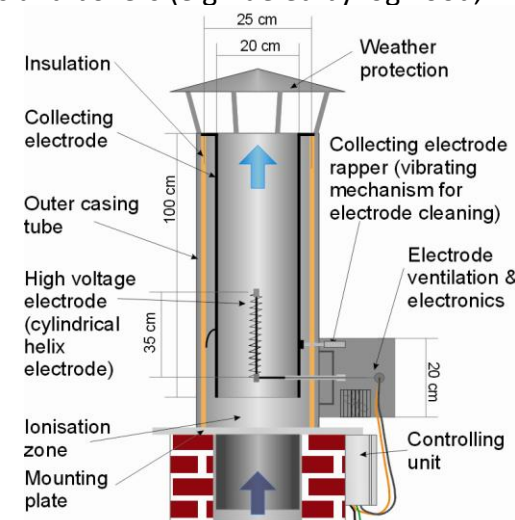


Fig.1: Sketched design of the ESP

Technical data:

	Unit	
Material		Stainless steel V4A
Chimney diameter	mm	120 – 350
Filter height	mm	1200
Capacity range of heating system	kW	Up to 40
Electrical energy consumption	W	In operation: 11; in standby: 3 – 5
Voltage output	kV	Up to 26
Precipitation efficiency	%	Up to 70
Cleaning system		Automatic cleaning by rapping
Guarantee		2 years
Certificate		European TÜV certificate intended

The performance

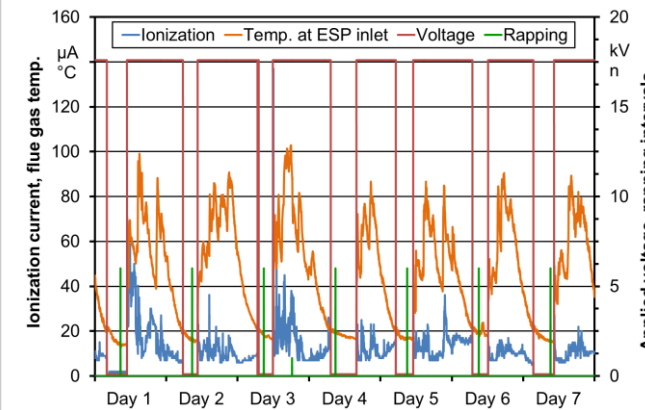


Fig.2: ESP operation behavior

Over a period of two heating seasons four ESPs were mounted at field testing sites to observe their operation behavior under environmental conditions. A constant voltage of 24 kV applied with increasing flue gas temperature could be kept stable over several weeks (Fig.2). The combustion systems that were equipped with an ESP - an old and a modern logwood boiler and an old and a modern stove – were operated with various biomass fuels such as logwood and briquettes. Therefore, influences as the users heating behavior or the type and quality of fuel used could be considered.

Within dedicated field tests the ESP's precipitation efficiency was obtained by measuring the dust load in the raw and the clean gas in parallel. Additionally, measurements at a wood chip burner were performed under laboratory conditions to assess technological adjustments and design modifications. Furthermore, results from test bench measurements were compared to real life emissions. A reduction of total suspended particle (TSP) emissions of up to approx. 70 % could be reached both at high and at low dust loads (between 20 mg/Nm³ and 550 mg/Nm³) in the flue gas, with various combustion systems and with automatic or manual feeding systems (Fig.3).

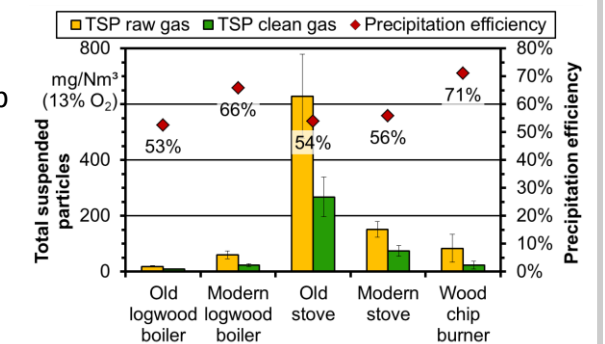


Fig.3: Results from TSP measurements

[mg/Nm ³ at 13%O ₂]	TSP - raw gas		TSP - clean gas		Precipitation efficiency	
	Mean value	Standard deviation	Mean value	Standard deviation	Mean value	Standard deviation
Field measurements	215	49	93	24	57 %	10 %
Laboratory conditions	83	50	24	14	71 %	1 %

The advantages

Advantages for users:

- When an existing combustion application does not reach the required PM emission limit values and a complete replacement of the combustion should be avoided, the ESP can be used as retrofit installation.
- As roof top installation additional space is required neither in the living nor the boiler room.
- The expected price will be of advantage compared to a new heating system.

Advantages for the general public:

- With reduced emissions of particulate matter esp. in urban living areas the air quality is expected to improve significantly.
- By replacing fossil fuels a contribution to climate protection is made.

Market introduction strategy:

- Training of chimney sweeps starting in March 2014
- Volume production is going to take up in March 2014
- Presentation of the technology on trade fairs, in show rooms, and in exhibition centers.

Availability on the market:

- With approx. 20 units sold the ESP is already available on the market.

