

#### Institut für Energie- und Umwelttechnik e.V.

Bliersheimer Str. 60, D-47229 Duisburg

Telefon: +49 (0) 2065 418 - 0 Telefax: +49 (0) 2065 418 - 211 E-Mail: info@iuta.de

# **Reduction of soot particles and hydrocarbon emissions** from small scale furnaces

**Dr.-Ing. Egon Erich** 

· Wood is becoming increasingly important as a

renewable fuel for generating heat in private households. Approximately 14 million small-scale

furnaces have already been installed in Germany.

Especially those with less than 15 kW of power are

monoxide, these wood furnaces also emit large

quantities of gaseous hydrocarbons that have not

only been classified as carcinogenic but also have

Especially the high PM10 concentrations in the dust

known to emit substantial quantities of pollutants. • In addition to dust particles and the toxic gas carbon

#### Dr. rer. nat. Ulrich Quass

### Exhaust from small scale furnaces

Hydrocarbon content: 4000 mg/m<sup>3</sup> (90 - 8000 mg/m<sup>3</sup>)

#### Dust content:

Approx. 130 mg/m<sup>3</sup> (50 - 450 mg/m<sup>3</sup>) (therefrom about 100 mg C/m<sup>3</sup>)

#### Particle size:

Up to 95 % of the dust in the exhaust gas of small scale furnaces are smaller than PM10

Around 90 % of all dust particles from domestic heating are emitted by wood-fired furnaces.

## emissions require an urgent need for action. Solution

very unpleasant odour.

**Problem** 

The Institute of Energy and Environmental Technology (IUTA) has developed a catalyst system for small-scale wood-fired furnaces with which it is possible to significantly reduce gaseous hydrocarbons and Carbon monoxide as well as the soot content in the exhaust gas.

The emission control system is mounted directly behind the furnace in the flue pipe. It consists of a lens-shaped cartouche filled with approx. 600g high-grade steel chippings, which are coated with palladium, the active component of the catalyst. A special dedusting unit consisting of a stainless steel lattice welded on a copper ring is mounted in the center of the catalyst material. The device operates according to the Seebeck effect: in response of a temperature gradient two dissimilar materials generate an electromotive force, causing the flow of current. The generated current respectively the induced electrical and/or magnetic fields lead to the collection of the soot paticles, which are subsequently oxidized.

#### **Oxidation of hydrocarbons** with the Pd-chipping catalyst





Pd-chipping catalyst Cartouche assembly



#### Hydrocarbon conversion



Temperature profile in the fluegas



Emission control system for small scale furnaces

**Collection and conversion** of soot particles with the dedusting lattice





Dedusting and conversion lattice Soot collection



No.	raw gas	clean gas	separation rate	
	mg/m <sup>3</sup>	mg/m <sup>3</sup>	in %	
1	1140	182	84	soot
2	10950	612	94	soot
3	191	29	85	soot
4	177	55	69	soot
5	402	150	62	mineral dust
5	402	102	02	collection

results obtained by recent measurements



Cascade impactor data of the dust

The investigations at IUTA have been supported by Germans Federal Ministry for Economics and Technology via the Working Comitee of Industrial Research Associations (AIF-Otto von Guericke) as well as the Ministry for Nutrition and Rural Area of Baden Württemberg via the State Institute for Environment, Measurements and Nature Conversation (LUBW). The financial support is gratefully acknowledged. We also thank our Industrial Partner MoreCat GmbH for their technical assistance in the development and commercialisation of the emission control system.

