TECHNISCHE UNIVERSITÄT DRESDEN

DRESDEN concept

Faculty of Forest, Geo and Hydro Science / Institute of Waste Management and Contaminated Site Treatment

EXHAUST GAS EMISSION FROM MBT-PLANTS -A CASE STUDY OF MBT CRÖBERN-

Dipl.-Ing. Lilly Brunn

Dr.-Ing. Stephan Mattersteig, IAA, TU Dresden
Prof. Dr.-Ing. habil. Dr. h.c. B. Bilitewski IAA, IAA, TU Dresden
Dr. rer. nat. M. Friese, MATTERSTEIG & Co. INGENIEURGESELLSCHAFT mbH

Balaclava, 7th September 2011

TECHNISCHE UNIVERSITÄT DRESDEN

Table of contents

Background of research

silicone

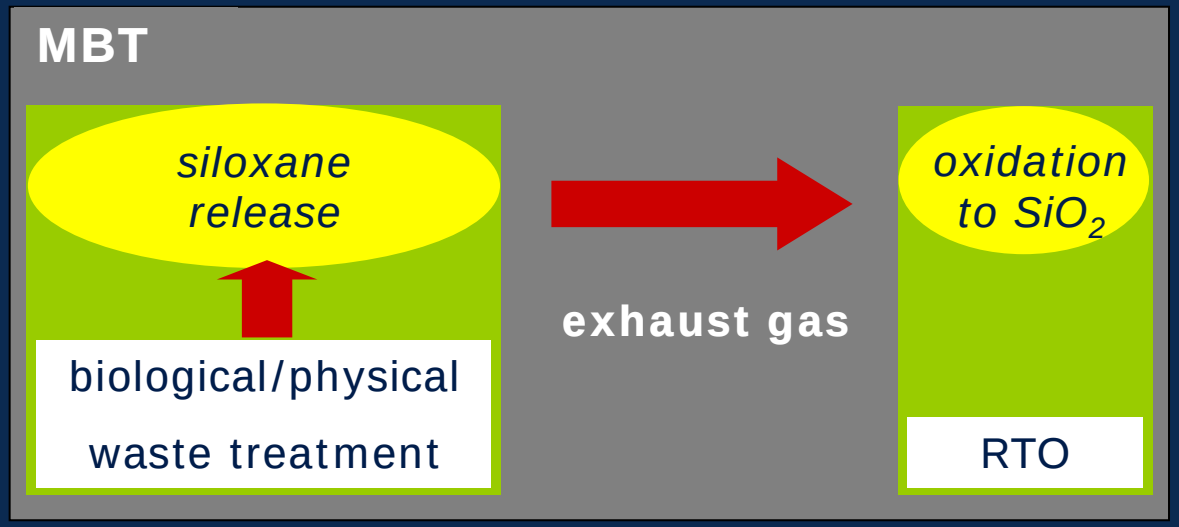
Global production of approx. 2 Mio. tons of silicon products per year (Held, 2002)

Resistence to cold and heat, low electrical conductivity, hydrophobic properties

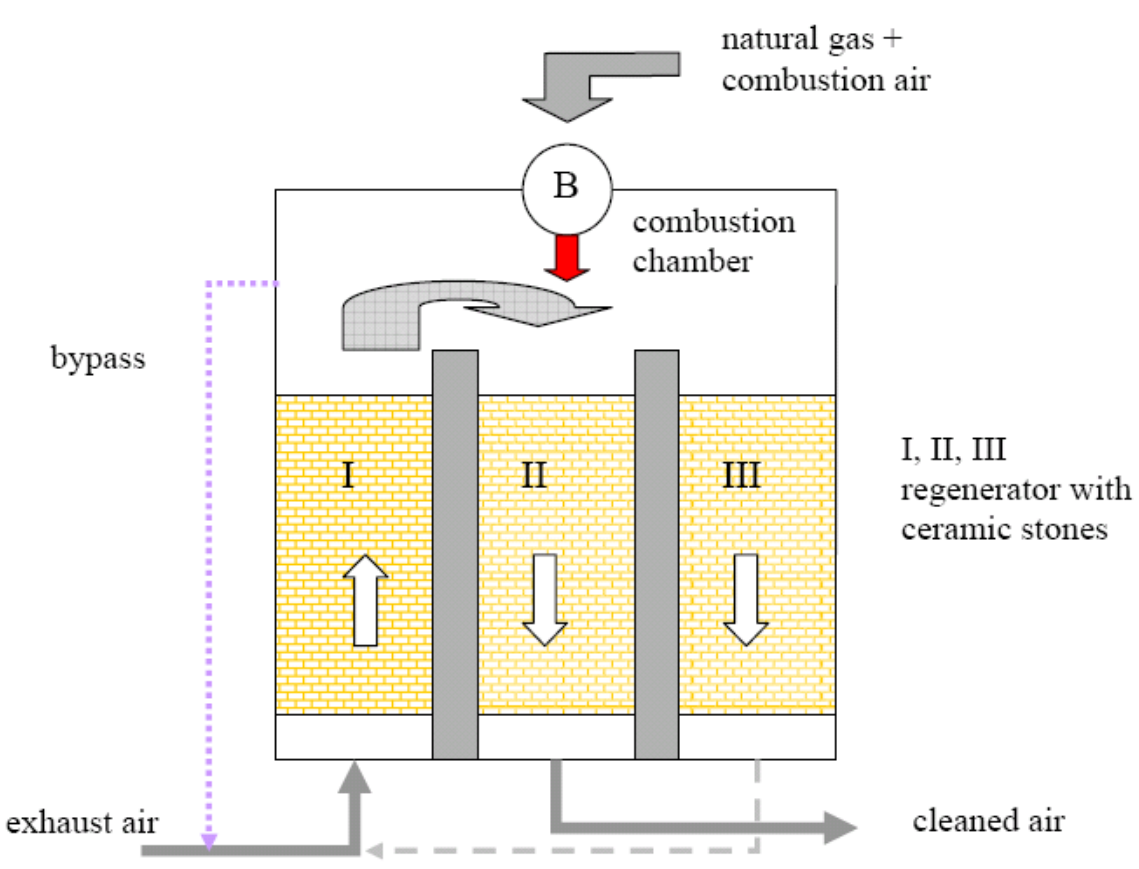
Usage of silicones e.g. in the construction and transport sector; electronic, textile, paper and metal industry, as well as in medical, pharmaceutical and cosmetical products, also in the chemical and plastic industry

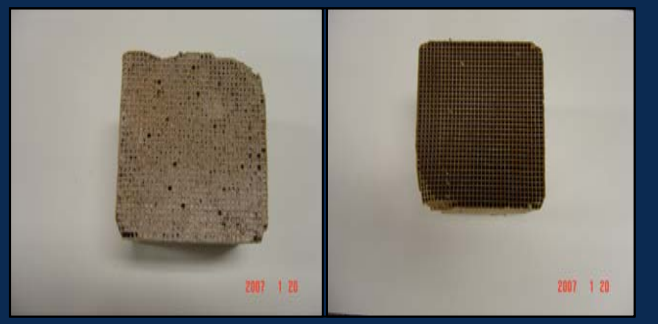
varnish / paint
cosmetics / washing agent
paper / packaging
foodstuff
textiles

residual waste



Function of RTO





clogged stone original stone

Organosilicon compounds are responsible for low endurances and high running costs up to 2,50€/Mg input (Mattersteig et al., 2008)

Aim and content of research

Aim of research was / is:

- **to investigate source, formation and emission of siloxanes**
- **to find a cost effective gas treatment option**

Since 2007 measurement series to siloxane emission at different types of MBT in Germany and Austria, at biogas plants and landfills

Since 2009 investigations to siloxane reduction at biological filters

---

Two extensive measurement series at Germanys largest MBT Cröbern over an intensive rotting stage of 5 weeks each

Investigations at a test biofilter over a period of 7 months located at MBT Cröbern

MBT Cröbern
- Investigations to siloxane emission -

The MBT Cröbern has a waste treatment capacity of 300.000 Mg/a.

MBT Cröbern is a classical MBT with mechanical treatment to separate contraries, resources and a high heat value fraction.

The separated organic enriched fraction < 40 mm is aerobically treated in 44 rotting boxes over 5 weeks by 50-60°C .

The organic material is turned over up to 3 times during the rotting process, regularly watered and pressure aerated.

The organic material is furthermore treated in non-ventilated triangle heaps until the organic material achieves the compulsory disposal criteria and can finally be landfilled.

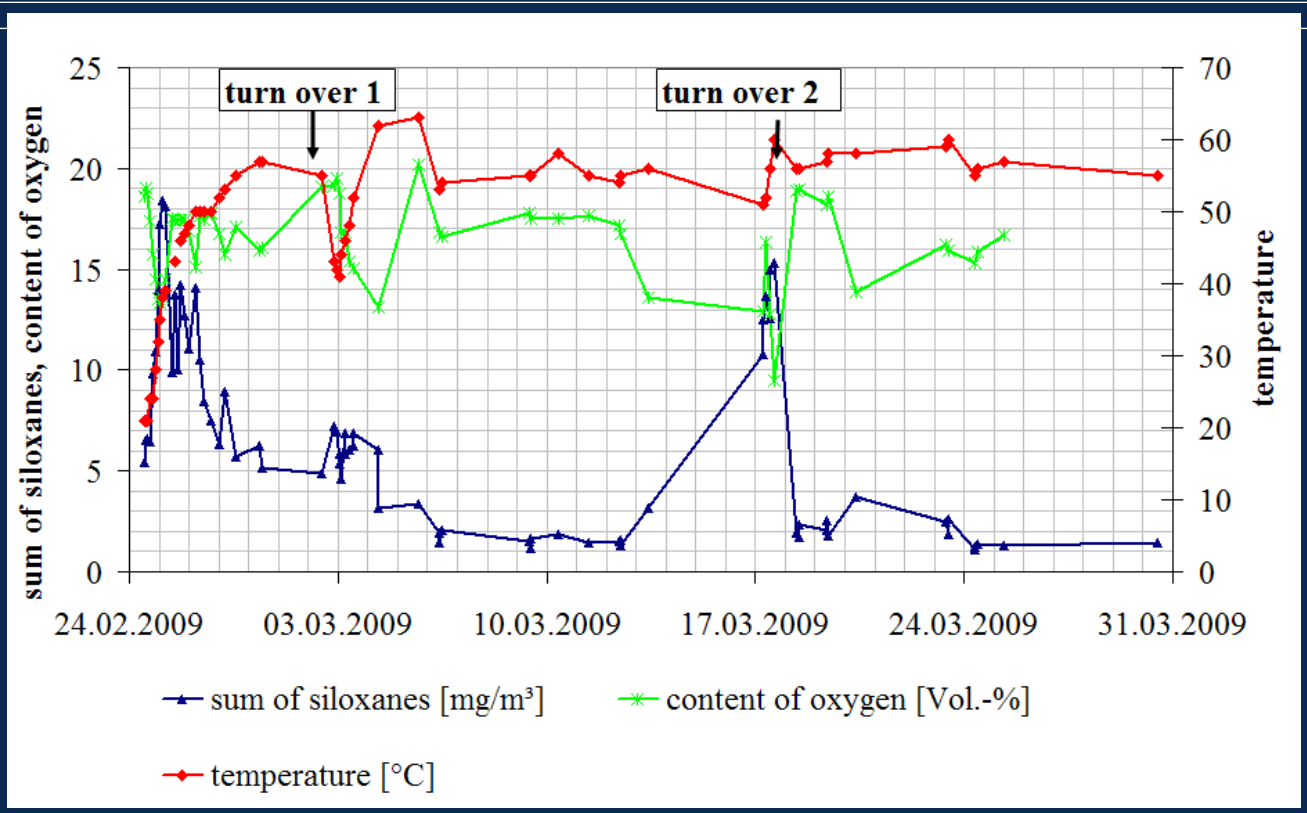
Test facility located at MBT Cröbern

- **5 thermo isolated chambers**
- **Chamber volume of 28 l each**
- **Upstream connected heat exchanger**
- **Heatable pipes**

Three chambers have been operated under same process conditions, filled up with root wood and bark mulch.

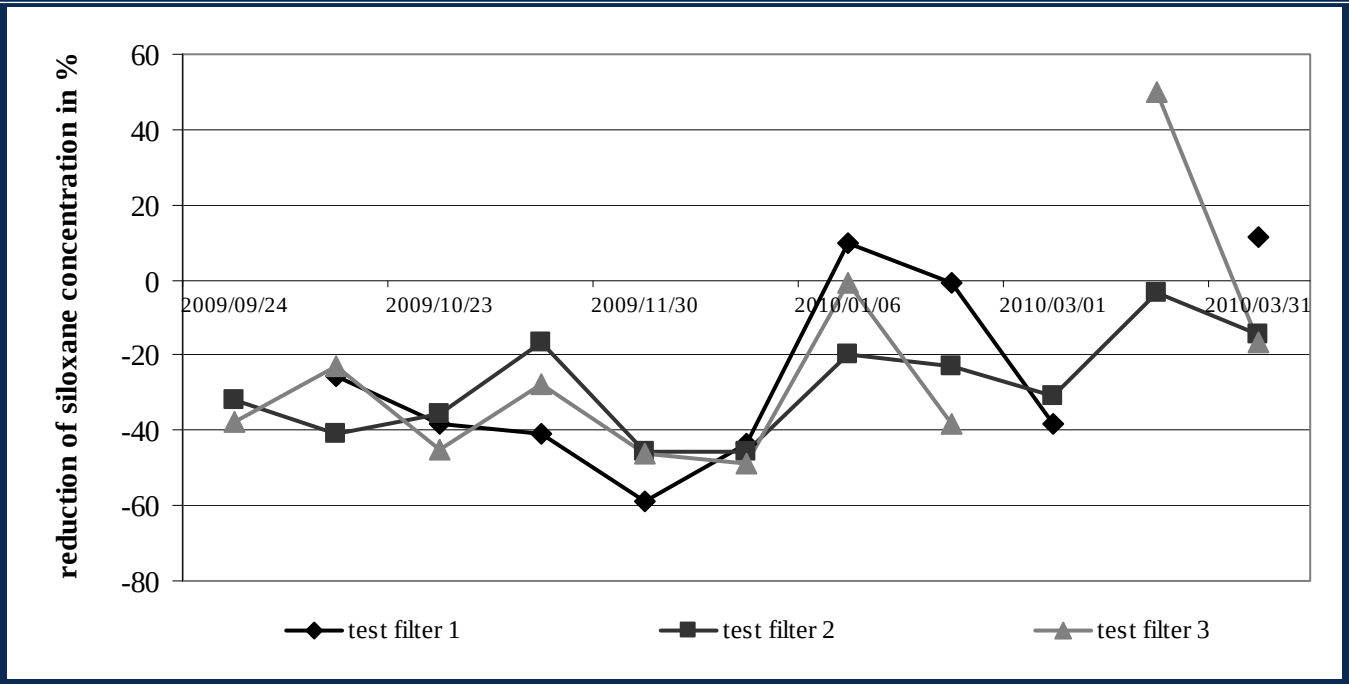
The biological test filters have been continuously loaded with the exhaust air of the intensive rotting process of the MBT Cröbern.

Results of siloxane measurements at MBT Cröbern



- **Main emission during the first days of rotting process and on a lower level again after the turn overs of the rotting material**
- **No direct dependency between siloxane emission and temperature**
- **Direct dependency between oxygen respectively milieu conditions**

Results of siloxane measurements at the biological test filter



- **Constant reduction between 16 % and 59 % during first 3 months**
- **Reduction declined to max. 38 % during last 4 months**
- **Some days higher amounts between 10-50 % in the output air streams**
- **D5 and D6 represent the main part of siloxane emission**
- **Concentrations of D5 between 2-21 mg/m³, 1-3 mg/m³ in case of D6**

Conclusions

The investigations to siloxane emission showed that:

- the main emission takes place during the first days of the rotting process and on a lower level again after turning over the rotting material
- the process temperature does not have an influence on siloxane release in the first place
- there is a direct dependency between siloxane release and content of oxygen / the change of milieu conditions

TECHNISCHE UNIVERSITÄT DRESDEN

Conclusions

The investigations to siloxane emission and reduction showed that:

- considering all investigations of the project the siloxane release is also influenced by the age and composition of the rotting input
- D5 represents the main part of siloxane emission
- a significant reduction of siloxane concentration is possible by biological filtration

  → an explanation for this reduction is not available yet, microbial, chemical or/and physical effects are possible

TECHNISCHE UNIVERSITÄT DRESDEN

»Wissen schafft Brücken.«

THANK YOU FOR YOUR ATTENTION

Contact:

Dipl.-Ing. Lilly Brunn

lilly.brunn@tu-dresden.de

Dr.-Ing. Stephan Mattersteig

s.mattersteig@mattersteig-und-co.de

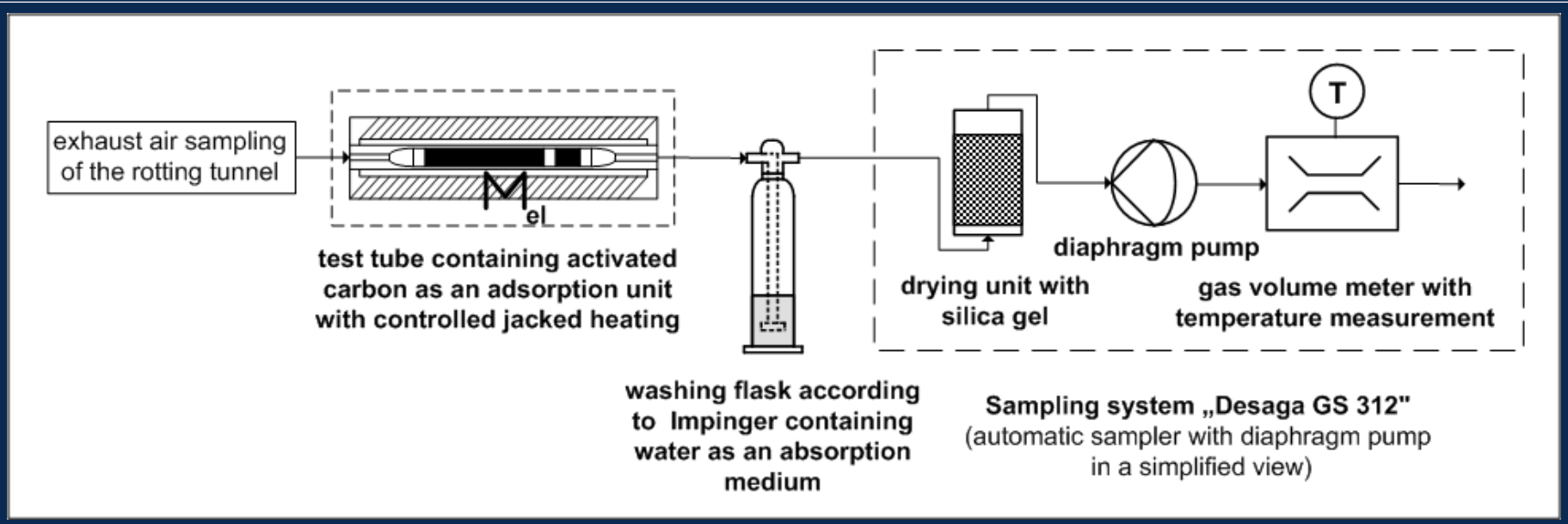
Gefördert aus Mitteln der Europäischen Union

Europa fördert Sachsen.

EFRE

Europäischer Fonds für regionale Entwicklung

Siloxane measurements



Sampling with an activated carbon tube placed in a heated pipe, extraction by carbon disulphide and quantification by GC/MS

- **Hexamethyldisiloxane (L2)**
- **Octamethyltrisiloxane (L3)**
- **Decamethyltetrasiloxane (L4)**

- **Hexamethylcyclotrisiloxane (D3)**
- **Octamethylcyclotetrasiloxane (D4)**
- **Decamethylcyclopentasiloxane (D5)**
- **Dodecamethylcyclohexasiloxane (D6)**