

Welcome to the Eranet Workshop:

**Wood Stoves 2020 –
Towards high efficiency and low emissions**

EUBCE-Conference, Stockholm,
Tuesday 13 June 2017, 13:30 - 17:00h

The main project data



- **Project title: Development of next generation and clean wood stoves**
- **Acronym: Wood Stoves 2020**
- **Duration: 08/2014 till 07/2017**
- **Partner countries: Germany, Austria, Sweden
(3 RTD-partners + 3 industry partners)
+ Consulted informal partner: Denmark**
- **Total project costs: 960,000 €**
- **Funding: Eranet Programme: 7th joint call for research and development proposals.
Funding via the national funding agencies:**

Austria



Sweden



Germany



Project partners



■ Partners from Germany

- Technology and Support Centre of Renewable Raw Materials, TFZ (Coordinator)
- Kutzner+Weber GmbH



■ Partners from Austria

- BIOS Bioenergiesysteme GmbH
- Rika Ofentechnik GmbH



■ Partners from Sweden

- RISE Research Institutes of Sweden (formerly SP)
- Nibe AB



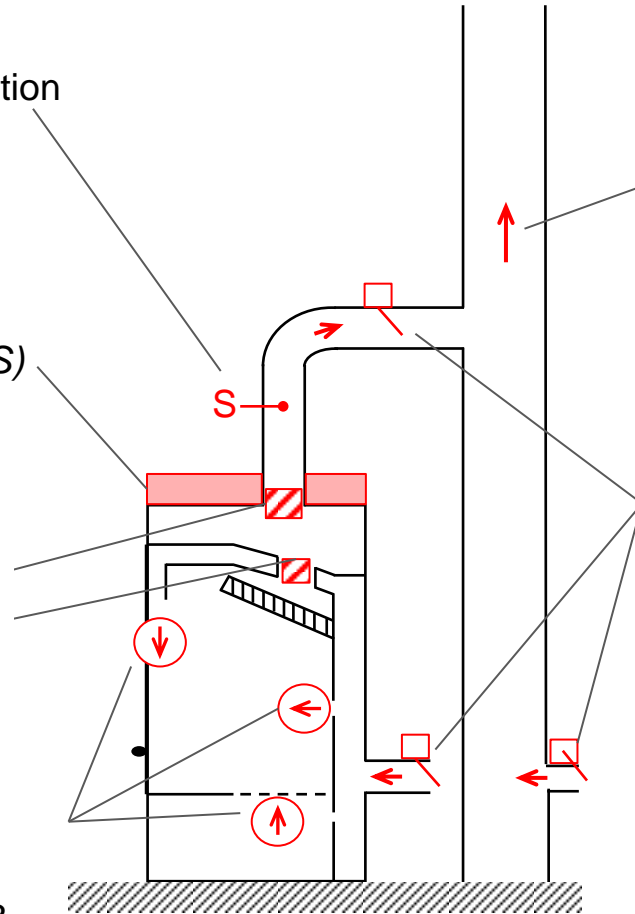
The comprehensive “Wood Stove 2020” approach

Flue gas sensors and evaluation
Ingmar Schüssler, RISE

Efficiency increase and heat storage via PCM
Ingwald Obernberger (BIOS)

Integrated medium or high temperature catalysts
- *Ingmar Schüssler, RISE*
- *Thomas Brunner, BIOS*

Sensor-based integrated combustion air control
- *Christoph Mandl, BIOS*
- *Johan Furborg, NIBE AB*



Heat losses through chimney
Hans Hartmann, TFZ

Retrofit combustion air control and draught stabilizers
Robert Mack, TFZ

Agenda

| | Speaker | Organization |
|---|--|---------------------|
| Welcome and introduction | Dr. Hans Hartmann | TFZ |
| Quantification of energy losses during wood combustion in stoves | Dr. Hans Hartmann | TFZ |
| Flue gas sensors testing and evaluation | Ingmar Schüssler | SP / BIOS |
| Development of integrated stove control systems based on temperature sensors | Dipl.-Ing. Dr. Christoph Mandl | BIOS/Rika |
| Development of integrated stove control systems based on temperature and flue gas sensors | Johan Furborg | Contura/SP |
| Coffee break | | |
| Retrofit controlling units and modern draught stabilizers for stoves | Robert Mack | TFZ |
| Selection and integration of high temperature catalysts into a stove | Dipl.-Ing. Dr. Thomas Brunner | BIOS |
| Selection and testing of medium temperature metal based mesh catalysts for stoves | Ingmar Schüssler | SP |
| Improved high efficiency low emission stove concept including an PCM heat exchanger | Prof.Univ.-Doz.Dipl.-Ing.Dr. Ingwald Obernberger | BIOS/Rika |
| Concluding remarks | | |

Further outcome of the project (completely available after July 31st, 2017)

Three jointly elaborated guidelines:

- Guidelines for optimized stove concepts
- Guidelines for automated control systems for stoves
- Guidelines for heat storage units based on Phase Change Materials (PCM)
- Technical reports (in presentation format)
- Links to several publications
- Comprehensive final report
- All presentations from this EUBCE-Workshop

Download link at Project Webpage:
www.tfz.bayern.de/en/162907/index.php

Background



Small-scale biomass combustion is one of the most relevant bioenergy applications today. Driven by EU-wide and national measures to promote the utilisation of biomass for energy production, the European market for biomass based residential heating systems is expected to substantially increase by about 150% until 2020 (based on 2009). Regarding the installed units stoves show the highest and steadily increasing numbers in Europe. According to market studies a potential for an annual installation of almost 2.200.000 stoves (logwood and pellet stoves) is forecasted for Europe in 2020.

This additional potential for renewable energy production will of course contribute to a reduction of the EU's greenhouse gas emissions, however, it is also well known that among the different residential biomass combustion technologies logwood stoves show the highest CO, COC and fine particulate matter (PM) emissions. But at the same time it had also been shown in a previous project (ERA-NET FutureBioTec in 2009) that by application of advanced combustion concepts and modern design tools significant emission reductions can be achieved, even compared with state-of-the-art stoves (80% for CO, 85% for COC and 55% regarding PM). The Stove2020-project directly lies in with these results and aims at the development of innovative measures and technologies in order to further reduce emissions from wood stoves, to increase their thermal efficiency and to expand their field of application from solely single room heating to central heating. The latter could especially be of relevance for future applications in low energy buildings.

Objectives

The project aims at a comprehensive improvement of log wood stoves. Regarding emissions and the fuel consumption the technologies used shall be optimized considerably. Thereby the project focus lies not only on the furnace technology itself, but rather on the whole system. This means also technical improvements regarding automatic combustion air control, heat storage, chimney draught control and minimization of user influence and standing losses. As a result there should be new approaches for more effective system integration of highly efficient and clean log wood stoves.

With the new technologies developed in the project an emission reduction between 50 and 50% and an increase of the efficiencies in a range above 90% is targeted. If in future all newly installed wood stoves in Europe would be equipped with these new technologies, a PM emission reduction of 80 - 90% could be achieved.

Project content and work plan

Automated process control for stoves

- Identification of sensors for relevant flue gas components and possible other parameters available or close to market introduction, and preliminary assessment of their applicability for process control in stoves
- Evaluation of the feasibility of selected sensors for process control in stoves in terms of measured parameters, signal characteristics, resistance to thermal, mechanical and chemical stresses etc.
- Elaboration, implementation and validation of control algorithms for integrated systems adapted to three advanced wood stoves
- Development, implementation and validation of a universal retrofit control system

Measures for emission reduction

- Evaluation of the potential of optimized stove geometries and novel air staging strategies
- Development of a concept for catalyst integration for effective emission reduction from stoves
- Evaluation of the PM reduction potential of ceramic filter inserts in practice

Increasing efficiency and applicability

- Development and integration of a heat storage system based on phase change materials (PCM)
- Evaluation of novel concepts for prevention of standing losses for increased system efficiency
- Evaluation of advanced draft stabilisation concepts for increased efficiency

Testing and evaluation of the technologies developed

- Provision of common test rules by defining sound and reproducible methods and test plans
- Quantifying the effects of the improved stoves and system components regarding emission reduction and efficiency increase
- Elaboration and dissemination of guidelines for the design of future low emission stoves and for the retrofit of old stoves
- Provision of a user friendly compendium for wood stove system developers or promoters which compiles all recommendations derived from the technological achievements
- Dissemination of the project results and the achievable improvements.

Results / Downloads / Links

- Results have been presented at the IEA-Workshop "Highly efficient clean log wood stoves" in the presentation "Performance of foam ceramic elements in log wood stoves" October 20th 2015 in Berlin. [↗](#)
- A very similar presentation of these results has been given at the European Biomass Conference and Exhibition on June 7th 2016 in Amsterdam (Proceedings p. 392 to 395) [↗](#)
- The research results of standing losses have been presented at the European Biomass Conference and Exhibition with a poster "Standing Losses Via Chimney when Using Log Wood Stoves" June 7th 2016 in Amsterdam, Netherlands. (Proceedings p.646 to 650). [↗](#)

Guidelines

- Guidelines for optimized stove concepts
- Guidelines for automated control systems for stoves
- Guidelines for heat storage units based on Phase Change Materials (PCM)

Final project workshop

- A final project workshop is scheduled to be held along with the European Biomass Conference and Exhibition (EUBC Stockholm 2017). Title: Wood Stoves 2020 - Towards high efficiency and low emissions [↗](#)

Partner information

Project coordination: Technology and Support Centre (TFZ), Straubing (Germany)
German funding: Priority area of the programme "Renewable raw materials" of the Federal Ministry of Food and Agriculture (BMEL), allocation by the Fachagentur Nachwachsende Rohstoffe e. V.
Project partners: RISE - Research Institutes of Sweden (Sweden), BIOS - BIOS Bioenergiesysteme GmbH (Austria), Kutzner+Weber GmbH (Germany), RIKAI Innovative Ofenteknik GmbH (Austria), Nibe AB (Sweden)

Announcement for tomorrow's event:

Bioenergy - from Research to Market Deployment in a European Context

Wednesday 14 June, 2017

08:30 - 15:00 h

➤ here on on EUBCE-Conference

Thanks for listening!

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