Technologie- und Förderzentrum
im Kompetenzzentrum
für Nachwachsende Rohstoffe

User influence on stove performance – Experiences from Germany

Sustainable low emission wood stoves – recent developments and proper operation
29th February 2024 in Verona, Italy

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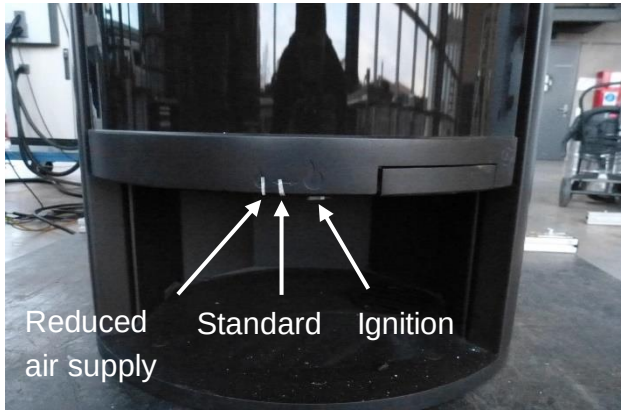
Content

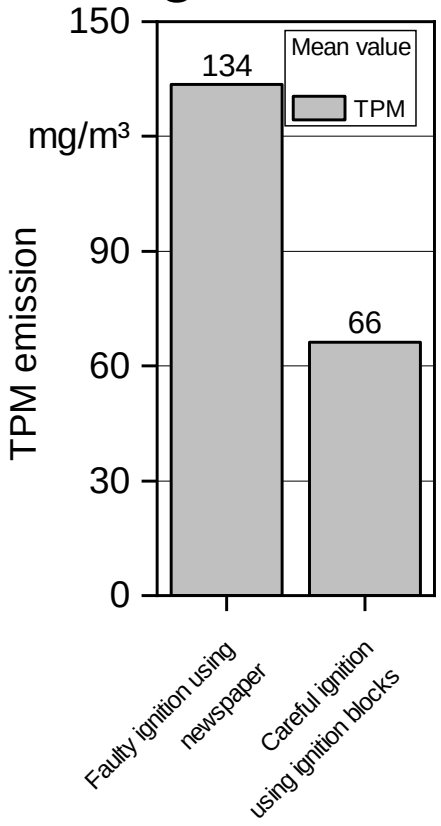
- Typical heating errors using log wood stoves
- Effect of teaching users on emissions for proper stove operation
- Summary

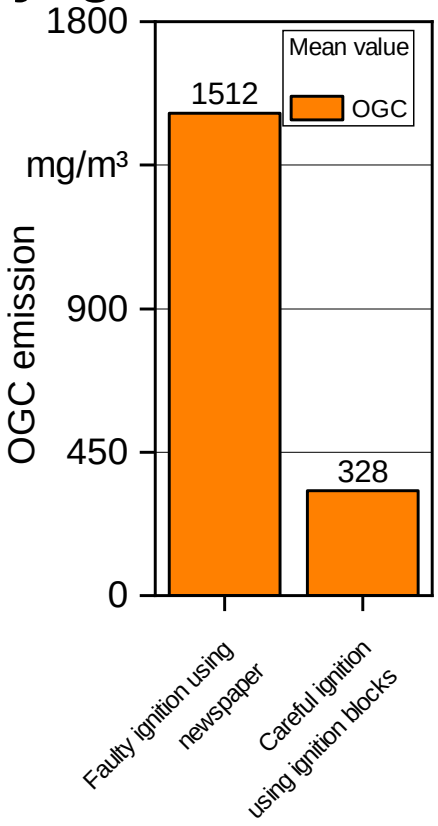
Some heating errors investigated on wood stoves

- Faulty ignition
- Primary air (through grate) remains open
- Late recharging
- Overload: 1.5-fold fuel mass



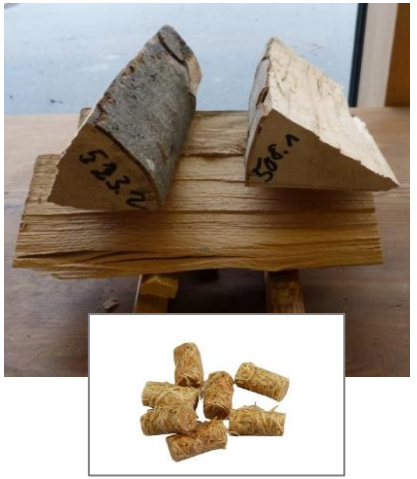
Heating error: Faulty ignition





Faulty ignition using newspaper

Careful ignition using blocks

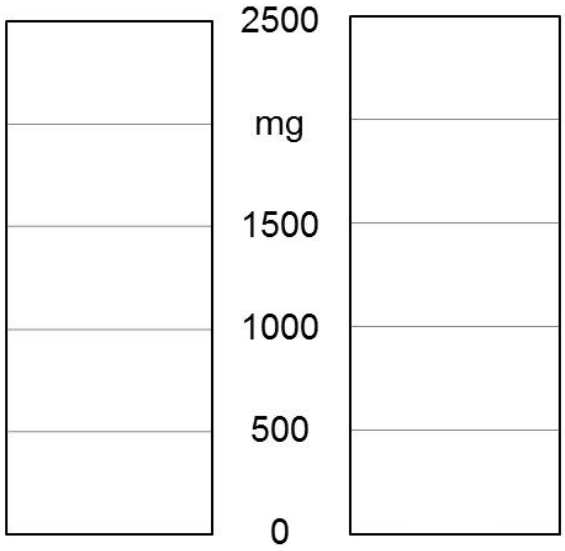


Heating error: Wrong air setting

Optimum air settings

Primary air is closed

TPM emission



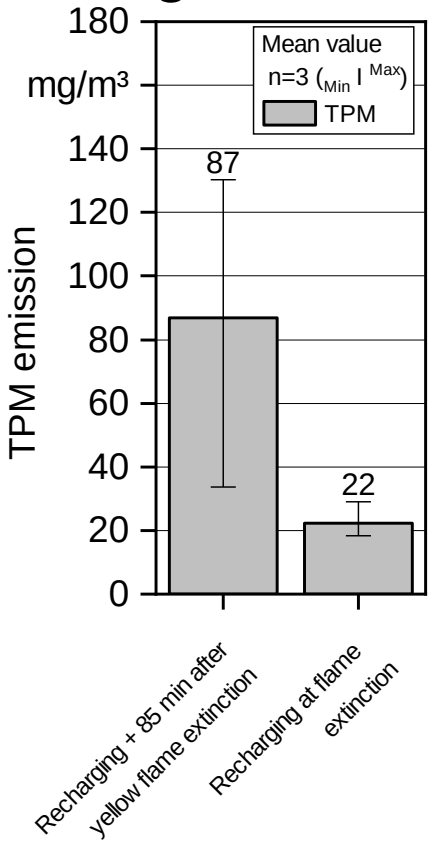
Incorrect air settings

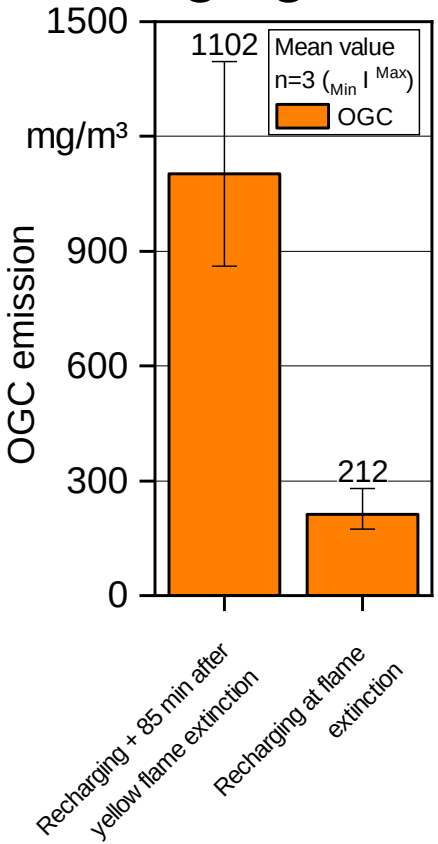
Primary air is open

Hartmann, Mack

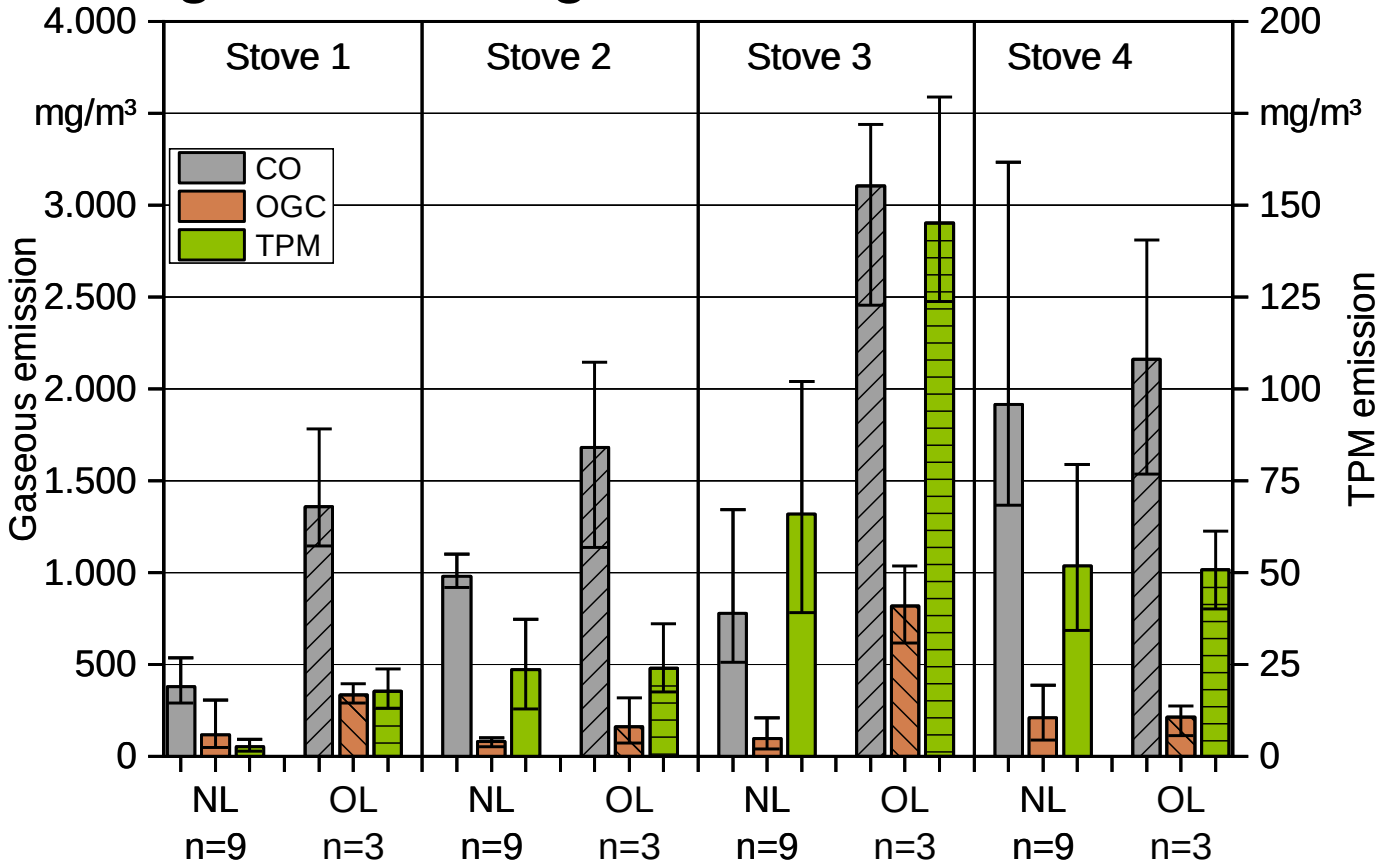
Video footage by TFZ: Download here: https://youtube/biOQmIFg2gY

Heating error: Late recharging at very low ember bed





Heating error: Wrong fuel mass – Overload



Nominal load (NL):
With 2 or 3 logs according to manual

Overload (OL):
150% fuel mass based on nominal load
→ number of logs was increased, mass per log constant

Stove 1 and 3 very sensitive!

Real-LIFE Emissions

TFZ

Initiative of German Environmental Office (UBA)

Operators license for log wood stove owners : Emission reduction through certified training course

Procedure of stove license

- Development of teaching material for a six hour training course on basics on combustion and emission formation, legislation, stove technology, safety issues, chimney properties, proper stove selection, fuels, stove operation, maintenance,…
- Validation of teaching impact:
  - Measurements in combustion laboratory with six voluntary testing persons

Validation of user training – Setup

- 2 stoves were chosen and erected on test stand:
  “Stove A“: low cost stove, “Stove B“: higher cost stove
- 6 voluntary testing persons were first asked to use the stove in the same way as they would do at home
  (4 of 6 already had a stove at home)
- Task for each person was: 1 x ignition batch + 3 x recharging
- Testing at natural draught conditions (4 m chimney)
- Determination of CO, OGC, TPM, P-Number, PAH
- The full operational cycle was repeated after the teaching day

Combustion tests were performed at:

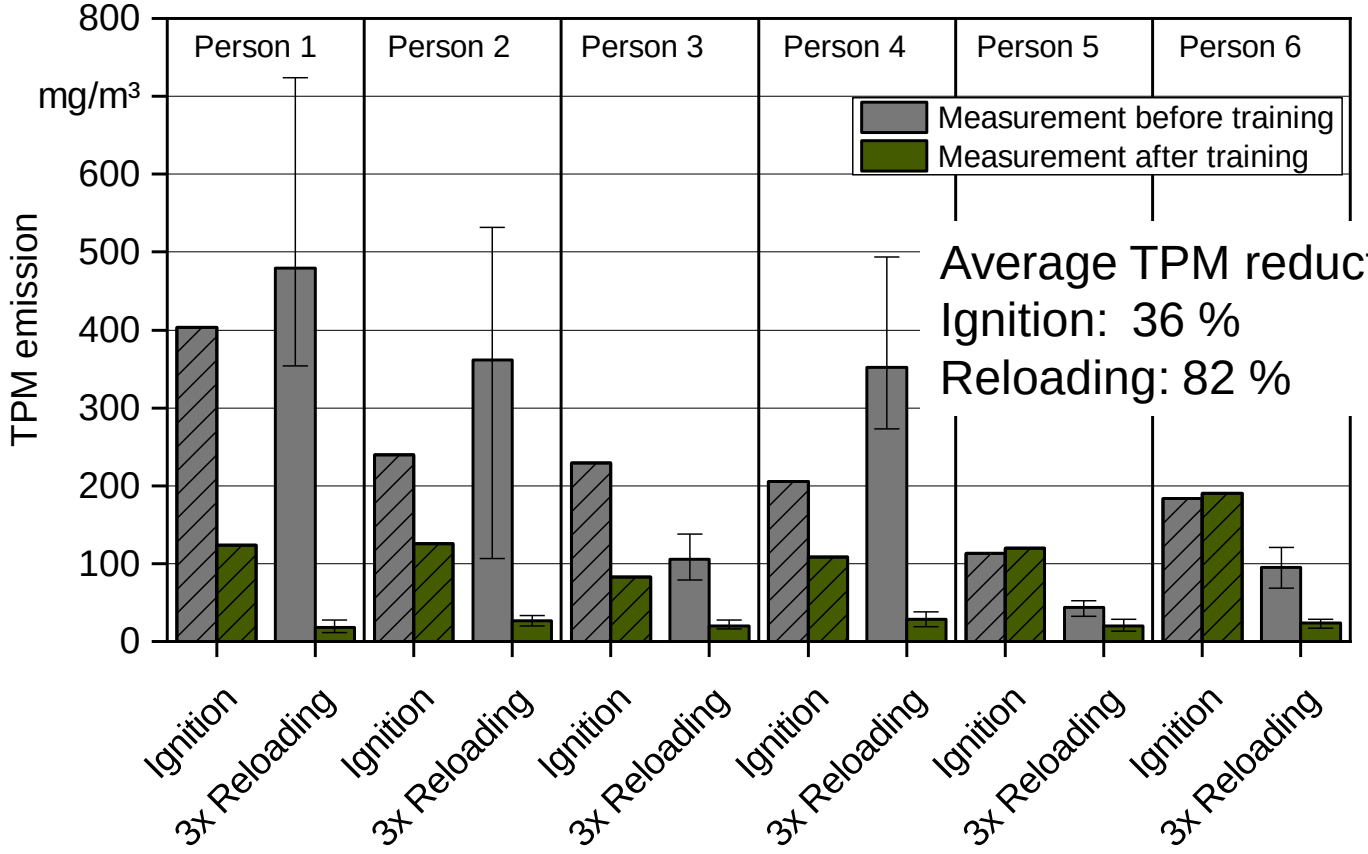
Gastechnologisches Institut

TFZ

Validation of user training – conditions

- Several fuel choices and ignition aids were provided
- Operating manual of the 2 stoves were provided (only read by one user)

Results: TPM emission



Average TPM reduction during
Ignition: 36 %
Reloading: 82 %

Summary

- Poor stove operation largely affects emission behaviour of stoves
- Systematic training of wood stove users can effectively reduce emissions
- Success story is to be continued ☺.

Thank you for your attention!

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