

Development of Test Methods for Non Wood Small-Scale Combustion Plants

Participants

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Project Summary

In several European countries increasing efforts are recently made to use non-wood biomass (cereal crops and their residues, energy crops like miscanthus, etc.) as solid biofuel in small-scale furnaces. New technological approaches regarding the appropriate combustion technologies are on the way, but the verification of any such development is difficult and there is a large uncertainty about testing procedures and equipment. While for wood combustion standardized European measuring regulations are available and broadly applied, the testing of non-wood biomass fuel combustion installations is generally not following a commonly accepted procedure. Consequently, the results of such measurements are not fully comparable.

Initially, a study of the driving forces and barriers for the use of non-wood fuels was done in order to evaluate and choose the most promising fuels for small-scale boilers. Furthermore, information on regulations of the authorities in the participating countries relevant for the project as well as other related European documents were gathered. In parallel an overview and further compilation of the current state of technology for small-scale non-wood fuels appliances in Europe, with focus on the participating countries, was done.

Measurement equipment and methods were analyzed and evaluated experimentally at three test stands. The validation was done by applying statistical methods on the experimentally derived results. The overall results are the basis for a proposal (best practice guideline) for a Europe-wide standard for testing non-wood fuels in small-scale boilers.

Finally, a round-robin test was planned and the further R&D required for the development of uniform and comparable tests methods was identified in two joint workshops of the project partners.

There is a wide range of biomass sources which is relevant for the application in small-scale combustion plants and which is classified in the European pre-directive CEN/TS 14961. In the project partner countries in general there are potentials for energy crops and several residues, especially straw from grain production. A potential increase can be

expected for energy crops. Most interesting biomasses for use in small-scale combustion units are straw-pellets as well as pellets from miscanthus or reed canary grass. The demand on energy grain will depend very much on market prices for grain.

To meet an increased use of non-wood fuels, there is a need of technical development and of increased knowledge to improve the performance. Development is needed with respect to improved fuel and load flexibility to avoid sintering, fouling, corrosion and high emissions.

The granting of a license for the fuels is handled differently in the partner countries. Regulations reach from no licence for non-wood fuels over a dependence to the plant size up to no licence necessary.

Boiler testing is orientated on EN 303-5 in the partner countries, but there is no valid regulation concerning boilers for non-wood fuels in most cases. Some voluntary labelling systems are implemented.

Depending on future emission limits in the different countries, primary and/or secondary means will need to reduce emissions. Beside combustion and emission performance, it is important that future technique will meet also the users' demands for convenience (e.g. effort for operating combustion plant).

Regarding dust measurements numerous sources of error and a high number of influencing factors and interactions (filter treatment, filter preparation, type of equipment, isokinetics, sampling positions in the exhaust pipe, volume flow determination, asymmetrical particle distribution, etc.) are given. An isolated consideration of a single influence is difficult, particularly as the repeatability of dust determinations is generally relatively low. Further R&D must attach importance on that topic.

For the best practice guideline the European Standard EN 303-5 was used as basis. In order to ensure a wide-spread acceptance of this guideline, changes and amendments to the existing EN 303-5 were kept as low as possible. The work has focussed on derivation and evaluation of measurement principles and procedures.

Six laboratories have expressed interest to participate in a following round-robin test. Two fuels will be chosen (e.g. miscanthus pellets/briquettes and wheat straw pellets/briquettes) and combusted in a max. 100 kW boiler according to the proposed guideline. Further adaptations of the guideline will be done on the basis of the round-robin results where appropriate.

For further R&D research activities on measurement methods for non-wood small-scale combustion plants should be continued categorically. Next step is to start a round-robin project within the ERA-net programme to evaluate compiled results and improve the best practice guideline.

In the course of the round-robin test measurement methods regarding dust measurements have to be evaluated again and experience of participating laboratories should be unified to common European wide dust measurement method.

The consortium of the ERA-net project “Development of test methods for non-wood small-scale combustion plants” strongly recommends the establishment of a European standard regulating the requirements for testing small-scale furnaces for biogenic non-wood fuels.