Newsletter 2-2011

StableWood

New solutions and technologies for heating of buildings with low heating demand:
Stable heat release and distribution from batch combustion of wood

www.sintef.no/StableWood

This newsletter focuses on a new method developed for calculating the energy efficiency for wood stoves and IEA activities.

Wood stove efficiencies

Energy efficiency is the relation between useful heat output to energy input. There are two main options for calculating the efficiency in batch combustion processes like wood combustion in wood stoves and fireplaces.

The first option is to use methods which consist of introducing arithmetic average values in efficiency calculation equations. The European standard, NS/EN 13240, efficiency calculation method belongs to this category.

The second option takes into account the transient effects during the combustion process in the efficiency calculation. This is the case of Fuelsim-Transient[1], which includes transient models and calculates weighted average values to incorporate the transient effects into the emission results and the efficiency calculation.

However, measurement campaigns over the last years at SINTEF have shown that the efficiency calculated by these two methods do not differ significantly, especially when taking into account the variations related to how the stove is operated by the user.

Stove type	Efficiency
Old stoves (> 50 years)	20 – 40 %
Open fireplaces	10 – 15 %
Fireplaces with liner - old technology	35 – 50 %
Fireplaces with liner - new technology	60 – 80 %
Closed stoves – old technology	35 – 50 %
Closed stoves – new technology	60 – 85 %
Tile- and soapstone stoves	75 – 85 %
Sauna stoves	50 – 65 %
Boilers – old technology	60 – 75 %
Boilers – new technology	80 – 90 %

[1] *Wood log batch combustion calculation tool developed at NTNU/SINTEF*

This brings us to the topic of increased consumption of wood in the Norwegian households and how this has enforced the authorities to seek more specific information about how the wood is actually burned, to better estimate the energy contribution. Today only experience data is used to estimate this. In the table typical efficiency span for some wood firing units are listed.

Increased consumption of wood demands knowledge on how the energy bound in the wood is transformed into heat. Several factors are crucial for how efficient the combustion is:

- Firing technique
- Firing habits
- Quality of the wood
- The stove itself
- The installation of the stove and especially the quality of the chimney

To control these factors it is necessary to relate them to a relevant test method or standard. Today efficiency is only defined and calculated by the European standard (NS/EN 13240) and is only calculated at nominal load. Contrary to the EU standard, the Norwegian standard (NS 3058/NS 3059) defines firing at lower part loads than the nominal load in relation to the official requirement for particle emissions. However, it does not include requirements for how to calculate the efficiency at these part loads.

To allow wood stove manufacturers to calculate part load efficiencies for part load tests, SINTEF has taken the initiative to propose the addition of part load efficiency calculations to the Norwegian standard.

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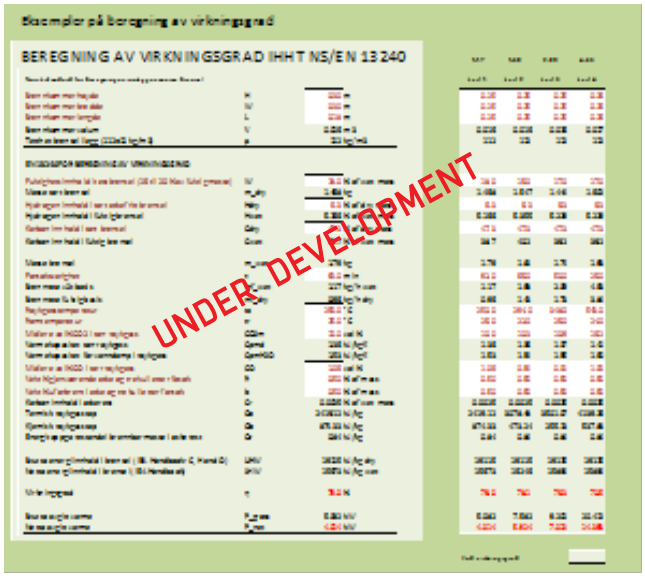
Initiative for a New Norwegian standard
Driven by the market and the inherent change in building philosophy of low-energy houses, more wood stove manufacturers acknowledge the need to know how their stoves perform at low part loads. Related to this is the need for product documentation based on standardized test methods.

This has lead SINTEF, in cooperation with several of the largest stove manufacturers in Norway, to present an initiative to an addendum to the Norwegian standard, describing a set of equations to calculate part load efficiency. The formulas are based on the European standard using arithmetic average values.

However the important difference is that efficiency is calculated at four part loads and then weighted according to the already described (NS 3058/59) procedure for calculating a weighted particle emission level.



Weighted efficiency calculations

IEA Task 32 activities in Dublin

IEA Task 32 "Biomass Combustion and Cofiring" arranged the second task meeting this year in October. Different issues related to biomass combustion were proposed by representatives from member countries. These were prioritized for the next triennium task activities.

The task meeting was held in conjunction with two workshops: "National workshop on local developments in small scale biomass combustion" and "Processing routes for Solid Recovered Fuels".

The first workshop highlighted the current challenges in Ireland for implementing appropriate biomass combustion technologies and introduced upcoming EU legislation on product requirements (stoves and small scale boilers) and the relevance of health and safety related issues.

The second workshop covered different aspects related to Solid Recovered Fuel combustion and cofiring. The presentations from the two workshops are available on the Task 32 website.

Task 32 organized a visit to a stirling engine demonstration plant established by Teagasc (the Agriculture and Food Development Authority) in Oak Parc, Carlow. Additionally, a field trip was arranged for visiting the Lagan cement kiln with co-incineration of SRF at Kinnegad (west of Dublin) and the WtE plant of Indaver in Dublin. Liang Wang, SINTEF, participated in the task meeting, workshops and visits.

The next IEA Task 32 meeting is planned 18-20 June in 2012 in Milan together with 20th European Biomass Conference and Exhibition.

Other news

Guidebook on effective and environmentally friendly firing of firewood
A guidebook for firewood users was published in the EU-project Quality Wood. The guidebook gives practical advices for firing firewood in firing units in order to achieve efficient combustion and low emissions. These advices include the latest research results in the field. English and Norwegian editions are available on the Stablewood website.

Bioenergidagene 2011
The largest Norwegian bioenergy conference, "Bioenergidagene 2011", was arranged 7-8 November in Sarpsborg by Nobio. One session was devoted to "Bioenergy and Low-energy buildings", including two presentations from StableWood partners. Edvard Karlsvik, SINTEF, presented "Pellets stoves and wood stoves in buildings with low heating demand – challenges and opportunities", while Rene Christensen, Jøtul, presented their strategic marked development towards low-energy buildings. Further information on www.nobio.no.

Renewable Energy Research Conference 2012
This scientific conference is arranged 16 - 18 April 2012, in Trondheim, and is focusing on renewable energy technologies. In addition to interesting lectures on general issues concerning renewable energy, there will be detailed scientific parallel sessions.

Scientists from all areas of environment-friendly energy research will have the opportunity to present and discuss recent technological and scientific achievements in 13 parallel sessions.

One session is devoted to Bioenergy including heat, cooling and/or power generation from biomass. The conference is arranged by SFFE - Centre for Renewable Energy. More on www.sffe.no.

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