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Feasibility Study for new Ecolabels
For the Product Group: Wood pellet firings

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Summary

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The feasibility study deals with the question whether the ecolabel “Blue Angel” is suitable for wood pellet firings and which requirements should be fulfilled in the case of certification. The study was carried out by the Institute for Ecological Economy Research (IÖW) gGmbH on behalf of the Environmental Protection Agency in the context of the environmental research plan (project no. 200 95 308/01). It was financed with federal funds. The investigation was executed following the ISO 14024 (Environmental labels and declarations - Type I environmental labelling – Principles and Procedures).

The aim of the study was to check the suitability of wood pellet firings for the granting of an ecolabel as well as to create a transparent discussion basis for the interested groups. For this purpose a market analysis was executed, the state of the art was determined, environmental impacts and improvement potentials were identified, and a draft of criteria for an ecolabel was suggested. For the selection of suitable product categories an ecological system comparison between wood pellet firings and oil and gas-fuelled heating systems as well as conventional wood heatings (wood chips and log wood) was executed. The comparison analysed the pollutant emissions and the consumption of primary energy.

Wood pellet firing systems are particularly designed combustion systems, which use wood pellets as fuel. Wood pellets is cylindrical compressed wood from untreated wood, usually made of wood residues or sawdust from woodworking operations. Wood pellets are a standardised fuel, in Germany in accordance with DIN 51731 „Requests at compressed woods from untreated wood“. Due to its size and form the pellets may be poured and trickled and thus are suitable for an automatic filling of the firings and for the transportation by tank cars. Wood pellets can be used in central heating systems, single room furnaces (room heaters or pellet furnaces) and in long-distance heating systems. Both the standardised fuel with to a large extent uniform quality and the automatic combustion regulation contribute to the fact that wood pellet firing systems operate efficiently and with low emissions. Additionally, operating errors due to inappropriate operator behaviour can be minimised as far as possible.

Market Analysis

Within the market analysis a questioning of manufacturers and providers was carried out. It resulted in a sales figure of more than 5,000 pellet firings in the performance range up to 50 kilowatts in the year 2001 on the German market. About half of it were each pellet boilers and pellet furnaces. The sales figures strongly rose in the last years. However, compared to the German heating system market the share of pellet firings is still relatively small. This is among other things due to the comparatively high investment costs which are hardly counterbalanced by the lower fuel costs. During the last years, wood pellet firings became more attractive. A big advantage is the high comfort of the systems. Additional favourable conditions are the support from the programme for market development for the use of renewable energies and the rise of costs for the fuel oil.

The manufacturers of the pellet firings which are offered on the German market are to the predominant section German and Austrian firms. Additionally, there are further providers from the Scandinavian countries, from Italy, Liechtenstein and the Czech republic which have however altogether relatively small sales figures. For the product evaluation in the context of the ecolabel wood pellet boilers (performance range up to 50 kilowatts) and wood pellet furnaces (performance range up to 15 kilowatts) were selected. The predominant number of pellet firings ranks among this performance

range. Besides, this performance range is particularly relevant for private consumers who are the primary target group of the ecolabel.

Environmental Characteristics

Products labelled by an ecolabel should guarantee an environmentally sound operation during service life. In order to minimise sources of error by inappropriate operation, the scope was limited to such systems, which are operated exclusively with wood pellets and which have an automatic combustion regulation as well as an automatic ignition.

For the development of criteria an extensive questioning of manufacturers was executed. The questioning concentrated on environmental characteristics. The results of the data collection clarify that between the systems substantial differences exist regarding the ecological quality. This concerns in particular the efficiency factors and the pollutant emissions of the examined products. The efficiency factors of pellet boilers are on the average 91% with nominal load and 89% with partial load, for pellet furnaces they amount to an average of 90% with nominal load and 91% with partial load.

According to § 4 of the Federal Immission Control Act (Bundes-Immissionsschutzgesetz - BImSchG) wood combustion plants up to 1 MW firing thermal output require no approval, nevertheless for those the 1. BImSchV (1. Federal Immission Control Ordinance, Regulation on Small-scale Combustion Plants) applies. It sets limit values of 4 g/m³ for carbon monoxide (CO) and 0.15 g/m^3 for dust. Smallest plants with fewer than 15 kW are not subject to the emission request of the 1. BImSchV. All systems to which data were raised had emission values clearly below these limit values. Nevertheless, the different systems point to substantial dispersions. Further relevant pollutant emissions are hydrocarbons and nitrogen oxides, these were also examined.

System Comparison

A system comparison including pellet boilers, wood heatings with log wood and wood chips, as well as gas- and oil fired boilers from the heating system stock, clarifies that in comparison to fossil-fuelled boilers wood heatings show clear advantages with the climate relevant carbon dioxide emissions and thus make a smaller contribution to the climate change. In contrast to this, wood heatings cause higher emissions of the air pollutants carbon monoxide, nitrogen oxides and dust. These contribute to the environmental impacts of acidification, terrestrial nutrification, PM_{10} (mortality risk) and summer smog. Among the wood heatings pellet firings have ecological advantages, in particular due to the high degree of automation and the homogeneous fuel quality. This leads to low emissions on carbon monoxide, hydrocarbons and dust. Additionally, pellet firings have a smaller potential of forming hazardous and carcinogenic substances, e.g. polycyclic aromatic hydrocarbons, benzene and dioxins as conventional wood combustion plants. This advantages is especially important in relation to handfed systems.

Suggested Certification Criteria

On base of the assessment the introduction of an ecolabel for wood pellet firings is recommended. Compared to conventional wood heating systems they cause lower emissions and can be operated more efficiently. Additionally, they contribute to a reduced consumption of fossil resources and the reduction of CO_2-emissions with climate impact.

From the collected data and the system comparison requirements for an ecolabel were developed and discussed in an expert discussion with representatives of manufacturers, testing institutes, organisations and the Environmental Protection Agency.

As the active participation during the expert talk and further statements in the aftermath of the discussion round showed, the project was met with vivid interest.

The transcription of the ecolabel is proposed as "because of low emissions and energy-efficiency". The suggested certification criteria cover request on:

- guideline conformity
- efficient energy use (efficiency factors and supplementary electrical consumption)
- emission values for carbon monoxide, hydrocarbons, dust and nitrogen oxides
- adjusting and operating instruction and
- services of the manufacturer

As emphasis request the efficient energy use and the reduction of pollutant emissions were worked out.

The suggested criteria are fulfilled by every third case of the examined wood pellet boilers and pellet furnaces. Beyond that, there is a number of further systems which miss the suggested criteria only scarcely. Here is to be assumed that the requirements can serve as an incentive for technical improvements.

With the pursuit of the topic of wood pellet firings in the context of the ecolabel an important product group is taken up for environmentally sound and energy-efficient heat production. The voluntary labelling of wood pellet firings gives a signal for an environmentally sound heat production. It can make a contribution to the intensified use of renewable energy sources and thus for the reaching of the climatic protection targets of the Federal Government.

Summary of the Suggested Requirements

Product	Scope	Efficient energy utilisation			Emission[59]						Other requirements
		Efficiency		Auxiliary electrical consumption	NO_x (mg/Nm³)	CO (mg/Nm³)		Dust (mg/m³)	C_{total} (mg/Nm³)		
		Nominal load	Minimal load	Nominal load	Nominal load	Nominal load	Minimal load	Nominal load	Nominal load	Minimal load	
Pellet boiler	• Performance up to 50 kW • Automatic ignition, automatic heat exchanger cleaning, automatic regulation of performance and combustion • Only for wood pellets	≥ 90%	≥ 88%	≤ 1% of the generated thermal performance	150	100	250	30	5	5	• Specification of the concentration of dust in the exhaust gases at minimal load • Specification of electrical consumption with minimal load andstand-by operation • Specification of power input of important plant components, as well as the water-side flow resistance • requirements on adjustment and operating instructions • Offer of services
Pellet furnaces	• Capacity up to 15 kW • Automatic ignition automatic and regulation of combustion • Only for wood pellets	≥ 90%	≥ 90%	≤ 1% of the generated thermal performance	150	200	400	35	10	15	

[59] Related to the exhaust gases at normal condition (0°C, 1013 mbar) with an volume content of Oxygen of about 13%