

## Small-Scale Furnaces

# Automated Feeding of Crushed RUF Briquettes

Wood briquettes make an important contribution to renewable sources of heat. However, so far it has not been possible to feed small-scale furnaces automatically. But this could change very soon because in a joint project the briquetting system manufacturer RUF together with DBFZ Deutsches Biomasseforschungszentrum gemeinnützige GmbH has drawn up an approach for an economically useful solution. The central feature is the so-called briquette crusher.

Solid fuels of biogenic origin are an important component of ecological sources of heat for private households and industrial companies. Wood briquettes, which are made of untreated wood, form part of this together with pellets or wood chips. Briquettes have many strengths: they can be produced easily and flexibly precisely where scraps of wood occur. In addition, they can be produced cheaply with modern machinery.

However, wood briquettes also have a disadvantage: furnaces cannot be fed continuously and automatically with them – until now. In order to change this, the briquetting machine specialists at RUF GmbH, Zaisertshofen, together with the DBFZ from Leipzig, started a project that has laid the foundations for this. According to Andreas Jessberger, Sales Manager of RUF GmbH, the advantages of the briquettes – namely cheap, flexible production – are to be combined with the advantage of pellets – good conveyability.

The task of the innovative project was on the one hand to find out how continuous briquette burning can be achieved and whether there are already marketable solutions for this. On the other hand the emissions occurring during burning had to be assessed and optimised if necessary.

### Crushed wooden briquettes make automatic feeding possible

The DBFZ discovered through extensive product and patent research that there is currently no automatic, continuous feeding of wood briquettes for a small-scale furnace. There is merely a patent, which describes the irregular, requirement-oriented feeding of wood-fuelled boilers with paraffined wood briquettes. Reason enough to finally start the project. Jessberger stated: "First of all we must crush our RUF briquettes to implement our idea so that they can be conveyed evenly and automatically by means of a screw."

A briquette crusher developed by RUF engineers (see box) accomplishes this task. According to the manufacturer, the briquettes used for feeding the machine have a fuel value 5.0 kWh/kg, the cross-section is rectangular (15.3 cm × 6.3 cm) and the height is 9 cm. They are conveyed to the briquette crusher by means of a conveyor belt, which deposits the crushed fuel into a storage vessel monitored by filling level sensors. Lastly they are transferred into the small-scale furnace via a screw conveyor. A type C0 boiler from the company A.P. Bioenergie-technik GmbH with nominal output of 49 kW was used as the combustion unit in the show-case RUF-DBFZ project.

### Carbon monoxide emission is in accordance with the law

How the emissions that occur during the burning of the crushed wood briquettes are to be classified, was lastly the objective of a piece of research led by Dr. Ingo Hartmann, a scientist at the DBFZ. A test bench to measure emissions was constructed for this at the DBFZ's site in Leipzig. The necessary machinery with a briquetting press and a briquette breaker operated continuously without any disruptions so that it was possible to compile representative results. Ingo Hartmann explained: "Our measurements immediately showed average carbon monoxide emissions of 0.355 g/m<sup>3</sup>. This means we are within the statutory framework of 0.4 g/m<sup>3</sup> without the need for any further adjustments." Also with regard to the dust emissions, the test structure only just missed the statutory dust limit of 0.02 g/m<sup>3</sup> with its average value of 0.026 mg/m<sup>3</sup>. "Similarly to the use of wood chips, this problem can be kept under control with corresponding reduction measures."

Whether and in which form this is even necessary, is to be shown by additional tests. There are already indications now that the fine particle fraction from the crunching of the briquettes is partly responsible for the slightly higher dust



The briquette crusher from RUF – a central component of continuous briquette burning.

### The RUF Briquette Crusher

The RUF briquette crusher, which was built as a prototype, consists of two electrically driven counter-rotating drive shafts, which are located inside the machine and turn only slowly ( $n = 15.75 \text{ min}^{-1}$ ). Toothed rings are located on the opposite side of the drive shafts and have been welded in a staggered form. They are used as breaking devices and used to grip and crush the briquettes that have been thrown in. A small SPC with the Siemens LOGO is used to monitor the drive unit.

concentrations. If this is confirmed, separation units on this machine could provide a particularly cost-efficient remedy.

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