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PRODUCTION OF DRY WOOD CHIPS IN CONNECTION WITH A DISTRICT HEATING PLANT

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ABSTRACT

Moisture and its variation in wood chips make the control of burning in small scale heating appliances difficult resulting in emissions and loss of efficiency. If the quality of wood chips would be better, i.e. dried and sieved fuel with more uniform size distribution would be available, the burning could be much cleaner and efficiency higher. In addition, higher power output could be obtained and the investment costs of the burning appliances would be lower. The production of sieved and dried wood chip with good quality could be accomplished in connection with a district heating plant. Then the plant would make profit, in addition to the district heat, from the dried wood chips sold to the neighbouring buildings and enterprises separated from the district heating net using wood chips in energy production. The peak power of a district heating plant is required only a short time during the coldest days of the winter. Then the excess capacity during the milder days can be used as heat source for drying of wood chips to be marketed. Then wood chips are sieved and the fuel with best quality is sold and the reject is used as fuel in the plant itself. In a larger district heating plant, quality of the fuel does not need to be so high. In this paper the effect of moisture on the fuel chain and on the boiler is discussed. Energy and mass balance calculations as a tool of system design is described and the characteristics of proposed dry chips production method is discussed.

KEYWORDS

biomass, bioenergy, biofuels, energy production, boilers, drying

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REFERENCES [view full list]

1. [1] Nurmi, J., Characteristics of Whole-tree Biomass for Energy, PhD Thesis, University of Helsinki, The Finnish Forest Research Institute, Researh Papers 758, 42 p., 2000.
2.

3. [2] Nurmi, J., Longterm Storage of Fuel Chips on Large Piles (in Finnish), Folia Forestalia 767, 18 p., 1999.
4.
5. [3] Nurmi, J., Drying of Fuel Chips and Chunks in Wooden Bins (in Finnish), Folia Forestalia 687, 40 p., 1987.
6.
7. [4] Nurmi, J., The Storage of Logging Residue for Fuel, Biomass and Bioenergy, Vol. 17 (1999), pp. 41-47
8.
9. [5] Obernberger, I., Nutzung fester Biomasse in Verbrennungsanlagen, Verlag f r die Technische Universit Graz, 1998
10.
11. [6] Saastamoinen, J.J., Horttanainen, M., Taipale, R., and Sarkomaa, P., Propagation of the Ignition Front in Beds of Wood Particles, Combustion and Flame, Vol. 123 (2000) No. 1-2, pp. 214-226
12.
13. [7] Koistinen, R., Fundamentals of Fuel Bed Combustion in Grate Firing (in Finnish), VTT Research Notes 622, 102 p., Espoo 1989
14.
15. [8] Thunman, H., Leckner, B., Ignition and Propagation of a Reaction Front in Cross-current Bed Combustion of Wet Biofuels, Fuel, 80 (2001), pp. 473-481
16.
17. [9] Saastamoinen, J.J, Kilpinen, P.T., Norstr m, T.N., New Simplified Rate Equation for Gas-phase Oxidation of CO at Combustion, Energy & Fuels, Vol. 14 (2000), No. 6, pp. 1156-1160
18.
19. [10] VDI-GVC, VDI-W鋳eatlas, Berechnungsbl er f r den W鋳e bergang, 6. erweiterte Auflage, VDI-Verlag, D sseldorf 1991
20.
21. [11] Saastamoinen, J.J., Taipale, R., NOx Formation in Grate Combustion of Wood,
22. Clean Air: International Journal for Energy for a Clean Environment, Vol. 4 (2003), No. 3., 30 p.
23.
24. [12] Anttila, V., Market analysis of drying of wood chips and sawdust (in Finnish), Bs. Thesis, Satakunta Polytechnic, Pori, Finland, 2002
25.
26. [13] Hakkila, P., Review of the Wood Energy Technology Programme in 1999-2003, in: Final Report of the Wood Energy Technology Programme in 1999-2003. VTT, Jyv yl 2004, pp. 11-19
27.
28. [14] Kiukaanniemi, E., A local heating system using wood fuel from farms, Working Papers, REDEC, Kajaani, Finland, 1998
29.
30. [15] Lundgren, J., Hermansson, R., Dahl, J., Experimental studies of a biomass boiler suitable for small district heating systems, BiomassBioenergy, 26 (2004), pp. 443-454
31.
32. [16] Koponen, H. Transport Processes in Finnish Birch, Pine and Spruce, Paperi ja puu, (1986), No. 6-7., pp. 456-474
33.
34. [17] Groenli, M. A. Theoretical and Experimental Study of the Thermal Degradation of Biomass, PhD. Thesis, The Norwegian University of Science and Technology, Trondheim, Norway, 1996.

35.
36. [18] Alakangas E., Properties of Fuels used in Finland (in Finnish), VTT Research Notes 2045, Espoo 2000
37.
38. [19] Yrj l ., Saastamoinen J.,J., Modelling and Practical Operation Result of a Dryer for Wood Chips, Drying Technology, Vol. 20 2002 No. 5., pp.1073-1095
39.
40. [20] Yrj l ., Model and Simulation of Heat Exchangers and Drying Silo in a New Type of a Boiler Plant, Proceedings Progress in Thermochemical Biomass Conversion, Tyrol, Austria September 17-22, pp. 678-692
41.
42. [21] Saastamoinen, J.J., Impola R., Drying of solid fuel particles in hot gases, Drying Technology, Vol. 13 (1995) No. 5?7, pp.1305?1315

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