

Properties of Briquettes from Paper Waste

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Worldwide increasing energy demand is today permanently covered by a majority of non-renewable energy sources, namely by coal, crude oil and natural gas. This causes the rapid decline of their reserves and the time gets near when they will be run out. Therefore in last years the exploitation of renewable energy sources is permanently preferred. One of alternative fuel forms is the fuel on the basis of paper waste. In this paper the results of tests are published, which were carried out using five sorts of paper waste, pressed in form of briquettes. During the tests following briquettes parameters were watched: moisture content, ash amount, length and diameter, weight, density, rupture force and mechanical durability. The results are presented in form of tables and graphs. It was proved that briquettes made from recovered paper and board are compared with briquettes from wood waste of high density, high mechanical durability and for their rupture the relatively high force is necessary. But at the same time they have high ash amount and low combustion heat.

Keywords: renewable energy sources, recovered paper and board, briquetting, properties of briquettes, mechanical durability

References

- [1] BASORE C.A. (1929): *Fuel Briquettes from Southern Pine Sawdust*. Auburn, Alabama Polytechnic Institute: 30.
- [2] BROŽEK, M. (2001a): Briketování nekovového odpadu (Briquetting of non-metallic waste). In.: *Sborník mezinárodní vědecké konference XIV. DIDMATTECH 2001*. Radom, Politechnika Radomska. s. 84 – 87.
- [3] BROŽEK, M. (2001b): Briketování kovových odpadů (Briquetting of metal waste). In.: *Sborník mezinárodní konference Trendy technického vzdělávání 2001*. Olomouc, Univerzita Palackého. s. 38 – 41.
- [4] BROŽEK, M., NOVÁKOVÁ, A. (2011): Influence of storage on briquettes mechanical properties. In.: *Ecology and farming technologies: Agro-engineering approaches*. Saint-Petersburg-Pavlovsk, Russian academy of agricultural sciences et al., s. 225 – 232.
- [5] BROŽEK M., NOVÁKOVÁ A., KOLÁŘOVÁ M. (2012): Quality evaluation of briquettes made from wood waste. *Research in Agricultural Engineering*, 58: 30-35.
- [6] KAKITIS, A, NULLE, I., ANCANS, D. (2010): Durability of the arranged structure biomass briquettes. In.: *Engineering for rural development*. Jelgava, Latvia university of agriculture, s. 285 – 289.
- [7] KOLÁŘOVÁ, M. (2011): *Vlastnosti pelet a briket pro energetické využití* (Properties of pellets and briquettes for energy use). Disertační práce. TF ČZU v Praze, 144 s.
- [8] NOVÁKOVÁ, A., BROŽEK, M. (2009): Briquettes from paper waste. In.: *Ecology and farming technologies: Agro-engineering approaches*. Saint-Petersburg-Pavlovsk, Russian academy of agricultural sciences et al. 2011, s. 219 – 225.
- [9] PLÍŠTIL D., BROŽEK M, MALÁŤÁK J, HENEMAN P. (2004): Heating briquettes from energy crops. *Research in Agricultural Engineering*, 50: 136–139.
- [10] PLÍŠTIL, D. et al. (2005): Mechanical characteristics of standard fuel briquettes on biomass basis. *Research in Agriculture Engineering*. 51: 66 – 72.
- [11] SHERIDAN E.T., BERTE V.C. (1959): *Fuel-briquetting and Packaged-fuel Plants in the United States that Reported*. Washington, U. S. Government Printing Office: 7.
- [12] TYMICH, J. (2011a): Sběrový papír a jeho využití (Waste paper and its use). *Papír a celulóza*. 66: 20 – 23.
- [13] TYMICH, J.(2011b): Sběrový papír a jeho využití. 2. část. (Waste paper and its use. Part 2) *Papír a celulóza*. 66: 52 – 54.
- [14] ČSN EN 643 (2002): Papír a lepenka – Evropský seznam normalizovaných druhů sběrového papíru a lepenky (Paper and board – European list of standard grades of recovered paper and board).
- [15] ČSN EN 14774-2 (2010): Tuhá biopaliva – Stanovení obsahu vody – Metoda sušení v sušárně – Část 2: Celková voda – Zjednodušená metoda (Solid biofuels – Determination of moisture content – Oven dry method – Part 2: Total moisture – Simplified method).

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- [16] ČSN EN 14775 (2010): Tuhá biopaliva – Stanovení obsahu popela (Solid biofuels – Determination of ash content).
- [17] ČSN EN 14918 (2010): Tuhá biopaliva – Stanovení spalného tepla a výhřevnosti (Solid biofuels – Determination of calorific value).
- [18] ČSN EN 14961-1 (2010): Tuhá biopaliva – Specifikace a třídy paliv – Část 1: Obecné požadavky (Solid biofuels – Fuel specifications and classes – Part 1: General requirements).
- [19] ČSN EN 15210-2 (2011): Tuhá biopaliva – Stanovení mechanické odolnosti pelet a briket – Část 2: Brikety (Solid biofuels – Determination of mechanical durability of pellets and briquettes – Part 2: Briquettes).
- [20] Directive of Ministry of Environment No. 14–2009: Brikety z dřevního odpadu (Briquettes from Wood Waste). Prague, Ministry of Environment of the Czech Republic.
- [21] Papír [online] [viewed 27. 11. 2012] Available: <http://cs.wikipedia.org/wiki/Pap%C3%ADr>
- [22] *Historie výroby papíru* [online] [viewed 27. 11. 2012] Available: <http://www.rucnipapir.com/rucni-papir/historie-vyroby/>
- [23] *Briketovací lis BrikStar 30, 50, 70* [online] [viewed 27. 11. 2012] Available: <http://www.brikkis.cz/briketovaci-lis/30-50-70/>