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MIXED MUNICIPAL WASTE, COMPETITIVE RAW MATERIALS FOR OBTAINING COMBUSTIBLE MATERIALS

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Introduction

At both the European and national levels, the issue of municipal waste is topical. The amount of municipal solid waste is continuously increasing, and more reliable solutions are needed to minimize and manage it efficiently. The aim of waste management in the circular economy is to save natural resources by reusing recoverable parts from waste that can be converted into secondary resources and to the most advantageous methods that lead to minimal environmental impact. Activities that underpin the circular economy can stimulate economic value growth while reducing the consumption of natural resources.
This work presents the preliminary results regarding using municipal solid waste for energy purposes.

Materials and methods

Briquettes (35 mm diameter and 38-50 mm thick) were prepared using a pressure press.
Municipal solid waste was mixed in different proportions, and municipal sludge (S) and water (W) was used as a binder, were analysed and compared in terms of lower heating value. The main briquette (MSW) is composed of 5% textile, 30% cardboard, 5% biomass, 45% plastic, 15% inert material. The mixtures were briquetted and characterized by moisture content (W) by drying at 105ºC, ash content determined at 550ºC, elemental analysis (C, N, H, S) characterized using a Thermo Fisher FlashSmart CHNS Elemental Analyzer, higher heating value (HHV), lower heating value (LHV) characterized using an IKA C600 Calorimeter and chlorine (Cl) determined from the water resulting from combustion in the calorimeter combustion vessel.

Results and conclusions

Waste briquetting leads to a significant increase in density, a parameter influencing the combustion process. Briquettes with a higher density tend to have a longer burning time and release more heat.
The briquettes made only from municipal solid waste, as well as those made from a 14% water mixture, showed low stability and density. The use of municipal sludge in the composition of briquettes resulted in increased density and stability.
The water content of the raw material prevents compression of the briquettes, and water evaporation leads to a decrease in bulk density but an increase in calorific

value. The obtained results from the characterization of briquette composition are presented in Table 1.

Table 1. Technical, elemental, energy characteristics of the briquette variants obtained from MSW

Briquette	W (%)	Ash W (% d.m.)	Elemental analysis C (% d.m.)	H (% d.m.)	N (% d.m.)	S (% d.m.)	Cl (% d.m.)	HHV (kcal/kg)	LHV (kcal/kg)
MSW	4.4	18.22	47.34	4.91	0.10	0.05	0.05	4755	4490
86%MSW+14%S	17.7	15.67	40.71	4.22	0.09	0.04	0.04	4089	3784
78%MSW+8%S+14%W	17.7	17.56	39.21	4.13	0.39	0.12	0.04	3946	3645
60%MSW+26%S+14%W	17.5	21.8	35.82	3.91	1.09	0.28	0.04	3622	3334

MSW-municipal solid waste; S-sludge; W-water; d.m.-dry matter

Increasing the content of municipal sludge in the composition of the briquettes leads to an increase in density and a decrease in calorific value. The results regarding the behaviour of briquettes in the function of density are shown in Table 2.

Table 2. Behaviour over time of the briquette variants obtained from MSW

Briquette	Density (g/dm3)	Water loss (%)	LHV Growth (%)
MSW	216	-	-
86%MSW+14%S	360	14	19,5
78%MSW+8%S+14%W	475	13	18
60%MSW+26%S+14%W	540	11	15,5

Waste briquetting is a densification process that improves handling characteristics, increased energy content per unit volume, reduces transport costs and produces uniform and stable combustible waste. Calorific value, the essential characteristic of using briquettes in combustion processes, is influenced by the proportions of waste in the briquette composition. The calorific value decreases with increasing sludge and water content, i.e. the slighter the sludge content, the higher the calorific value.

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