

## SESSION V - AGRICULTURAL ENGINEERING

CZU: 662.8

### EFFECTS OF DENSIFICATION PARAMETERS ON THE QUALITY OF BRIQUETTES PRODUCED FROM MIXING *MISCANTHUS GIGANTEUS* AND AGRICULTURAL RESIDUES

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The aim of this study was to investigate the influence of densification parameters on the compaction degree of briquettes obtained from biomass derived from mixtures of *Miscanthus giganteus* and arboricultural residues. The study focuses on establishing the relationships between the influence of process variables (matrix temperature, compaction pressure and biomass moisture) on briquette particle density.

The experiments were carried out in the UTM Scientific Laboratory of Solid Biofuels, using a laboratory equipment developed by the authors of this study, which allows the compaction of single briquettes in closed cavity and in flow by monitoring the compaction regimes. The study was conducted using a 2k complex central factorial experiment, to which 2k "star" points were added at a distance  $\alpha=5\%$ , along with 2 experiments conducted at the central point.

Statistical processing of the experimental data, obtained in this study, resulted in the following regression equation which, in natural coordinates, shows the relationship between particle density and densification regimes of briquette samples produced from a mixture of *Miscanthus* (50%) + Arboricultural Residues (50%):

$$DE = 0,146+0,003T+0,004P+0,05M-0,000004T^2-0,000002T \times P-0,00008T \times M+0,000002P^2-0,0002P \times M-0,0004M^2.$$

Analysing the obtained equation, it can be deduced that pressure (P) and compression temperature (T) have a dominant effect on particle density, while moisture content (M), within the limits of the experiment, does not record significant modification. By calculating the prime equation, it is possible to determine the values of the technological regimes that provide the most favourable conditions for obtaining the quality parameters predetermined by the manufacturers.

As a result of the analysis of the data obtained in this research, it was possible to establish an interdependence between the values of process variables and the densification capacity of briquette particles produced from lignocellulosic biomass, on the example of mixtures of *Miscanthus giganteus* and arboricultural residues, which can serve as a reliable tool for choosing the technological regimes for briquette densification.

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