

## ABSTRACT

*This study aims to produce and evaluate the quality of solid fuel briquettes derived from tree branch charcoal waste at TPST UPT K3L Universitas Diponegoro based on their physicochemical characteristics and burning rates. The briquettes were formulated using a mass ratio of charcoal powder, water, and tapioca starch binder at 5:5:1. The molding process was conducted using a hydraulic press with molding pressure variations of 1, 2, 3, 4, and 5 tons, followed by an indirect sun-drying method under a lightweight steel roof. Quality testing included density, moisture content, ash content, shatter index, and burning rate, evaluated against the Indonesian National Standard (SNI) 01-6235-2000 quality standards. The results demonstrated that increasing the compression pressure from 1 ton to 5 tons proportionally increased the briquette density from 0.73 g/cm<sup>3</sup> to 0.768 g/cm<sup>3</sup> and effectively reduced the moisture content from 8.50% to 6.85%. Furthermore, pressure variations did not significantly affect the shatter index, which remained stable below 10%, or the ash content, which was remained in a high range of 14.69%–14.89% due to the high inherent bark ratio. In thermal testing, increasing the pressure unexpectedly accelerated the burning rate from 0.135 g/min to 0.139 g/min. This thermal anomaly was caused by the formation of structural cracks due to the “spring-back effect” in high-pressure briquettes, which facilitated massive oxygen penetration, and the absorption of latent heat by residual moisture in low-pressure briquettes, which hindered initial oxidation. Based on a comprehensive evaluation, the 3-ton pressure variation was determined to be the optimum production point because it balances physical durability, meets moisture content criteria of below 8%, and maintains efficient burning rate stability for household-scale fuel applications.*

**Keywords:** *Charcoal briquettes, tree branches, hydraulic pressure, physicochemical characteristics, burning rate.*