

INTISARI

Meningkatnya pertumbuhan populasi penduduk, ekonomi bertumbuh, tingginya biaya eksplorasi, semakin menipisnya sumber cadangan minyak, dan emisii karbon gas buang menjadi alasan untuk mencari energi alternatif selain energi fosil. Sumber energi alternatif yang telah banyak dikembangkan untuk mengantisipasi krisis energi salah satunya dari limbah biomassa. Limbah biomassa serbuk kayu menjadi pilihan penelitian yang dapat dijadikan energi alternatif terbarukan (renewable) dan berkelanjutan (sustainable). Penelitian dengan judul densifikasi serbuk kayu Merbau dan Matoa menjadi wood pellet untuk upgrading nilai kalor bertujuan mengetahui peningkatan nilai kalor dan mencari komposisi yang efektif, efisien, dan ekonomis dengan proses densifikasi.

Bahan baku pembuatan pelet kayu (wood pellet) dalam penelitian ini berasal dari limbah padat serbuk kayu Merbau dan Matoa. Variabel yang diperlakukan adalah ukuran partikel bahan baku, rasio komposisi campuran serbuk, variasi perekat kanji, dan variasi tekanan. Proses pembuatan dimulai dengan penghalusan bahan baku dan penyaringan serbuk dengan saringan 10 mesh. Kemudian serbuk Merbau dan Matoa ditimbang sesuai rasio komposisi campuran dengan total 25 g. Perekat dibuat sesuai rasio komposisi kanji 1%, 5%, dan 10% dari berat total serbuk ditambahkan air 25 g untuk setiap rasio komposisi campuran serbuk Merbau dan Matoa. Kemudian rasio komposisi campuran serbuk dicampurkan dengan perekat hingga merata, selanjutnya dikempa dengan alat cetak bertekanan 5 ton. Hasil cetakan berupa pelet kayu berbentuk silinder berdiameter 20 mm. Selanjutnya pelet kayu di analisa kadar air, kadar abu, kadar zat terbang, kadar karbon terikat, nilai kalor dan uji kuat tekan.

Hasil penelitian menunjukkan bahwa pelet kayu dengan kode sampel $R_2K_1P_3$ (R_2 adalah komposisi merbau 70% matoa 30%, K_1 adalah perekat kanji 1%, P_3 adalah tekanan 150 kg/cm²) dengan nilai kadar air 5,3479%, kadar abu 3,9035%, kadar zat terbang 67,8150%, kadar karbon terikat 22,9336%, nilai kalor 4409,3786 kal/g, kuat tekan 6020 Newton, ROI ratio 27,06%, dan keuntungan Rp 2.045.000/bulan yang paling efektif, efisien, dan ekonomis.

Kata kunci : Limbah kayu Merbau dan Matoa, densifikasi, dan pelet kayu.

DENSIFICATION OF MERBAU AND MATOA WOOD DUST INTO WOOD PELLETS FOR UPGRADING CALORIFIC VALUE

ABSTRACT

The increasing population and economic growth, high costs of exploration, depletion of oil reserves, and major source of carbon emission are several reasons to look for alternative renewable energy to substitute the fossil energy. Alternative energy sources that have been developed for many years yet has not reached the optimum implementation is from biomass. Sawdust as one of biomass sources can be a renewable alternative energy resource that is sustained. Research entitled densification of Merbau and Matoa wood dust into wood pellets to upgrade the calorific value will be the study conducted to obtain the composition of an effective, efficient, and economical densification product.

Raw material of the wood pellets comes from solid waste sawdust of Merbau and Matoa wood. The variables are particle size of the raw materials, composition of the mixture ratio powder, starch, adhesives, and variations of densification pressure. The manufacturing process begins with refinement of the raw materials and filtering the powder with 10 mesh siever, and then the Merbau and Matoa sawdust is weighed in accordance with the composition of the mixture ratio of total 26 g. Kanji as Adhesive is added in accordance with the ratio of 1%, 5%, and 10%. Pressure applied into the mixture is about 5 tons to form the wood pellets. Cylindrical wood pellets with a diameter of 20 mm is the final result that will be further analyze. The analysis will be in subsequent order such as moisture content, ash content, level of flying substances, fixed carbon content, and the calorific value as well as the compressive strength.

The results showed that wood pellets with sample code of $R_2K_1P_3$ (R_2 is composition merbau 70% matoa 30%, K_1 is adhesive kanji 1%, P_3 is pressure 150 kg/cm²) provide the most effective, efficient, and economical densification product with 5.35% of moisture content, 3.90% of ash content, 67.82% of flying substances, and 22.93% of fixed carbon content. While the calorific value reaches the level of 4,409.38 cal/g. Instead of the compressive strength, it obtains the value of 6020 Newton. The economical evaluation shows that the ROI is 27.06% and the profit is Rp 2.045.000/month.

Keywords: Merbau and Matoa sawdust, densification, wood pellets.