

INTISARI

Penerapan *co-firing* biomassa di PLTU merupakan langkah nyata dalam mendukung kebijakan pemerintah untuk mencapai target bauran energi bersih dan *Net Zero Emission* 2060. Penerapan *co-firing* biomassa di PLTU tipe *pulverized coal* (PC) umumnya menerapkan metode *direct mixing* antara biomassa dan batubara di *coal yard*. Cara ini cukup praktis, tetapi sering kali menyebabkan kendala terutama dalam proses penggilingan, seperti seperti vibrasi yang tinggi pada *mill*, penyumbatan pada peralatan *mill* dan saluran bahan bakar, dan kemungkinan terjadinya perbedaan rasio campuran pada produk akhir dan rasio awal umpan.

Penelitian ini bertujuan untuk mengkaji pengaruh variasi rasio komposisi campuran *co-firing*, jenis biomassa (sekam padi dan *sawdust*), serta jumlah putaran penggilingan terhadap produk hasil penggilingan. Berbeda dengan penelitian terdahulu yang umumnya hanya menguji sampel secara terpisah, studi ini mengisi kesenjangan riset dengan menguji campuran biomassa dan batubara secara langsung (*direct mixing*) seperti skenario praktis yang diterapkan di PLTU. Eksperimen dilakukan menggunakan *vertical ball milling machine* skala laboratorium, dilanjutkan dengan analisis distribusi ukuran partikel melalui metode ayakan dan identifikasi proporsi biomassa–batubara pada fraksi halus dengan teknik *image processing*. Sehingga diharapkan mampu menghasilkan indikator *grindability* campuran batubara-biomassa yang lebih representatif.

Hasil penelitian diharapkan dapat memberikan pemahaman mengenai selektivitas penggilingan dan campuran yang optimal dalam skenario *direct mixing*, sehingga dapat menjadi dasar rekomendasi teknis bagi pengelola PLTU dalam implementasi *co-firing* biomassa di Indonesia sebagai bagian dari strategi transisi energi nasional.

Kata kunci : *co-firing* biomassa, *pulverized coal boiler*, *direct mixing*, *grindability*, *image processing*

ABSTRACT

Biomass co-firing in coal-fired power plants is a practical strategy to support the Indonesian government's clean energy mix target and the Net Zero Emission 2060 agenda. In pulverized coal power plants, biomass co-firing is commonly implemented through direct mixing of biomass and coal in the coal yard. Although this method is relatively simple, it often creates operational problems during the grinding process, such as high mill vibration, blockage in mill equipment and fuel pipes, and possible deviation between the initial feed ratio and the final product ratio.

This study aims to investigate the effects of co-firing mixture ratio, biomass type, and grinding rotation number on the characteristics of the ground product. Rice husk and sawdust are used as biomass samples. Unlike previous studies that generally tested coal and biomass separately, this research addresses the gap by directly testing coal and biomass mixtures under a direct mixing scenario, similar to practical implementation in power plants. The experiment is conducted using a laboratory-scale vertical ball milling machine. The ground product is then analyzed through particle size distribution using the sieving method. The biomass and coal proportions in the fine fraction are identified using image processing techniques. This approach is expected to provide a more representative grindability indicator for coal and biomass mixtures.

The expected results of this study are a clearer understanding of grinding selectivity and the optimal mixture condition in direct mixing co-firing. The findings can serve as a technical basis for power plant operators in implementing biomass co-firing in Indonesia as part of the national energy transition strategy.

Keywords: *biomass co-firing, pulverized coal boiler, direct mixing, grindability, image processing*