

Densification of Corncobs Using Algae as a Binder

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ABSTRACT

*Corn residues are abundantly available, but utilizing this potential biomass energy source is limited by their low density and non-uniform physical characteristics. Densification may be used to solve this problem. Many studies have used high temperature and pressure to compress biomass materials into pellets, as well as expensive additives to produce high-quality pellets. In this study, we investigated whether moderate temperature and pressure with a binding agent from an inexpensive and environmentally friendly source offers an alternative solution. We used locally available algae (*Spirogyra* sp. and *Chara* sp.) as a binding agent for densification of corncobs and studied the effects of pressure (100-200 MPa) and algae-to-biomass ratio (10-40% w/w), at a fixed die temperature of 30°C, on pellet characteristics. We found that algae can be successfully used as binder for densification of biomass. Using the algae at 20% w/w or less with an applied pressure of 150-200 MPa improved the relaxed density of the pellets by 250-285%, higher than the bulk density of the original corncobs before compaction, with energy density of 12-14 GJ/m³.*

Keywords: Agricultural residues, Biomass, Pelletization, Renewable energy

INTRODUCTION

Northern Thailand produces the most corn in the country, with Chiang Mai Province one of the biggest producers, with over 128,000 tons annual output in 2014 (Office of Agricultural Economics, 2014). After harvesting, large amounts of corn residue are usually abandoned in the fields and subsequently burned as a method of disposal. Air pollutants, especially smoke, from burning these residues adversely affect public health and the environment.

Potentially, around 520 TJ of biomass energy can be derived from these corn residues in Chiang Mai Province and surrounding areas. These agricultural residues may be utilized for energy via physical or thermochemical conversion routes to help reduce these problems (Wongsiriamnuay et al., 2013; Auprakul et al., 2014; Sittisun et al., 2015; Wongsiriamnuay and Tippayawong, 2015;