



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Process development for the production of briquette using agro forest waste and taro binder for rural household applications

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SHORT ABSTRACT

The potential use of agro forest waste (Rice straw, Eleusine indica grass, Polyalthia longifolia leaves) for briquette production using low-power screw press machines was studied in this research. A low-cost, abundant, and novel binder, Taro (*Colocasia esculenta*) was used for briquetting. The briquettes obtained were tested for physical, mechanical, physio-chemical, and thermal properties. As charcoal is reported to enhance the briquette properties, so bamboo charcoal was added to the same composition of raw materials at three percentages (0, 25, and 50) % and briquetted and analyzed for fuel properties. Taguchi-Grey analysis was employed to obtain the best briquette composition based on calorific value, shatter resistance, density, water resistance, and compressive strength. The best result was obtained for the straw and 25 % charcoal and 15 % binder. Cost analysis and specific energy consumption during briquetting were also done. Specific energy consumption shows that size reduction using a chaff cutter machine consumes 87 % of the total specific energy required for briquette production. Therefore, to omit the chaff cutter machine in order to reduce the specific energy, the rice straw was carbonized for the next step before briquetting. As carbonization effectively reduces the material's resilient properties and is effective in the reduction of pollution emissions, carbonization was the chosen pre-treatment method. The novel binder was compared with the two most widely used binders in the literature to validate its use as a binder. The result showed that the taro binder does not harm the briquette quality and is equally effective as starch and paper binder. For the last step, a low-cost manual press was fabricated at a local welding shop. The briquette obtained was compared with the same combination sample obtained using a screw press, and the best selection was obtained from Taguchi-Grey analysis. The result showed that the taro binder does not harm the briquette quality and is equally effective as starch and paper binder. A low-cost manual press was fabricated at a local welding shop to fulfill this objective. The machine was used for briquetting the best combination of straw at 15 % binder; the sample characteristics were compared with the same combination sample obtained using a screw press, and the best selection was obtained from Taguchi-Grey analysis. The samples were analyzed and compared based on physical, thermal, mechanical, and physio-

chemical properties. Cost, specific energy consumption, and burning rate were also compared. The results show that as carbonization helps omit the chaff cutter from the briquetting process, the specific energy and cost of capital investment and production cost decreases. This technology is best for insitu briquette production, which will reduce the transportation cost, which is one factor that adds up to the cost of the raw materials used for briquetting.

