RICE HUSK GASIFIER CUM ROTARY DRYER FOR DRYING COCO FIBER

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Glory to God!!!

Even coco fiber processing plant can now use the rice husk gasifier as heat source for drying freshly decorticated coconut husks. Business enterprises can now have the capability to increase production of coco fiber to meet export demand even amid weather condition that does not favour sundrying.

A project was carried out early of 2014 to design and develop a coco fiber drying machine that uses a rice husk gasifier as source of heat. Freshly decorticated coconut husks produce fiber with 40% or even higher moisture content. In order to make it acceptable for export, coco fiber moisture must be dropped down to around 18% moisture level. Sundrying of coco fiber is commonly practiced by coco-fiber producers. Because of the limited drying pavement and of the erratic weather condition during sundrying, however, coco fiber production is hindered causing most producers to resort to the use of mechanical drying.

As shown in Figure 1, the rice husk gasifier unit has a 1.2m-diameter moving-bed downdraft-type reactor. The gasifier and the rotary dryer construction were completed just recently and have subsequently been tested and evaluated. The gasifier, as shown, has a fuel hopper located on top of it while at the bottom is a char bin filled with water to quench burning char when the scraper is turned to discharge char from the char chamber. The gas produced from the gasifier is directed to a heat exchanger that transmits clean hot air into the dryer. The gasifier uses a 1.5-hp centrifugal blower to supply the needed air in gasifying rice husks. The combustible gas coming from the gasifier is burned in a jet-type

Figure 1. The Moving-Bed Down-Draft Rice Husk Gasifier Model 1.2D

Model	RHG Model 1.2D
Reactor Diameter	1.2 m
Char Removal System	Rotating Sweeper
Air-Moving Device	1.5-kW centrifugal blower
Fuel Consumption Rate	10 to 12 sacks of rice husk per hour

burner and the product of combustion is directed to an air-gas heat exchanger equipped with air-moving device to force ambient air into the heat exchanger and into the rotating bin of the dryer.

Figure 2. The Rotary Drum Dryer for Drying Coco Fiber

The dryer designed for the coco fiber, as shown in Figure 2 above, is a convection-type rotary drum dryer having 2 meter diameter and 12 meters length. The dryer is inclined at around 10 degrees to cause the fiber to move from the inlet end, where the heat exchanger is located, to the outlet end. The drum is rotated by a 1.5-kW, 3-phase motor at 5-rpm speed. The fan at the drum that supplies the air for drying is an 80-cm vane-axial-flow-type fan driven by a 7-hp, 3- phase motor.

Diameter	2 m
Length	12 m
Drum Inclination	10 deg
Drum Speed	5 rpm
Drive Motor	1.5 kW, 3 phase
Fan Size	80-cm Vane Axial
Motor Drive	7-hp, 3-phase motor

The gasifier consumes 10 to 12 sacks of rice husk per hour for the dryer output of 200 to 350 kg per hour. The moisture content of fiber obtained at the end of the dryer ranges from 18 to 20%. Further exposure of dried coco fiber to the ambient air after leaving the dryer stabilizes further its moisture down to 18%. After 7 hours of operation, around 420 kg to 735 kg of char is obtained.

Initially, the entire system is operated by 6 persons. Two assigned to operate the gasifier, another 2 persons to load wet coco fiber and the other 2 persons to unload the dried one.

A bucket elevator will be constructed to automatically feed rice husks into the gasifier and a belt conveyor will also be added to increase the capacity of feeding the fiber into the dryer. A shed will also be constructed to be able to operate the dryer and the gasifier even during rainy season. Further improvement will be done to increase the capacity of the dryer as well as to reduce the rice husk fuel consumption of the gasifier.

The gasifier, including the dryer, can be fabricated using local skills and materials. The electric motor, blower, gear drive, and other standard materials are readily available locally. The cost to produce the entire system depends on the prices of materials and the cost of labor in the locality. The benefits that can be derived from using this technology are: (1) energy cost saving – instead of fossil fuel, biomass can be used as replacement; (2) employment generation - provides employment in the construction and operation of the gasifier and dryer system; (3) soil-quality improver production – char is produced in the gasifier that can improve quality of soil; and (4) carbon sequestration medium – char helps, in one way or another, in sequestering carbon from the atmosphere and put back into the soil.

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