

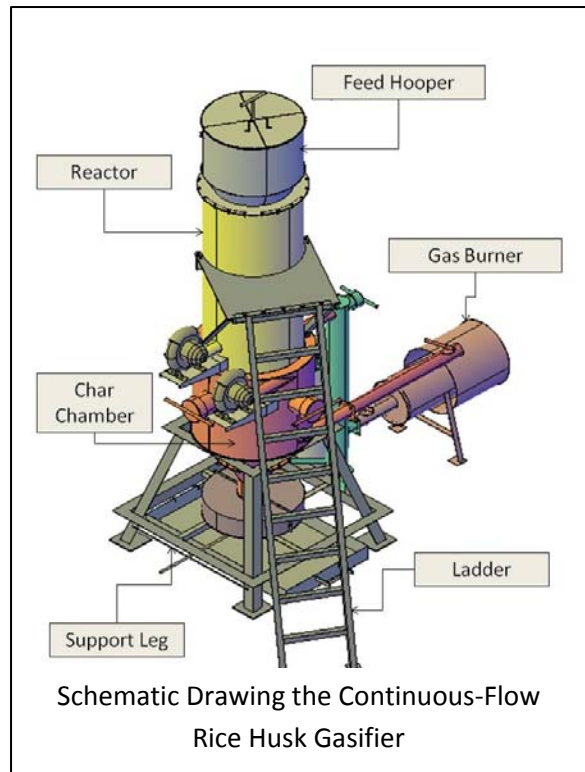
## RICE HUSK GASIFIER AS SOURCE OF HEAT FOR FLATBED PADDY SEED DRYER

by: Alexis Belonio and Billy Belonio

Drying paddy is one of the major problems of seed growers in Nueva Ecija. Oftentimes when drying coincides with rainy periods, seed grains become deteriorated because of the inability to dry them which results in a poor germinability.

The use of mechanical drying is the alternative method to dry seed grains in order to assure good quality, especially during rainy periods. The use a flatbed dryer has been proven to be the simplest method of drying grains since almost no moving parts in it, except the fan. Additionally, using rice husks as fuel is the cheapest energy source for heating the dryer. However, the use of traditional rice husk furnaces as a source of heat for the flatbed dryer has brought lots of problems. The major problems or feedbacks about the use of traditional rice husk furnaces for the dryer are: (1) investment cost per power output is high; (2) inconvenient to use, requiring lots of attendance during operation; (3) smoke emission is excessive, especially at the start up; (4) difficult to maintain the right temperature for drying; (5) life span is short, since parts easily get corroded brought about by the intense heat; and (6) char and ash particulates go with the drying air.

In order to overcome these problems, a recently developed moving-bed inverted downdraft rice husk gasifier was tested and evaluated for the flatbed dryer in drying rice seeds in

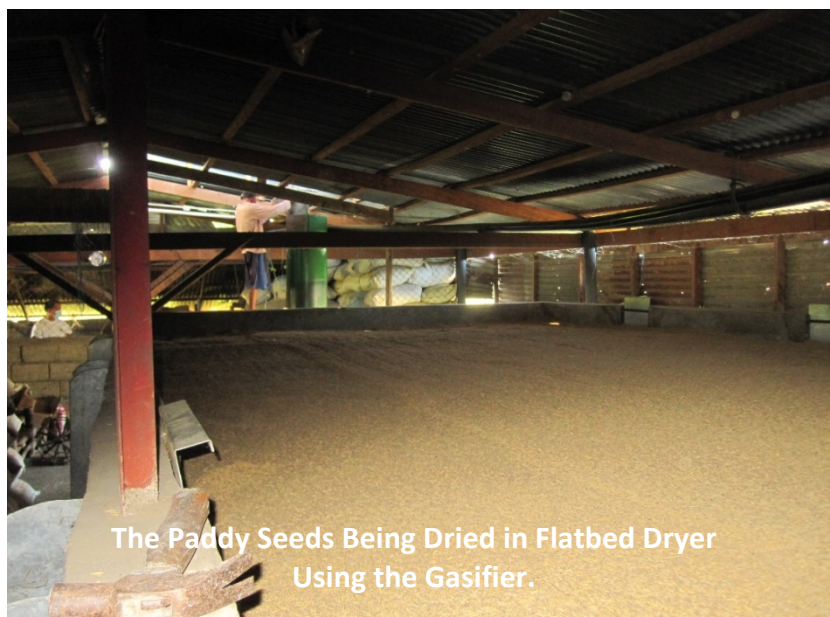


Mapangpang, Munoz, Nueva Ecija. Instead of using the traditional rice husk furnace, a rice husk gasifier was used. The gasifier produces combustible gases from rice husks as contrasted with direct combustion of rice husks in the traditional rice husk furnace. The gasifier, as shown above, basically consists of a feed hopper, a reactor, a char chamber, a gas burner, a ladder, and a support leg. Rice husks are fed at the reactor through a feed hopper. With limited amount of air ( $1.25 \text{ m}^3$  per kg of fuel), rice husks are burned which produces carbon. When the carbon gas produced reacts with air, it produces combustible gases that are rich in carbon monoxide and hydrogen. Burning of rice husks starts from the bottom and it moves vertically upward along the reactor. Hot air is introduced from the top and leaves through the char chamber's annular space. The gases are allowed to pass through the particle separator before they are burned in the gas burner. The char is discharged by swinging the scraper at the bottom of the char chamber.

The gasifier is coupled to the flatbed dryer by positioning its burner 30-cm apart from the dryer fan inlet in offset position. Combustible gases are produced from the gasifier within 15 to 20 minutes after ignition of fuel. Burning gas provides the required heat for drying seed grains at a temperature of 39 to 43°C. The 0.4-meter diameter gasifier reactor can sufficiently provide the heat energy needed by a 4-ton capacity flatbed dryer; whereas, the 0.5-meter diameter gasifier reactor suits perfectly for a 6-ton capacity dryer. Only one person is needed to attend the operation of the gasifier, that is, to load fuel and to discharge char. Seed grains are dried in the flatbed dryer using the gasifier within 12 to 14 hours consuming 5 to 6 kg of rice husks per hour per ton



The Burning Gas Coming Out of the Gasifier Burner Entering the Dryer Fan



The Paddy Seeds Being Dried in Flatbed Dryer Using the Gasifier.

of rice seeds. Results of tests conducted revealed that rice seeds dried in the flatbed dryer using the gasifier has higher germination percentage of 85% and above.

The advantages of the use of gasifier for the flatbed dryer are: (1) It is convenient to use - the ignition time to produce gaseous fuel is very short also the loading of rice husks and the removal of char are simple; (2) No smoke emission is observed during operation – the smoke produced are combustible and are efficiently burned in the burner; (3) Easy to control and provides uniform temperature for drying – the amount of heat can be easily increased or decreased with the use of a rheostat switch or a gas valve and no wider fluctuation in the drying temperature during operation that can be observed; and (4) Low electrical consumption per power output – only 0.01 kWe per kWt is needed to run the gasifier.

The gasifier cost P90,000.00 which includes the reactor and the two units 2½-in. electric blowers. The electric consumption of the two blowers is 32 watts. The investment for the gasifier can be recovered within a year provided that drying operation will be done 20 days per month and 9 months per year.

For further information, contact: The Project Director, Center for Rice Husk Energy Technology, College of Agriculture, Resources and Environmental Sciences, Central Philippine University, Iloilo City, Philippines. Email: [atbelonio@yahoo.com](mailto:atbelonio@yahoo.com) and website: [www.crhet.org](http://www.crhet.org). You can also contact Engr. Billy Belonio for the technical aspect of the gasifier and the dryer at [btbelonio@yahoo.com](mailto:btbelonio@yahoo.com) or at +639167173476. Interested seed processors who would like to see the technology can contact Ms. Divina Gracia Boydon (+639164219007) at Mapangpang, Science City of Munoz, Nueva Ecija.

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