# DUAL- REACTOR RICE HUSK GASIFIER FOR 6-TON CAPACITY RECIRCULATING-TYPE PADDY DRYER

by

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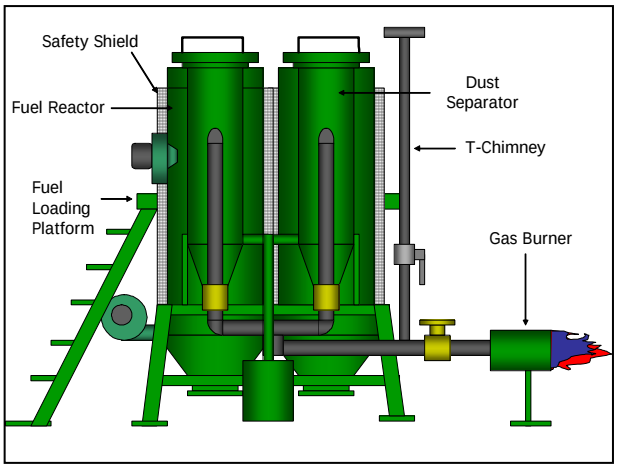
Good news!!!

Drying of paddy in a re-circulating type dryer is quite expensive nowadays. This is because of the continued increase in the prices of fossil fuel, particularly diesel. At present, a liter of diesel costs about P38.80. With a fuel consumption of 6 liters per hour of diesel using a typical re-circulating type dryer, about P2,300 per day is spent on fuel for 10 hours operation,.




Rice husk, which is a by-product of milling of rice, is a potential biomass material that can be used to replace diesel fuel that is commonly used in a recirculating-type grain dryer. Gasifying rice husk on a top-lit updraft (T-LUD) mode was proven to produce quality flame that approaches the quality of that of diesel. Using gasifier, combustible gases can be piped-in through a remote burner for direct use by the dryers. Since, T-LUD type rice husk gasifier normally operates on a batch mode, a dual-reactor rice husk gasifier was designed and developed so that the reactor can be alternately ran thereby continuous drying operation can be achieved.


The dual reactor rice husk gasifier is a biomass energy technology for thermal application designed and developed at the Appropriate Technology Center, College of Agriculture, Central Philippine University, Iloilo City with the assistance from the agricultural

engineering students, Lucio Larano and Daniel Belonio. As schematically shown above, the rice husk gasifier consists of the following: two reactors, where rice husk fuel is burned with limited amount of air to generate combustible gases; char chambers where burnt rice husk is discharged; a momentum-type separator to collect char particles that go with the gas; a set of blowers that supplies the needed air for gasification and for cooling the reactor; a gas pipe to convey combustible gases from the reactor to the burner; a jet-type burner to burn combustible gases; and a pneumatic conveyor to discharge char from the reactor to the cyclone separator for subsequent disposal.


Each reactor has a diameter of 0.5 m and a height of 1.6 m. It is made from 1.3 mm stainless steel plate inner cylinder and 1.3 mm mild steel plate outer cylinder. It has a 10-cm annular space where ambient air is injected to cool the inner cylinder and subsequently used for combustion of combustible gases as well as for the supply of hot air into the dryer. Two centrifugal 2½-in. electric blowers are used for each of the reactor to supply the needed air for gasification and one 3-in. electric blower for the cooling of the reactors. The gas is conveyed to the jet-type burner through a 3-in. diameter GI pipe equipped with gate valve to control the flow of gases.


Performance testing and evaluation of the gasifier showed that each reactor can accommodate 4 sacks of rice husk per load with a power output of 10.4 kW. Ignition of fuel can be done within 2 minutes and combustible gases can be generated within 5 minutes. The amount of rice husk fuel consumed averages to 29 kg per hr. Each reactor operates for 1 hour and 20 minutes before shifting to the other. The computed specific gasification rate and superficial velocity of the reactors averages to 148.5 kg/hr-$m^2$ and 5.4 cm/sec, respectively. The percentage amount of char produced is 35%. One person is needed to attend in loading and unloading of fuel from the reactor. Actual tests showed that the gasifier can continuously supply the required heat that is needed by a 6-ton

capacity recirculating-type grain dryer. Heated air temperature of 45 to 60ºC can be attained at the plenum chamber during drying. The investment cost for the gasifiier is P200,000.00 per unit. It can be recovered within less than 1 year of operation when operated at 10 hours per day, 20 days per month, and 8 months per year operation.

The gasifier is an alternative device to replace the use of high cost diesel fuel. It can help minimize the problem of rice husk disposal and also a potential source of additional income in the production of carbonized rice husk.

Any interested organization who wishes to adopt the technology may collaborate with the Appropriate Technology Center, Department of Agricultural Engineering and Environmental Management, College of Agriculture, Central Philippine University, Iloilo City, Philippines. You may contact through our landline at 063-033-3291971 loc 1071 or our mobile phone at 063-09167115222.