For more information, write or call:

TECHNOLOGICAL SERVICES DIVISION
Industrial Technology Development Institute (ITDI-DOST)
Telefax: 837-2071 loc. 2265 / 837-6156
e-mail: tsd@itdi.dost.gov.ph

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ITDI GASIFIER COMBUSTOR

Department of Science and Technology
INDUSTRIAL TECHNOLOGY DEVELOPMENT INSTITUTE
DOST Compound, General Santos Avenue
Bicutan, Taguig City, Metro Manila, PHILIPPINES
http://www.itdi.dost.gov.ph

'Our Business is Industry…"

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Prepared by: **ELNILA C. ZALAMEDA**
TSD-ITDI

LORENCITO M. PACATANG
TSD-ITDI

Edited by: **VIOLETA A. CONOZA**
TSD-ITDI

Cover layout by: **LUZMIN R. ESTEBAN**
TSD-ITDI

Adviser: **NELIA ELISA C. FLORENDO**
TSD-ITDI

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ITDI GASIFIER-COMBUSTOR

INTRODUCTION

Thermal or heat energy is an indispensable input in agriculture and small industries. In the rural areas, a potential source of energy for small-scale applications is rice husk (also known as rice hulls).

The common methods of converting rice husk to usable energy are combustion and gasification. Combustion, which is the burning of rice husk in the presence of air, is the traditional and most widely practiced method of deriving energy from rice husk. It is used in stoves for cooking, in furnaces for heating and in boilers for steam and power generation.

The term gasification refers to the thermal conversion of rice husk into a low calorific value gas with ash, which is mainly silica and unused carbon, as residue.

In most applications, gasification and subsequent combustion of the gas produced has some advantages over direct combustion of rice husk. Temperature control is easier when producer gas is used as fuel rather than utilizing the heat generated in the direct combustion of solid fuels.

The most common fuel for brick and pottery kilns is wood. However, it has become scarce and expensive. The continued use of wood in a massive scale has resulted to the depletion of trees in our forests which is now causing heavy floods in various parts of the country. A potential substitute for wood is rice husk.

Traditional fuels or heat source for mechanical driers are wood, fuel oil, LPG and electricity. With the increasing price of these fuels and the question on its availability in the near future, agricultural wastes such as rice husks are the most attractive because of its inexhaustible supply.

This brochure gives practical operating and maintenance procedures of the rice hull gasifier-combustor (RHGC) based on actual experiences in the field.

APPLICATION

A. Small-Scale Brickmaking and Pottery Making
B. Palay Drying
C. Conversion of Wood Pottery and Brick Kilns to Rice Husk Gasifier-Combustor
D. Other Applications of Rice Husk Gasifier-Combustor
    1. Drying of Papier Mache
    2. Fish Drying
    3. Village-level Extraction of Citronella Oil
    4. Bakery Oven
    5. Boiler Application
    6. Lime Calcination
    7. Candle Making
    8. Coffee Roasting
    9. Pili Nuts Processing

TECHNOLOGY DESCRIPTION

The rice hull gasifier-combustor operates on the principle of the fixed bed, throatless, batch-type downdraft gasifier. It has several advantages over other types of thermal converters, i.e. low cost, higher efficiency, easy control of heat delivery rate and produce clean gas and flame. The gas which is generated in the reactor, with a heating value of 3,600-4,000 KJ/SCM is ignited in the gas exit or piped to a thermal equipment where the gas is burned. The conversion efficiency, which is the ratio of the heat delivered to the fuel consumed, is about 70-80 percent.

OPERATION OF A GASIFIER-COMBUSTOR

A. Before starting the gasifier-combustor

1. Check the alignment or positioning of the grate gas/air pipe line, flange gasket and blower.
2. Check whether the bolt fasteners that join the segmented reactor are properly and evenly tightened.

B. Start up

1. Burn 3 kg of charcoal which will serve as the starter for the combustor. Drop the burning charcoal on top of the grate through the fuel inlet hopper. Make sure that the grate is in a horizontal position to prevent dropping of the fuel. Wood chips and coconut husk can also serve as starter for the combustion.
2. Load 4 sacks of fuel (rice hulls) through the fuel inlet hopper. Be sure that the air inlet pipe is not covered with rice hull. Close the hopper tightly to prevent air leakage.
3. Turn on the combustor blower. Initially, a non-combustible gas is generated, however, after 3-5 minutes, a combustible gas is produced.
4. Light up the gas in the combustor's gas outlet.
5. When the combustor has run out of fuel, turn off the blower, discharge the ash and load a new batch of fuel.

NOTE: If the combustor is retrofitted to a flash drier continuous flow model, just connect the air pipe of the combustor to the pipe of the mechanical blower which is being driven by an engine. However, when the combustor has run out of fuel, detach the connection of the combustor pipe from the pipe of the mechanical blower without shutting off the prime mover (engine).

MAINTENANCE OF GASIFIER-COMBUSTOR

Careful attention to regular service and maintenance can reduce a costly repair and downtime.

1. Check the bolts and nuts. Tighten and replace if necessary.
2. Grease the blower bearing as recommended by the manufacturer.
3. Clean the ash grate occasionally to remove dirt or ash accumulated in the gas outlet.
4. Inspect the insulation of the combustor. Repair if any crack appeared in the body.
5. Detach the blower if the combustor is not in use.
6. Paint parts that need repainting.
7. Apply oil to exposed metal surface to prevent from rusting.

SAFETY PRECAUTIONS IN OPERATING THE GASIFIER-COMBUSTOR

1. Combustor should be operated only by those who have been trained and authorized personnel.
2. Never use gasoline to start the combustor. It may cause an explosion.
3. Wear gloves and mask during the loading of rice hull fuel and discharging of ash.
4. Do not open the emergency port of the combustor while the blower is in operation.
5. Make sure the gas valve is properly opened.
6. Make sure the ash grate is in the horizontal position before rice hull fuel is charged.
7. Never leave the gasifier-combustor unattended during operation.
8. Use a step-ladder in climbing to the top of the gasifier.
9. Provide a first aid kit. Treat all scratches and burns with proper antiseptic immediately.
10. Keep a handy fire extinguisher at all times.
11. Remember that safe operation means no accident.
12. Take time for safety.