Rice Husk Ash and Uses: A Brief Review

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Abstract : The rice husk, likewise called rice hull, is the covering on a seed or grain of rice. It is shaped from hard materials, including silica and lignin, to ensure the seed during the developing season. Every kg of processed white rice brings about generally 0.28 kg of rice husk as a result of rice creation during processing. ice husk was for quite some time considered a loss from the rice processing process and was frequently dumped as well as consumed. But since it tends to be handily gathered and is modest, some measure of rice husk has consistently been utilized as a vitality hotspot for little applications, for example, for block creation, for steam motors and gasifiers used to control rice factories, and for producing heat for rice dryers..

IndexTerms **– Rice Husk Ash ,Rice Hull , Concrete addons .**

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- Every kg of processed white rice brings about generally 0.28 kg of rice husk as a result of rice creation during processing
- Rice husk (kg) produced from 200 million tons of rice
  =200,000,000,000kg×0.28=56,000,000,000 kg

Field trip report

Rice husk gasification for electricity generation in Cambodia in December 2014

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Introductive summary

In 2014, the total rice production in Cambodia were approximately 9.3 million tons [1]. Rice husk accounted for approximately 20% of paddy production on a weight basis [2], meaning that 2 million tons of rice husk were produced. Only 10% of rice husk in Cambodia is utilized as fuel for household cooking and for brick kilns [3]. Rice mills have to throw the rest away or burn it out as a way of disposal. This creates environmental hazard and air pollution for the surroundings. Rice husk can become an interesting feedstock for electricity production. The conversion rate of rice husk to electricity is 1.6-1.8 kg per kilowatt-hour (kWh), equivalent to 1100 GWh of electricity [4][5].

Citation link: Hong Nam Nguyen, Minh Ha-Duong. Rice husk gasification for electricity generation in Cambodia in December 2014: Field trip report. [Research Report] Université de Sciences et Technologies de Hanoi. 2014. ffhal-01107615v2f

- Electricity (kWh) produced = 56,000,000,000 (kg) / 1.6(kg/kWh)=35,000,000,000 kWh
  to
  56,000,000,000 (kg) / 1.8(kg/kWh)= 31,111,111,111.11 kWh

An Overview of the Downdraft Rice Husk Gasifier Technology for Thermal and Power Applications

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Abstract: An overview of the downdraft rice husk gasifier (DDRHG) for thermal and power applications is herein presented. The different designs of the downdraft rice husk gasifier with reactor diameter ranging from 0.10 meter to 1.20 meter are discussed in detail. Smaller units of the DDRHG were found to have performed well in fixed bed. Larger units of the gasifier, on the other hand, are suited for moving-bed type making possible continuous operation without discharging and recharging the reactor. Present thermal applications of the gasifier includes: domestic cookstove, bakery oven, dryers, rotary kiln, steam boiler, and torrefyer. The DDRHG is also used to run surplus gasoline engines for driving water pump, micro-mill, and electric generator without any modification. The advantages and limitations of the gasifier as well as its environmental and socio-economic benefits over the use of conventional fossil-fueled systems are enumerated.

At present, the investment cost for the gasifier ranges from PHP2,000 to 2,500.00 (USD 1 = PHP40.00) per kWt for thermal application and PHP20,000.00 to 30,000 per kWe for power generation. The cost of using the gasifier is much cheaper than that of the conventional fossil fuel and the investment can be recovered in a shorter period.

Citation link: Belonio, A. T., Ramos, J. A., Regalado, M. J. C., & Ocon, V. B. (2013). An Overview of the Downdraft Rice Husk Gasifier Technology for Thermal and Power Applications . *Journal of Technology Innovations in Renewable Energy*, *2*(3), 246–258. https://doi.org/10.6000/1929-6002.2013.02.03.6

carbon dioxide and releasing heat. The amount of char produced from the gasifier is about 30 to 35% of the rice husks input. The char is a good material for agriculture.

Carbon (kg)=56,000,000,000kg×0.30= 16,800,000,000kg
to
56,000,000,000kg×0.35 = 19,600,000,000kg

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Sustainable gasification–biochar systems? A case-study of rice-husk gasification in Cambodia, Part I: Context, chemical properties, environmental and health and safety issues

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"Sustainable gasification-biochar systems? A case-study of rice-husk gasification in Cambodia, Part I: Context, chemical properties, environmental and health and safety issues," Energy Policy, Elsevier, vol. 42(C), pages 49-58.
<https://ideas.repec.org/a/eee/enepol/v42y2012icp49-58.html>

Rice husk contains approximately 20% ash, the main constituent of which appears to be silica; the carbon content of rice husks at 38% is lower than typical biomass (ca. 50%) due to the high ash content. The RHC is largely made up of silica and carbon—just over 60% ash to 35% carbon. Other measurements of the ash content are higher (e.g. at 72.5%) (Nagori, 2010).

- The amount of rice husk ash produced from the downdraft gasification of rice husk typically ranges from 15% to 20% of the original rice husk weight.
- Ash (kg)=56,000,000,000kg×0.15=8,400,000,000kg
  to
  56,000,000,000kg×0.20=11,200,000,000kg

Novel uses of Rice-Husk-Ash (a natural Silica-Carbon matrix) in Low-Cost Water Purification Applications

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Abstract. Rice-husk-ash is used as the base material for developing novel compositions to deal with the challenge of purifying drinking water in low-income households in India. For example, rice-husk-ash cast in a matrix of cement and pebbles can be formed into a filtration bed which can trap up to 95% of turbidity and bacteria present in water. This innovation was proliferated in villages across India as a do-it-yourself rural water filter. Another innovation involves embedding silver nanoparticles within the rice husk ash matrix to create a bactericidal filtration bed which has now been commercialized in India as a low-cost for-profit household water purifier. Other innovations include the impregnation of rice-husk-ash with iron hydroxide for the removal of arsenic from water and the impregnation of rice-husk ash with aluminum hydroxide for the removal of fluoride ions from water which together have the potential to benefit over 100 million people across India who are suffering from the health effects of drinking groundwater contaminated with arsenic and fluoride.

Based on the above calculations, it may be estimated that a total of 5.23 kg of aluminum hydroxide loaded RHA will be needed to treat 2000 liters of water (the desirable capacity for a low-cost household fluoride removal purifier) in order for it to meet WHO guidelines for drinking water while facing a challenge water containing 5 ppm of fluoride contamination.

Citation link: Malhotra, Chetan & Patil, Rajshree & Kausley, Shankar & Ahmad, Dilshad. (2013). Novel uses of Rice-Husk-Ash (a natural Silica-Carbon matrix) in Low-Cost Water Purification Applications. AIP Conference Proceedings. 1538. 113-119. 10.1063/1.4810040.

- Total water purified≈3.209×10^12 to 4.278×1012liters.
- With an approximation of 0.5 dollar per RHA brick of 1.5 kg a total of $2.8 billion to $3.73 billion worth of brick can be produced from the produced rice husk ash.

Carbon amount

Ash production

Water purification efficiency comparison

RHA brick standard size