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SIMULATION OF BOILER EFFICIENCY USING RICE HUSK AND COAL AS FUEL IN RICE MILLS

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Abstract: In view of energy and environmental problems associated with the use of fossil fuels (coal, petroleum and gas) in power generation, an increasing attention is being paid world-over by the scientists and technocrats for the utilization of renewable energy sources in power generation, metallurgical industries etc. There are various type of renewable energy sources such as solar, wind, hydropower, biomass energy etc. out of these renewable energy sources, biomass is more economically viable for almost all the continents in the world. Biomass is a carbonaceous material and provides both the thermal energy and reduction for oxides, where as other renewable energy sources can meet our thermal need only. Amongst all the solid fuel like coal etc. biomass is the purest fuel consisting of very lesser amount of ash materials Presently , co-firing (coal + rice husk) has been proved to be more attractive and economically viable technique for power generation. In the present work, briquettes were prepared by mixing non-coking coal from Orissa mines and the related biomass species in different ratio (coal: husk = 95:05, 90:10, 85:15, 80:20,75:25,70:30,65:35,60:40).
The proximate analysis results of studied coal proved it of F- grade.
Index Terms: Proximate analysis, ash fusion temperature, eletricity generation, energy content, biomass like rice husk.

I. INTRODUCTION

India's energy challenges are multi–pronged .They are manifested through growing demand for modern energy carriers, a fossil fuel dominated energy system facing a severe resource crunch, the need for creating access to quality energy for the large section of deprived population, vulnerable energy security, local and global pollution regimes and the need for sustaining economic development. Renewable energy is considered as one of the most promising alternatives. Recognizing this potential, India has been implementing one of the largest renewable energy programmes in the world. Among the renewable energy technologies, bioenergy has a large diverse portfolio including efficient biomass stoves, biogas, biomass combustion and gasification and process heat and liquid fuels. India has also formulated and implemented a number of innovative policies and programmes to promote bioenergy technologies. However, according to some preliminary studies, the success rate is marginal compared to the potential available. This limited success is a clear indicator of the need for a serious reassessment of the bioenergy programme. Further, a realization of the need for adopting a sustainable energy path to address the above challenges will be the guiding force in this reassessment. In this paper an attempt is made to consider the potential of bioenergy to meet the rural energy needs: (1) biomass combustion and gasification for electricity; (2) biomethanation for cooking energy (gas) and electricity; and (3) efficient wood-burning devices for cooking. The paper focuses on analysing the effectiveness of bioenergy in creating this rural energy access and its sustainability in the long run through assessing: the demand for bioenergy and potential that could be created; technologies, status of commercialization and technology transfer and dissemination in India; economic and environmental performance and impacts; bioenergy policies, regulatory measures and barrier analysis. Most of the rice mills have high capacity and high-speed processing machines and they are operated using either an electric motor or a diesel engine.

II. LITERATURE REVIEW

India's challenges are multi–pronged .The energy y are manifested through growing demand for modern energy carriers, a fossil fuel dominated energy system facing a severe resource crunch, the need for creating access to quality energy for the large section of deprived population, vulnerable energy security, local and global pollution regimes and the need for sustaining economic development. Renewable energy is considered as one of the most promising alternatives. Recognizing this potential, India has been implementing one of the largest renewable energy programmes in the world. Among the renewable energy technologies, bioenergy has a large diverse portfolio including efficient biomass stoves, biogas, biomass combustion and gasification and process heat and liquid fuels. India has also formulated and implemented a number of innovative policies and programmes to promote bioenergy technologies. However, according to some preliminary studies, the success rate is marginal compared to the potential available. This limited success is a clear indicator of the need for a serious reassessment of the bioenergy programme. Further, a realization of the need for adopting a sustainable energy path to address the above challenges will be the guiding force in this reassessment. In this paper an attempt is made to consider the potential of bioenergy to meet the rural energy needs: (1) biomass combustion and gasification for electricity; (2) biomethanation for cooking energy (gas) and electricity; and (3) efficient wood-burning devices for cooking. The paper focuses on analysing the effectiveness of bioenergy in creating this rural energy access and its sustainability in the long run through assessing: the demand for bioenergy and potential that could be created; technologies, status of commercialization and technology transfer and dissemination in India; economic

and environmental performance and impacts; bioenergy policies, regulatory measures and barrier analysis. The whole assessment aims at presenting bioenergy as an integral part of a sustainable energy strategy for India. The results show that bioenergy technology (BET) alternatives compare favourably with the conventional ones. The cost comparisons show that the unit costs of BET alternatives are in the range of 15–187% of the conventional alternatives. The climate change benefits in terms of carbon emission reductions are to the tune of 110 T C per year provided the available potential of BETs are utilized.

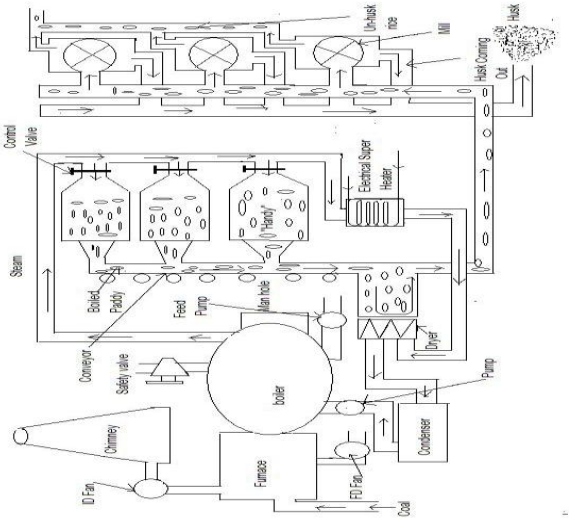

Fig.1 Diagram of conventional Rice-mill using coal

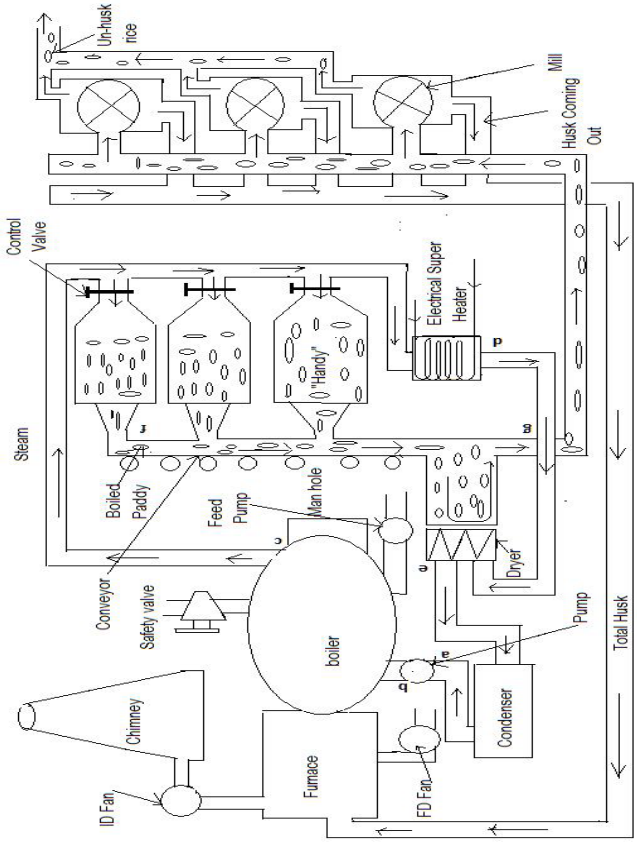

Fig. 2. Diagram of conventional Rice-mill using husk

These rice mills employ a large number of unskilled labourers for the processing of paddy besides technical man power for repair and maintenance of the machines. As the activities of the rice mills in India are not regulated under any legal provision, they are considered under unorganized sector. Hence, occupational health and safety cover for the workers in rice mills is non-existent. Rice milling is the oldest and the largest agro processing industry of the country. At present it has a turnover of more than Rs 25,500 crore per annum. It processes about 85 million tones of paddy per year and provides staple food grain and other valuable products required by over 60% of the population. Paddy grain is milled either in raw condition or after par-boiling, mostly by single hullers of which over 82,000 are registered in the country. Apart from it there are also a large number of unregistered single hulling units in the country. Apart from it double hulling units number over 2,600 units, under run disc shellers cum cone polishers numbering 5,000 units and rubber roll shellers cum friction polishers numbering over 10,000 units are also present in the country. Further over the years there has been a steady growth of improved rice mills in the country. Most of these have capacities ranging from 2. The details of the nature and type of plant and machinery, their capacity, power consumption, level of automation varies upon the market needs, nature and type of the end products and the investment capacity of the entrepreneur. Whenever paddy is required to be parboiled prior to deshelling, a parboiling unit with steam boilers has to be installed by the milling unit. The same will increase the plant and machinery cost. The details of plant and machinery for the rice milling unit are as paddy cleaner, rubber roll paddy shellers, paddy separators,blowers, husk and bran aspirators, paddy polishers, rice grader/ aspirator, bucket elevators. A majority of the Indian population does not have access to convenient energy services (LPG, electricity) (Pillai et al, 2009). Though India has made significant progress in renewable energy, the share of modern renewables in the energy mix is marginal. This paper reviews the status and potential of different renewables (except biomass) in India. The trends in the growth of renewables in India and establishes diffusion model as a basis for setting targets. The diffusion model is fitted tot the past trends for wind, small hydro and solar water heating and is used to establish future targets. The economic viability and greenhouse gas (GHG) saving potential is estimated for each option. Several renewables have high growth rates, for example wind, Photovoltaic (PV) module manufacture and solar water heaters. New technologies like Tidal, OTEC, Solar thermal power plants and geothermal power plants are at the demonstration stage and future dissemination will depend on the experience of these project. Bio-energy technologies (BETs) are presented as potential carbon abatement opportunities substituting fossil fuel or traditional (less efficient) biomass energy systems (Ravindranath et al, 2006). Cost of energy (produced or saved) of BETs is compared with fossil fuel and traditional biomass energy systems to estimate the incremental cost (IC). The IC of carbon abatement for each of the selected BETs (in $kWh-1 or $GJ-1) is estimated using the carbon emission (tCkWh-1

or tC GJ-1) reduction obtained by substituting fossil fuel and traditional biomass alternatives. The abatement costs are estimated and compared for ten combinations of BETs (with seven technology alternatives) substituting conventional technologies. The analysis indicates that out of the ten project cases six have negative ICs in the range of 37 to 688 $ tC-1 and four have positive ICs in the range of 52–162 $ tC-1 mitigation. The negative ICs indicate that the suggested alternatives are cheaper than the original technologies. Thus, results indicate that the chosen BETs are cost-effective mitigation opportunities and are currently aggressive candidates under Clean Development Mechanism. In view of high energy potentials in non-woody biomass species and an increasing interest in their utilization for power generation (Kumar and Patel, 2008), an attempt has been made in this study to assess the proximate analysis and energy content of different components of Ocimum canum and Tridax procumbens biomass species (both non-woody) and their impact on power generation and land requirement for energy plantations. Fire tube boilers are not better than the water tube boilers. The steam raised is less rapid, because of lower rate of steam raises; these are unstable for use in large power plant. The operating pressure is limited to 25 bars and moreover more floors are required for the given power. Modern high pressure water tube boiler can generate steam pressure of 125 bar and even higher. In this less floor area is required for a given power; the construction however is simpler.

III. CONCLUSION

The study and comparisons of boiler efficiency using husk and coal as a fuel is carried out and following points are concluded; The study and comparisons of boiler efficiency using husk and coal as a fuel is carried out and following points are concluded; In rice- mill husk as fuel is more reliable than coal because of coal demands the material handling and transportation which is more difficult than using husk.In rice mill, husk as fuel is used free of cost but coal requires more maintenance in comparison to husk. Rice husk produces much less pollution a coal, as coal produces CO2, CO, NO2, & SO2 gases. In rice mill husk fuel used in fluidized bed combustion directly, but coal needs to be pulverized first, before going into the fluidized bed.Rice husk ash used in steel, cement, concrete, steel industry in the production of high quality flat steel. Since Ordinary Port Cement is typically the most expensive constituent of concrete, the replacement of a proportion of it with RHA offers improved concrete affordability where as coal ash is not of any use and is treated as waste. In rice mill less skilled labours are required, but when talking about coal it requires high skilled labour because of material handling and storage problems. Production of steam becomes costly than the labour and whole cost of plant increased in using coal as fuel. The capacity of conventional rice mill is generally 5 tones /h. where as the capacity of auto rice mill is 6 tones /h. It is more than old conventional rice mill and fewer workers are required. The result and discussion, it is depicts that efficiency comes out to be approximately same when using husk and coal, but their comparison much varies when economic analysis is discussed, which implies that using husk is more profitable than using coal as fuel.

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