

GASIFICATION TECHNOLOGY USING PALM OIL MILL BIOMASS FOR SYNGAS PRODUCTION AND RENEWABLE ENERGY

by: ZULKIFLI AB RAHMAN; ROPANDI MAMAT
and RAVI MENON

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The global concern on environmental issues and the fast depletion of the fossil fuel resulting from the rapid industrialization of new nations have imposed a great strain on the developed countries to find alternate sources of fuels that are environmental friendly as well as non-depleting. The use of renewable energy (RE) for heating and power generation was considered to be the only choice for energy sustainability as they will always be available in one form or another. One of them is the use of biomass as a substitute for fossil fuel. A number of biomass-based energy conversion systems for combined heating and power generation are already in existence both in the developed and developing nations. But most of them use biomass very much the same way as the fossil fuel for firing in a boiler to produce heat or steam in combination with steam turbo-generators to produce electricity like the way it is done in conventional thermal power stations. Some companies have also used the technique of biomass gasification for power generation using internal combustion engines, a technology that is nearly a century old but did not take off in a large way due to constraints on the engine capacity limiting the load to below 1 MW. Now with the advent of RE development, gasification can play a vital role as gasification combined with an internal combustion engine offers by far the most efficient conversion method.

The palm oil mills generate abundant quantity of biomass waste especially empty fruit bunches

(EFB) and surplus fibre/shell, which are now facing a disposal problem, if they are not utilized for mulching or use them for generating electricity in the oil palm industry either off-grid system or grid-connected through gasification system. The syngas produced from the gasification of palm oil mill biomass can either use the gas as a fuel in the existing boiler or for combustion in gas engines to generate both power and steam. This could increase the boiler combustion efficiency with less environmental impact. The gas engine can generate additional power.

PRINCIPLE OF THE PROCESS

Biomass gasification is a thermal conversion technology, where the solid fuel is converted into combustible gas with a limited supply of oxygen. The producer gas is a mixture of combustible (CO , H_2 and CH_4) and non-combustible gases (CO_2 and N_2).

Gasification system basically consists of a gasifier unit (*Figure 1*), purification system and energy converters either for feeding direct to the boiler or gas engines. The gasification of solid fuel is accomplished in an air sealed, closed chamber, under slight suction or pressure relative to ambient temperature. There are four different processes that can be distinguished in the gasification unit such as drying, pyrolysis, oxidation and reduction. The complete process is illustrated in the flow diagram as shown in *Figure 2*.

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Malaysian Palm Oil Board, Ministry of Plantation Industries and Commodities, Malaysia
P. O. Box 10620, 50720 Kuala Lumpur, Malaysia. Tel: 03-89259155, 89259775, Website: <http://mpob.gov.my> Telefax: 03-89259446





Figure 1. Gasifier unit.

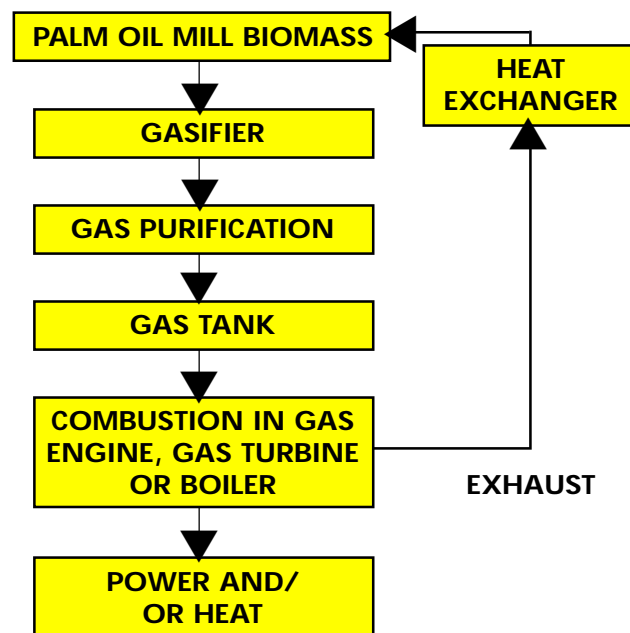


Figure 2. Schematic diagram of gasification technology system using palm oil mill biomass.

HIGHLIGHTS

- Alternative technology for RE using palm oil mill biomass.
- Emission levels are much lower than the conventional incineration or boiler chimney.
- Overcome the fuel price crisis and environmental concern on global warming.
- Help many developing countries to improve their balance of payments.
- Decentralized energy conversion system,

which operates economically even in a small scale plant.

- Have higher conversion efficiency between 22%-37% as compared to biomass combustion technology that gives only 15%-25 %.
- Requires less flue gas treatment with no black smoke emission as combustion takes place with only combustible gases.
- Relatively less operational problems as compared to the conventional boiler.
- Gasifier ash when mixed with the solids from



Gas burner



Modified gasoline/gas engine

Figure 3.

anaerobic pond can yield a good fertilizer for plantations.

COMMERCIALIZATION OPPORTUNITIES

- An alternative system for RE – biomass-based power generation and cogeneration.
- The system can be set in mini palm oil mills for steam and power generation.
- Potential to replace the existing gen-set for power supply during maintenance or during milling operation.
- This alternative technology can improve the existing boiler operation as well as reduce the black smoke emission and load concentration.

- Can be applied to other biomass including municipal solid wastes.

INVESTMENT

Main components: gasifiers, gas tank, gen-set – RM 1.5 million/MW (excluding electrical & building structure)
Payback period: two years

MARKET POTENTIAL

- Palm oil biomass power generation developers
- Palm oil mills

For more information kindly contact:

Director-General
MPOB
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50720 Kuala Lumpur, Malaysia.
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Website: <http://mpob.gov.my>
Telefax: 03-89259446