WOOD WASTE TO ENERGY- FROM WASTE TO WEALTH WITH SPECIAL REFERENCE TO MALAYSIA

by

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FORESTRY RESIDUES

1.	Logging Residues	5.10 mil m3
2.	Primary Manufacturing Residues	2.2 mil m3
3.	Plywood Residues	0.91 mil m3
4.	Secondary Residues	0.90 mil m3
	Total	9.83 mil m3

FORESTRY RESIDUES

- Forestry Residues

Forestry Residues

FORESTRY RESIDUES

- Secondary Residues

Mill Residues

PROPERTIES

Physical

- Moisture Content	7.9%
- Absolute density	669.5 kg/m3
- Bulk density	294.0 kg/m3

Chemical

- Volatile matter	80.2%
- Ash content	1.3%
- Fixed carbon	18.6%

COMPARITIVE COST

Source	CV (MJ)	Cost (RM/MJ)
Diesel	10600	0.45
Charcoal	7300	0.22
Wood	3000	0.09
Coal	7000	0.22

PROBLEM STATEMENTS

- Waste handling and disposal problem
- Environmental problem – carbon sequestration
- Volume increased multi-fold

National Energy Policy Objectives

- Supply Objectives
  To provide adequate and secure energy supply

- Utilisation Objectives
  To promote and encourage efficient utilsation

- Environmental Objectives
  To ensure the minimum impacts on environment

New Energy Policy – 5th Fuel Policy

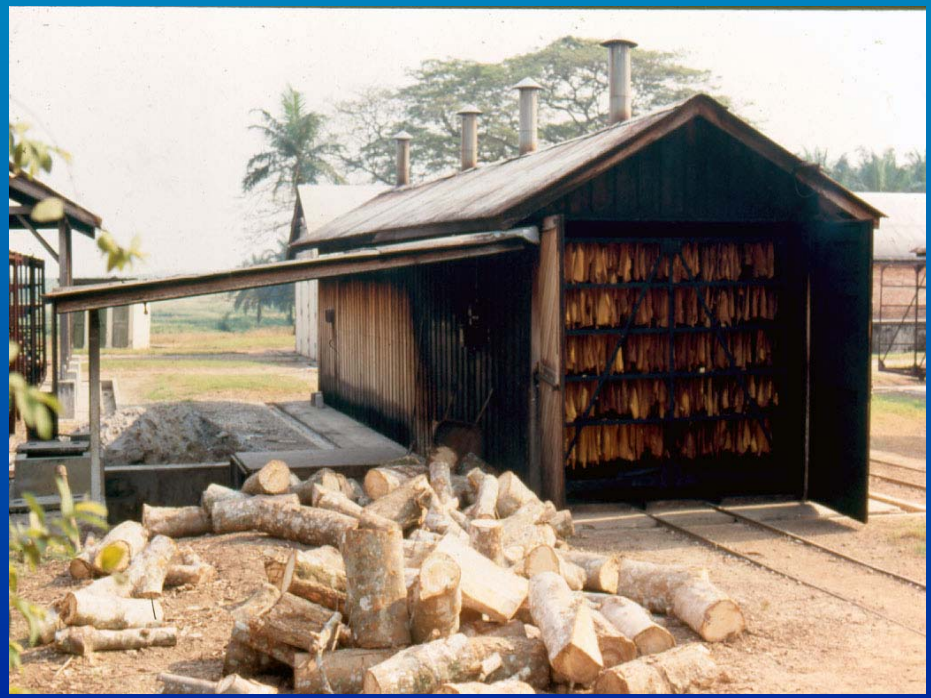
To supplement the conventional supply of energy, new sources such as renewable energy will be encouraged. In this regard, the fuel diversification policy which comprises of oil, gas, hydro and coal will be extende3d to include renewable energy as the fifth fuel, particularly biomass, biogas, municipal waste, solar and mini hydro. Of these, biomass resources such as oil palm and wood wastes as well as rice husk will be used on a wider basis mainly for electricity generation. Other potential source of energy will include palm diesel and hydrogen fuel

BIOMASS ENERGY TECHNOLOGY

- Solid Fuel Combustor System

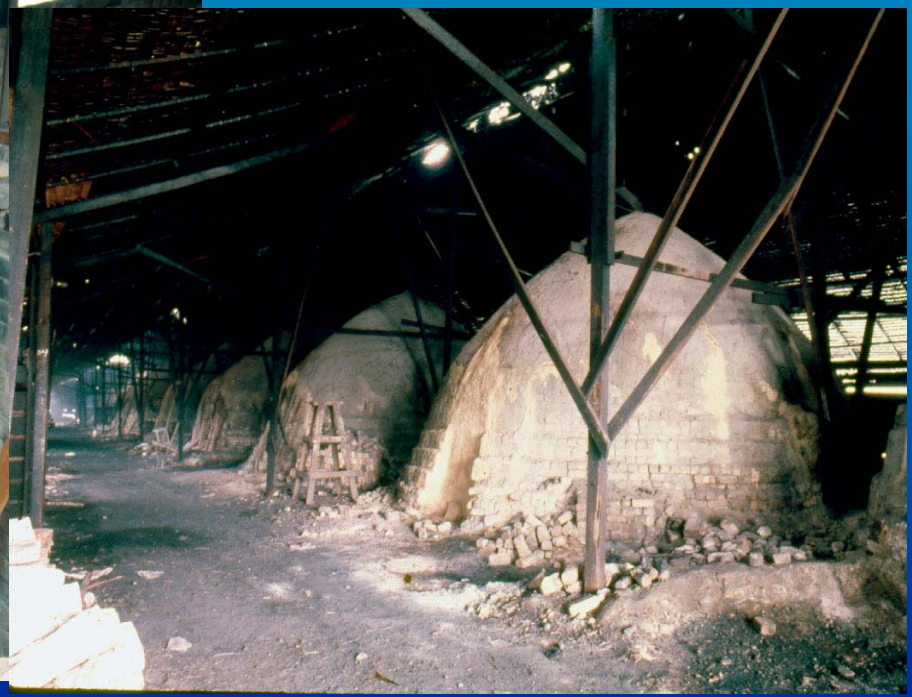
PRESENT USES

FUEL WOOD



PRESENT USES

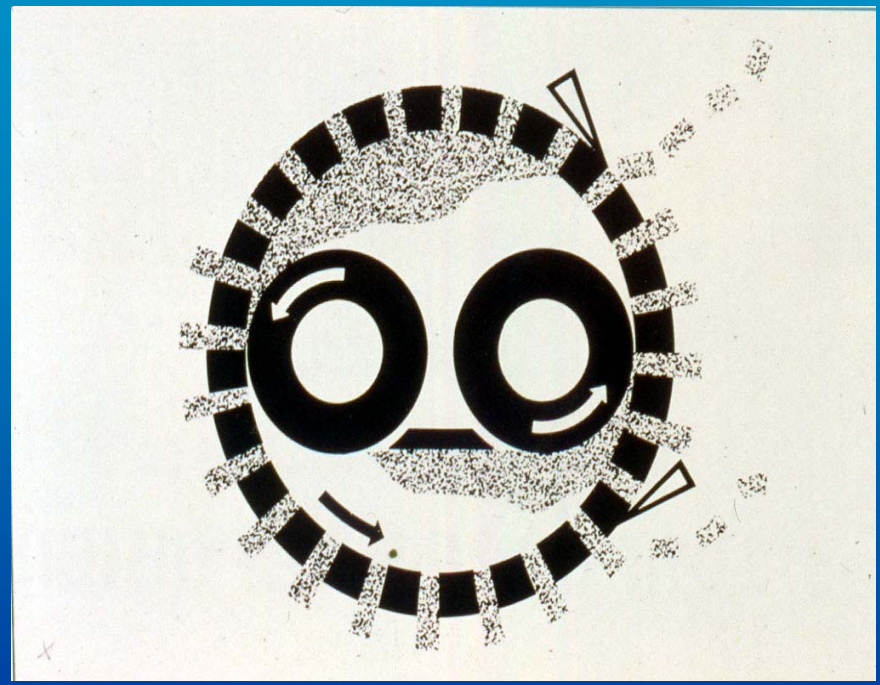
BRICK AND CHARCOAL INDUSTRY



ROTARY PYROLYSIS COMBUSTOR

1. Rice Husk Power Plant

WOOD BRIQUETTING



WOOD PYROLYSIS

PRODUCTS	”	YIELD (Kg)
CHARCOAL		360
ACIDS		50
TARS		80
SPIRITS		15
GASES		200

GASIFICATION

Wood and Charcoal Gasification System

WOOD GASIFICATION

	GASIFER	DIESEL
ACC	1678 ”	1808
FUEL COST		
-DIESEL	7795	25133
-WOOD	4940	-
LABOUR	3600	1800
MAINTENANCE	1050	525
LUBRICANTS	1260	840
TOTAL COST/Y	20324	30106
ENERGY COST	0.242	0.358

CURRENT SCENARIO

- Currently power generation system in P Malaysia consists of mainly non-RE resources i.e.
  - natural gas, coal, fuel oil and diesel.

- This scene is expected to change due to:
  - effort to encourage and promote utilisation of energy from alternative sources from RE resources

CURRENT SCENARIO

- several initiatives and incentives were launched in the 2002 Budget; tax exemption, tax allowance and exemption of import duty and sales tax on imported machinery and equipment
- Create a new window of opportunity for small-scale RE power producers (SREP) in electricity generation

CURRENT SCENARIO

- Number of RE power plants are expected to increase in the near future as promotion to accelerate development and use of RE in electricity generation is gaining pace

- Contribution from RE sources is targeted to reach 5% of total energy generated by the year 2005 under 8th and 9th Malaysia Plan
  – about 600MW of power capacity.

CURRENT SCENARIO

- Assuming this capacity (600 MW) from RE is fully utilized, an equal amount of generation capacity from existing resources would be displaced or ‘avoided’ from conventional generation.

CURRENT SCENARIO

– Analysis is critical in decision of how RE resources are developed and utilized for electricity generation in P Malaysia leading to a policy on

- pricing of electricity generation from RE
- Investment subsidies for RE generators

ENERGY POTENTIAL

Type of residues	% of wood residues	Residues utilized (mil tonnes)	Generation capacity (MW)
Rubber Wood	50% of logging residues & 10% of processing residues	2.02	1,380
Forest Wood	18% of residues from forest wood industry	0.33	225

COGEN PLANT-AN EXAMPLE

Turbine Configuration	2 x 650 kW
Boiler Capacity	6.5 MW (steam)
Boiler Efficiency	75 %
Fuel Input Rate (residues)	3.1 cubic meter per hour
Plant Availability	7200 hrs per year
Estimated Project Cost	RM 7.5 million

ECONOMIC /FINANCIAL

General Parameters and Assumptions

Installed Capacity	**: 6 MW**
Firm Capacity	**: 5.2 MW**
Commercial Operation Date	**: 2004**
Fuel	**: 77% EFB & 23% shells**
Total efficiency	**: 20.1%**
Capacity factor	**: 90.4%**
Investment cost	**: RM 31.4 million**
Fuel cost	**: RM15/tonne** *(current terms for 20 years)*
Electricity sales tariff	**: 16.7 sen/kWh** *(current terms for 20 years)*

FINANCIAL RESULTS

Parameter	Unit	Project Cost	
		RM 31 million	RM 27 million
FIRR	%	6.7	9.1
Payback	years	8	7

ECONOMIC RESULTS

Parameter	Unit	Project Cost	
		RM 31million	RM 27 million
EIRR	%	14.7	17.6
Econ. surplus	RM million	10.6	15
FOREX surplus	RM million	23.2	25.5

ENVIRONMENT RESULTS

Emissions	Unit	Value
CO_2	tonnes/year	- 41,764
SO_2	tonnes/year	- 42
NO_x	tonnes/year	562

CONCLUSION

- Implementation of RE power plant reduce 13,890 tonnes of coal consumption a year or fuel savings of RM 2.4 million for Malaysia
- Identified constraints:-
  - Logistic problem
  - Insecure and uncertain supply
  - Competition from other uses
  - Awareness
  - Lack of database, regular information on biomass energy

FUTURE ACTIONS

- Estimate the net availability of residues for electricity generation
- Study on the technologies for conversion of wood residues to energy
- Include additional case studies for analysis on economic and financial viability of RE power plants

FUTURE ACTIONS

- R&D to produce economically feasible extraction technology
- Encourage the key players to adopt Integrated System
- Create a price-effective market for wood waste sustainable market demand

THANK YOU