



Phambili Energy

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Conference on Climate Change Adaptation for South African
Industries

PHAMBILI ENERGY (PTY) LTD

INTRODUCTION

Phambili Energy is a company that has developed a biomass conversion technology known as the “BCT” that produces biochar, green energy and chemicals as well as sustainable fuels from a broad spectrum of biomass and waste resources in a carbon negative process.

The Technology & Raw material Inputs.

The Plant

Pyrolysis plant (100 plants planned in South Africa)

Raw Material Input

30 tonnes per day per plant

Raw Material Types
Biomass, plastics, rubber, waste coal.

Current Raw Material Focus
Biomass

Yields (biomass)

- 30% Biochar;
- 45% Crude condensate,
- 25% Syngas

Crude condensate composition

- 80% wood vinegar;
- 15% bio-oil;
- 5% bio bitumen.

Pyrolysis process output

Biochar (30%)

Different offerings

Raw bio char
Activated bio char
Inoculated bio char
Blended and granulated into an NPK
bio char fertiliser

Typical market products

Special cooking pellet
Bio char- based fertilisers with soil
amendments, rehabilitation and microbes
Water purification
Animal feed additive
Mineral extraction
Carbon composites

Crude Condensates (45%)

Composition

- 80% wood vinegar;
- 15% bio-oil;
- 5% bio bitumen.

Typical Market products

Fertiliser, bio stimulant & herbicides
Animal feed
Bio oil for diesel blending
Refined into various organic chemicals
Active pharmaceutical ingredients
Bio foam
Polymer for water purification

Syngas (25%)

Composed of different gasses like:

Butane,
Methane
Nitrogen
Carbon dioxide

Typical market product

Electricity generation
Sustainable aviation fuels
Boilers



Waste Management

Use of waste biomass and other materials (plastic, rubber, coal) to produce valuable products



Rural development

Location of plants in semi-rural areas close to biomass supplies
Creation of employment and green jobs
Reviving rural industrialization
Creation of smme's in the raw material supply chain



Localisation & the local Content

Local production of chemicals and chemicals active ingredients
Local production of intermediary chemicals
Local production of chemical-based products (e.g., Herbicides, nematicides . etc.)



Environmental/ Sustainability

Use of invasive plant species to produce valuable products
Creation of organic chemicals to replace synthetic chemicals.
Carbon sequestration , preservation of arable agricultural land and water

Socio- economic Benefits



Other pyrolysis plants

There are a few pyrolysis plants in South Africa, mostly imported and uses tyres as feedstock. The beneficiation of the output products of these has not been fully optimized



Gasification

A few organisations are currently investigating gasification project for developing electricity, e.g. Ngodwana

The primary output of these is electricity



Anaerobic digester

A few organisations have gone into this form of waste to energy process.

Mostly at low scales



Incinerator and fermentation

There is limited use of these technologies in South Africa currently

Competing Technologies



PILOT PLANT (V3)

Pilot plant commissioned at the end of 2019 in KwaZulu Natal Province
Used for technology optimisation as well as design and material testing and data and partial production



1st PRODUCTION PLANT (V4)

1st Production plant (V4) commissioned in 2024 in KwaZulu Natal Province

Now running at 24 tonnes/day

Used for production and partial technology optimization as well as design



UNDER DEVELOPMENT: OPTIMISED FOR SCALING UP PLANT (V5)

Version 5 plant currently under development in order to achieve optimisation for mass production, reduced building requirements, effective chemical fractionating and enable power generation.



NEW PLANT SITES LOCATION IDENTIFICATION

Phambili philosophy is to locate the plants at material source

Number of plants at location depends on material availability (each plant at 30 tons/day processing)

New sites for business scaling-up are currently being searched and identified.

CURRENT Operational status

WATER NEXUS

- ▶ The sustainable eradication of invasive alien species freeing up fresh ground water and arable land for agricultural production;
- ▶ The extraction of de-ionized water from the raw material during drying process and using it to replace fresh water for raw material pre-treatment
- ▶ Extraction and processing of saline water from the pre-treated feedstock during the drying process.
- ▶ The use and application of both our bio char and biochar-based fertilisers for water retention and stimulating plant defence mechanism system to reduce loss of water during transpiration and effectively metabolises

ENERGY NEXUS

- ▶ The provision Jenga Bio Char-based pellet as a replacement to anthracite coking coal for mining decarbonization programs;
- ▶ The provision of a bio char based renewable pellet and or briquettes for co-firing or fuel switching in power generation replacing coal.
- ▶ Blending and use of our bio-oil for bio diesel to replace fossil-based diesel and the conversion of the syngas for generate electricity

- ▶ Product formulation is an ongoing activity within Phambili. Currently there are over twenty products going through these process. Five (5) of many products have identified, investigated and researched to launch the market, certify and position our brand in the market:

CURRENT OPERATIONS

PRODUCTS BEING PRODUCED

- ❑ **Jenga Bio Pellet** (For replacement of Metallurgical coking coal)
- ❑ **Jenga bio char** (For soil amendment, carbon sequestration and soil rehabilitation)
- ❑ **Jenga bio fertiliser** (Carbon based Organic NPC range)
- ❑ **Jenga Bio Stimulant** (for plant growth and soil health)
- ❑ **Jenga bio-oil** (for 10-90% diesel blending)
- ❑ **Jenga Pyroligneous acid** (For agricultural use and polymer extraction used in water purification.

Products under development

- ▶ Activated biochar for use in water purification systems
- ▶ Graphene production
- ▶ Refined organic chemical
- ▶ Development of Active Pharmaceutical Ingredients (APIs) from the organic chemicals
- ▶ Essential oils from the biomass drying process
- ▶ Deionised and saline water from the biomass drying process
- ▶ Electricity generation from the syngas
- ▶ Herbicide
- ▶ Animal feed

JENGA ORGANIC[®]
FERTILIZER
CARBON GROW[™]

5-1-2+27C

50KG

GUARANTEED ANALYSIS

Total Nitrogen (N)	4.8%
Organic Available Nitrogen	4.8%
Available Phosphate (P ₂ O ₅)	1.25%
Soluble Potash (K ₂ O)	2.31%
Calcium (Ca)	1.88%
Magnesium (Mg)	1.045%
Sulfur (S)	0.14%
Boron (B)	0.0004%
Cobalt (Co)	0.0001%
Copper (Cu)	0.0032%
Iron (Fe)	0.952%
Manganese (Mn)	0.0543%
Molybdenum (Mo)	0.0002%
Sodium (Na)	0.27%
Zinc (Zn)	0.04%

Directions for use: Apply 150gm² evenly, water well, repeat every six weeks. Can be used in conjunction with Herbicidal Solute.

Registration: ACTWET1947 REG No: xxx, EU Fertilizer Regulation (EC) No: 2019/1009 xxx

Biochar-based
organic fertiliser
Example

Product Code	Name	Total Yield kg/Hr	24% JPA	16% JBO	% Yield	Actual Yield kg/Hr
	Guaicol	288	X		4.19	12
	Maltol	192		X	0.42	0.8
	Vanillic Acid	192		X	8.5	16.32
	Furfural	288	X		10.1	29
	Eugenol	192		X	1.56	3
	Propanoic acid	288	X		1.98	5.7
	Acetic acid	288	X		23.56	67
	Pyrocatechol	192		X	2.09	4

Sample of chemicals extracted so far

Sample Date	Sample ID	Results					
		CV (BOMB)	CV (Calculated)	Ultimate Analyses			
		[MJ/kg]	[MJ/kg]	C%	H%	N%	R%
26April 21	Engen	47.302	52.094	81.59	13.65	1.62	3.14
	Sample #10	46.918	47.75	78.50	13.09	0.54	7.89
	Sample #20	46.742	49.67	79.87	13.36	0.99	5.79
	Sample #30	46.673	46.29	77.60	12.78	0.21	9.40
	Sample #50	46.654	44.67	76.10	12.61	1.21	10.18

Bio diesel Blending Test Results





Donnybrook V4-Plant Installation

