COGENERATION PLANT FAQ

What is biomass cogeneration?

Cogeneration is the simultaneous production of electricity and heat using a single primary fuel.

Biomass cogeneration uses waste wood and horticultural materials as fuel. These are plants that derived their growth and energy from the sun, converting carbon dioxide into oxygen. This biomass green energy reduces use of fossil fuels. The electricity and steam generated are used to leverage in recycling and energy related business activities. Cogeneration results in higher thermal efficiencies as it uses heat that would otherwise be wasted. At the same time, carbon dioxide emissions are also reduced.

What is the difference in using fossil fuel and biomass as a fuel?

Fossil fuels are hydrocarbons and are not renewable. Fossil fuels when combusted is converted into energy and gasses such as carbon dioxide. Carbon dioxide is a green house gas that traps heat and a contributor to global warming and climate change.

Biomass is a renewable fuel and is carbon neutral. In their life cycle, plants covert carbon dioxide into oxygen. Biomass can be used as an alternative energy source to fossil fuels in generating energy.

How long has ecoWise biomass cogeneration plant been operating?

The plant has been operating since April 2005. Apart from the energy generated and the tipping fee revenues, the plant has also created new employment and upgrading opportunities for its staff.

What other advantages does the biomass plant bring?

In the past, biomass waste would have been sent to the incineration plants and burnt resulting in lost energy. Now such biomass can now be turned into useful energy. The cost of disposal at waste to energy plants is also lower, benefiting waste service providers.

What are the key features of the plant?

The plant has a net steam output of 15 tonnes per hour and superheated steam enters the turbine at 260 degrees Centigrade at a pressure of 22 bar. Its biomass fuel consumption is up to 5 tonnes per hour. A moving floor silo with an unloading system conveyors the crushed biomass to the boiler. The boiler is designed with a water cooled stepgrate. Particulates are captured in a mullticyclone dust collector and removed through an automatic fly ash evacuation system. Control is provided using a programmable logic control system such that the plant operates with minimum manpower and supervision. Operational performance is captured and stored electronically. A steam turbine with turbo generator generates the electricity.

What type of biomass fuels are used?

The plant uses a mixture of horticulture and wood wastes. These are sent to the plant where they are sorted, shredded and fed into the fuel feeding system. The biomass needs to be prepared in the correct sizes for conveyance and proper combustion.

How much energy can be expected from using such biomass?

The biomass varies in its energy values. Typically, base on a maximum moisture content, on wet base of 45%, the caloric value can range from 1900 kcal/kg to 3000 kcal/kg.

What factors affect the plant design and performance?

There are many varying factors, some of these include:

- thermal energy (MWt) required
- electric power (MWe) required
- fuel mix available ie calorific values of biomass fuels
- pollutant emission standards
- type of turbine selected
- stack temperature

Other factors include the electrical and the mechanical efficiency of the system and the electrical generator efficiency.

How is the plant controlled?

The plant has a programmable logic control system that uses sensors throughout the plant. These will monitor parameters such as fuel intake, combustion process, steam characteristics, flue gases etc and adjustments are made automatically to obtain the required output energy. The plant can run for long periods on automatic mode but the operators are able to change such settings to suit fuel and energy consumption conditions.

How is the ash and flue gases handled or monitored?

Fly ash is removed using a mullticyclone dust collector with an automatic fly ash evacuation system. Flue gases are continuous monitored as they exit through the chimney. Such electronic records are submitted regularly to the environmental authority.

How does having a biomass cogeneration plant impact ecoWise?

The biomass plant provides green power to run industrial operations thereby reducing costs. Apart from making our own electricity, the excess steam is used to provide heating and drying services for ISO containers and spent grains. This generates more revenues streams from different sources of materials.

The use of biomass as fuel and to provide heating services reduces use of non renewable fossil fuel while generating revenue. With biomass as a carbon neutral fuel, the company's carbon footprint is also reduced.

The provision of such services and the setting of such facilities has also increased our technical strengths in projects assessment, design and engineering, operations and maintenance.

Can such a biomass plant be replicated elsewhere?

The biomass plant can be replicated and upscaled to larger generating capacities even with different fuels and in different operating environments. Having such an operating biomass plant with over four years operating experience means that ecoWise can also add value by providing 'on the job' training to operators in its investments. Such integration between energy production and uses is gained through experiences of owing and operating industrial plants.

COMPOST FAQ

What is Compost?

Compost is a humus-like product that can be used as organic fertilizer or soil conditioner to improve nutrients level, soil aeration, water and nutrient retention and prevent soil erosion.

How is compost produced?

Compost is produced in the biological decomposition of organic matter under controlled aerobic conditions. A wide range of substrate materials can be used to produce compost.

What are the important nutrients in compost?

Compost should be made with the correct ingredients for maximum growth of selected crops. The important nutrients often mentioned are N-P-K or Nitrogen, Phosphorus, Potassium Different plants require different NPK ratios.

How is NPK measured?

NPK is expressed as total percentage of weight as packaged. Organic compost and nutrients usually have lower NPK than chemical nutrients. NPK can vary. Eg from 1-1-2 to as high as 10-15-15.

What is the use of NPK?

N - Nitrogen is a major element for the growth of plants. With a good supply of nitrogen, plants grow sturdily and mature rapidly, with rich, dark green foliage. ecoWise compost includes discarded soyabean from drinks manufacturers. The soyabean biosolids are mixed and enter the processing chambers. This improves the nitrogen levels.

P - Phosphorus is important for healthy growth, fruit and flower development, root development and better disease resistance.

K - Potassium, commonly known as potash. Potassium oxide is essential for plants to resist diseases, providing resistance to cold and dry weather and also minimizes excessive water loss.

Is a higher NPK better?

No, higher NPK especially from chemical sources may result in 'burning' of leaves and roots if not applied correctly. By its nature, organic compost has lower NPK and the nutrients are released over a longer period of time providing a consistent supply of nutrients.

Isn't normal soil good enough for plant growth?

There are different qualities of soils. Over fertilization, water logging and insufficient soil aeration, lead to poor soil quality. The addition of compost has chemical, biological and physical advantages. Plants require healthy soil to grow at their optimum rate.

What are chemical advantages using compost:

Good compost adds macro & micro nutrients to the soil in a slow release form, decreases the quantity of fertilizers required, helps increase the Cation Exchange Capacity of soil which increases the availability of nutrients, improves soil structure via the slow release of humic & fulvic acids which initiate the dissociation of tightly bound clay particles and increases soil moisture retention.

What are the biological advantages:

Compost decreases the quantity of pesticides required, promotes native bacteria growth, reducing the number of pathogens due to competition and promotes the growth of beneficial organisms such as earth worms & spiders which improve soil structure and feed on pests.

What are the physical advantages:

Compost can minimise soil erosion by protecting soil from being washed/blown away and helps aerate soil by physically separating soil aggregates.

What should a good compost be made of?

Good quality compost should have the following characteristics:

- no foul smell. A foul smell indicates that the compost is anaerobic and may be harmful to plants.
- should be brown or dark brown (almost black). If the compost is green or charcoal black in colour, it is either immature or has been carbonised. Immature compost can lock up nutrients and even harm plants by producing Volatile Fatty Acids and toxins while decomposing in the soil. Carbonised compost has no real beneficial effect on soil or plants
- should be mature enough so that it does not self-heat more than 40℃.
- a pH between 5.5 - 8. A pH between 6 - 7.5 is ideal.
- contains no impurities or heavy metals that will be toxic to plants.
- has good moisture retention qualities.
- does not leach its entire nutrient content after a short period of time.
- not be made up predominantly of mineral nutrients which are easily washed away

What are the advantages of ecoWise Compost

ecoWise produces a high quality compost that is newly matured. The compost contains nutrients in two forms (organic and mineral form). The mineral portion is immediately available for plants to take up. The organic portion is bound in compost particles and slowly breaks down to become available to plants over time. ecoWise compost acts as both an instant and slow release nutrient source.

What are the typical makeup of ecoWise compost

Typical average results are:

Carbon to Nitrogen Ratio	16 - 24
pH value	5.5 – 8
Available Nitrogen (N)	1.5 %
Available Phosphorus (P_2O_5)	1.5 %
Total Potassium (K_2O)	0.9 %
Moisture content	less than 25% (wet weight)
Conductivity	1.2 ms/cm
Organic matter	Minimum 25% by dry weight

How is ecoWise compost produced?

The compost is produced in a closed thermophilic system that eliminates the risk of contamination from pests. Only organic ingredients from horticulture wastes are used. Temperature control of the composting vessels gives total control of the composting environment ensuring that the product is pasteurized and free of any pathogens and weed seeds. The end result is a product which gives excellent results.

How is the quality of ecoWise compost maintained?

In addition to its in-house procedures and tests, ecoWise compost has been awarded the use of the GreenLabel mark as an environmentally friendly product by the Singapore Environmental Council. ecoWise compost is often used by gardeners, landscapers, nurseries and organic farmers.