Technical Environmental Solutions Slovakia s.r.o.

CEDAR Ridge

Biomass Generator

Information Pack
BG25 / BG50

Carbon Neutral
25kWe - 80 kWth / 50kWe - 95kWth

Technical Environmental Solutions Slovakia s.r.o. (TESS)
ul. Pasteurova 1, 040 01 Košice, SLOVAKIA
Tel: 055 7287406/5 - Fax: 055 677 1184
E-mail: info@tesslovakia.sk
www.tesslovakia.sk

Represented in Slovakia by:

Cedar Ridge CE s.r.o.
ul. Pasteurova 1, 040 01 Košice, SLOVAKIA
Tel: 055 7287406/5 - Fax: 055 677 1184
Email: info@cedarridgece.eu
IČO: 36575585 - DIČ: SK2021775976
Volksbank Slovakia: 4350253305/3100

Owning a TESS Biomass Generator

The introduction of the BG25 / BG50 combined heat and power generators to the market place represents a major affordable breakthrough in carbon neutral power generation.

Off the shelf, automotive components are used in the engine to give high reliability and ease of servicing, the design is simple to understand and the unit is simple to operate, i.e.

- **Totally automatic for 24/7 operation.**
- **Easy to use control system, remotely accessible,**
- **Auto-feed fuel system with weekly refuelling.**
- **Electrical output to export for sale to the grid or save on power costs and use internally: BG25 - 25kWe / BG50 - 50kWe**
- **Heat available to replace fossil fuel heating:**
  BG25 - 80kWth / BG50 - 95kWth
- **Income supplemented by green incentive feed in tariffs for heat and power**
- **Finance programmes available.**
- **Carbon neutral saving BG25 - 212t CO_2/annum / BG50 - 324t CO_2/annum.**
- **Easy installation and servicing.**
- **Simple on site conversion of biomass to energy.**
- **Typical users - residential buildings, hotels, farm, industrial units, waste re-processors, wood working industry.**
- **Power production can be planned.**
- **Small scale distributed power low impact on environmental cost of biomass movements and where own grown big advantages to the environment.**

Introduction

The TESS BG25 / BG50 are biomass powered Combined Heat and Power (CHP) Generators giving 25 / 50 kWe of carbon neutral electrical power; and 80 / 95 kWth of carbon neutral heat. Its revolutionary design concept utilises a novel adaptation of automotive components in the generation system combined with over 30 years of combustion technology experience to convert the energy released by the combustion of the biomass fuel into thermal and electrical power.

It releases the solar energy 'entrapped' within the fuel as well as CO2 which is released in any case when the plant degrades naturally which when growing the plant had absorbed via the photosynthesis process.

This environmentally conscious CHP generator is easy to operate with a fully automated control system, which can be monitored and controlled remotely. It's designed to be used at maximum continuous power without manpower input except for refuelling. Particular attention has been paid to ensure this occurs reliably giving the owner a good return on his investment.

How it works

Biomass is burnt in a controlled manner in a stepped moving grate combustor and the combustion gases are passed into an air-to-air heat exchanger (HEX). A series of baffles within the HEX's 'cassettes' directs the gas flow across stainless steel pipes the inside of which is compressed air from the compressor stage of the turbocharger.

The combustion gases still have some heat once they've passed through the HEX and this residual energy is extracted as hot water by passing the gases through a boiler. The gases are drawn through the system by an induction fan to atmosphere.

On exiting the heat exchanger, the now hot clean compressed air is directed into the turbine side of the turbocharger where it partially expands to drive the compressor impellor, which is drawing in fresh ambient air via a filter. It is then directed to two power turbines which drive induction generators via reduction gearboxes. The output of the generators is converted by an inverter to match the local grid standards.

To recover its residual energy the air from the power turbines is directed to the combustor to complete the process.

Specifications

	BG25*	BG50*
Power Outputs	25kWe to local specification 80kWth as hot water 60°C in 80°C out at 72l/min	50kWe to local specification 95kWth as hot water 60°C in 80°C out at 82l/min
Operation	Fully automatic computer controlled for 24/7 operation. Remote monitoring as standard.	Fully automatic computer controlled for 24/7 operation. Remote monitoring as standard.
Fuel	Multiple choice e.g. wood chips or pellets	Multiple choice e.g. wood chips or pellets
Fuel Size	To EU G50 standard	To EU G50 standard
Fuel Bunker	25m^3 with auto-feed	25 or 50m^3 with auto-feed
Combustor	Moving stepped grate. Refractory firebrick construction.	Moving stepped grate. Refractory firebrick construction.
Heat Exchanger	Heavy-duty high temperature stainless steel	Heavy-duty high temperature stainless steel
Engine	TESS twin compound series radial turbine system	TESS twin compound series radial turbine system
Generators	Twin 18kVA induction generators	Twin 36kVA induction generators.
Power Inverter	Software controlled to comply with local standards	Software controlled to comply with local standards
Control Panel	Touch screen with alarm PLC based data logging. Connectable to web for remote monitoring and control.	Touch screen with alarm PLC based data logging. Connectable to web for remote monitoring and control.
Size	2,25 x 3,75 x 3,65m high excluding bunker	2,25 x 4,50 x 3,65m high excluding bunker

** The TESS Biomass Generator design is subject to change without notice*

Installation requirements

The preferred installation is inside a well-ventilated enclosed building or its own boiler house. Providing that direct weather is kept off the system it can be outside e.g. under a Dutch barn provided extreme temperatures aren't present.

Base: A flat level concrete base is required capable of supporting a 16 tonne load over 3,75m x 2,25m x 200mm wide perimeter for the BG25 and a 24 tonne load over 4,50m x 2,25m x 200mm wide perimeter for the BG50.

Electrical connection: The Biomass Generator's maximum electrical power output is 36kVA 3-phase for the BG25, and 72kVA 3-phase for the BG50. The voltage and frequency is optional to match the customer's local grid standards e.g. 400V at 50Hz. The connection itself should be through an approved import / export meter via a fused isolator with wiring that meets local standards and is installed by a suitably qualified person.

It is possible for the system to operate in a stand-alone situation. A small 5kWe generator is required for start up and because all the power produced has to be

absorbed an electric power bank and a thermal hot water dissipater must be installed.

Water System: As with the electrical connection, plumbing is outside TESS source of supply and must be designed and installed by suitably qualified persons. The system should be designed to accept a heat absorption flow rate of 60°C in / 80°C out at a flow rate of 72l/min for the BG25 and 82l/min for the BG50 with a maximum pressure of 3 bar. If the heat isn't required it must be absorbed and dissipated to atmosphere with a 100kWth minimum dissipater for the BG25 and 120kWth for the BG50 to ensure peak loads are handled.

Bunker position: The bunker can be positioned to meet site needs with the following provisos:

a) It can be inline with or at right angles to the combustor feed auger.

b) The maximum auger length from the bunker to the rotary valve is 5m.

c) The maximum slope of the bunker auger is +/- 10°.

Fuel Size: Woodchip size distribution to Ecological Standard M 7133

	% by weight of relevant chip size (mm)				Extreme Values (mm)	
	20% max	60 – 100%	20% max	4% max	Cross section	Length
EU G50	>31,5	31,5 – 5,6	5,6 – 1,0	<1,0	50	95

There are five requirements for fuel:

(1) Size: it must conform to the EU G50 standard above.

(2) It mustn't pollute the atmosphere when combusted.

For applications where demolition wood is concerned, painted and pressure treated preservative wood must be separated at source and not burned.

(3) When burnt, the combustion gasses mustn't be corrosive.

This that can of concern with fuels such as wheat straw in that dependent upon the fertilizer regime used chlorine gases can be detrimental to the air-to-air heat exchanger and shorten its life. Fuel sample analysis will indicate if this is likely when if it is the case, lime can be added to the fuel to neutralise the effects.

(4) Ash content must be below 5% with minimal fly-ash.

(5) Tabott's recommends the use of wood chip at less than 25% moisture content for fuel in both the BG25 and the BG50 Biomass Generators, but moisture content can be up to 40%.

Other fuels may be used subject to analysis and TESS approval.

Ash Wood chip ash makes a good fertilizer and can be spread on soil for disposal.

Uses

The TESS biomass powered CHP Generators have multiple uses and will produce power when needed rather than being weather dependent. In practice, they can be used in distributed power and heating systems, replace diesel electrical generators, but primarily to substantially reduce power usage costs.

Typical applications are where biomass is supplied as fuel residential buildings, hotels and farms, woodworking and other industries such as waste re-cycling where the fuel would otherwise go to landfill.

CO_2 Saving

Biomass which absorbs atmospheric CO_2 via the photosynthesis process, is solar energy stored in fibrous material. When the plant degrades it breaks down and releases CO_2 to the atmosphere as it does if it's burnt which is why its carbon neutral. To calculate the carbon saving:

For each kW of electricity generated by a fossil fuel fired power station, 0.45kg of carbon dioxide is produced. Therefore:

25kWe x 8000hrs/year x 0,45kg/kWh = 90t/year
50kWe x 8000hrs/year x 0,45kg/kWh = 180t/year

The equivalent emissions from a gas-fired boiler are calculated based upon 1kW of heat generated by a gas-fired boiler 0.19kg of carbon dioxide is produced. Therefore:

80kWth x 8000hrs/year x 0,19kg/kWh = 122t/year
95kWth x 8000hrs/year x 0,19kg/kWh = 144t/year

In ***total 212 tonnes of CO_2 emissions*** will be displaced each year for every BG25 installation; and ***324 tonnes of CO_2 emissions*** will be displaced each year for every BG50 installation.

Servicing

The heat exchanger is cleaned monthly with a quarterly oil and filter change. A major service is required after 30,000hrs.

Example Layout of Biomass Generator