TRADITIONAL STEAM CYCLE COMPARED TO BIOMASS-FIRED TOP CYCLE (BTC) TECHNOLOY

The revolution of biomass

For over 200 years, we have produced biopower with the simple principle of a steam engine: burning biomass, boiling water and turning a steam turbine. With the giant challenges of climate change and global urbanisation ahead of us, we need to change how things are done: biopower must be revolutionised.

BTC - A scalable solution for our planet

To meet the needs of the Green New Deal, biopower plants must consume half the biomass, produce on-demand, and should be cost-effective. Phoenix BioPower is part of Bio-FlexGen and has has found a great solution: It is called Biomass-fired Top Cycle (BTC) technology. By converting biomass residues into electricity in a clean and efficient process, the BTC technology enables profitable and plannable renewable power. A unique opportunity to drastically improve the health of our planet and reliability of the energy system.

The BTC technology produces power from biomass twice as efficiently as traditional steam cycle technologies. In other words, half as much biomass is used per unit electricity produced. Thus, operating costs are cut almost by half. This results in a profitable plant that generates renewable power and heat on-demand.

TRADITIONAL STEAM CYCLE

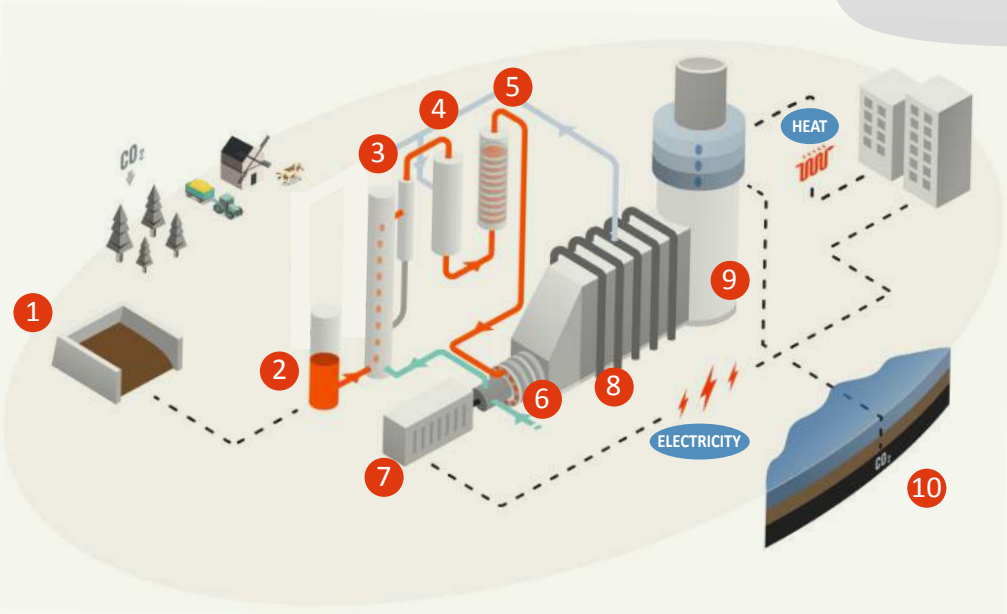
25-30% ELECTRICAL EFFICIENCY

BOILER INCINERATION
STEAM GENERATION
STEAM TURBINE

BTC TECHNOLOGY

50-60% ELECTRICAL EFFICIENCY

GASIFY FUEL
FEED A GAS TURBINE
DRIVE GENERATOR



1.BIOMASS
A broad stream of residues (wastes) from forestry, agriculture and processes are brought to the plant. This makes the BTC part of circular economy.

2. FEEDER
The residues are pressurised in a sluice (or lock) system and fed into the hot, pressurised gasifier. Recycled CO_2 or flue gas or nitrogen can be utilised for pressurisation.

3. GASIFIER
The solid biomass is converted to a gaseous fuel by heating it 800-900°C in a pressurised reactor together with steam and compressed air.

4. GAS COOLER
Prior to cleaning the gas, it is cooled to just under 500°C in the gas cooler, which makes contaminants easier to remove.

5. HOT GAS FILTER
Fly ash and other contaminants are removed in the hot gas filter prior to the gas turbine. Special filter materials are used for durability and to reach a high-quality fuel.

6. TOP CYCLE GAS TURBINE AND COMBUSTOR
The heart of the BTC process is designed for extreme conditions.
Air is compressed to high pressures and then combusted with the hot, clean and steam-rich fuel from the gasification system. The advanced combustor generates a gas at over 1400°C that drives the turbine. As all steam flows to the gas turbine, carrying all the energy from the exhaust gas and gasification, more power is produced in the gas turbine.

7. GENERATOR
Converts the mechanical power from the gas turbine to electricity.

8. HEAT RECOVERY STEAM GENERATOR
The exhaust gases from the gas turbine are over 500°C and their energy is recovered by generating the steam needed for the plant.

9. FLUE GAS CONDENSER
After the steam generator, water is recovered from the gases and recycled to the plant, ensuring no external water is needed and further decreasing emissions.

10. CO_2 STORAGE
CO_2 from flue gases can be captured and stored in permanent solutions like under deep sea-bed storage.

HEAT
Condensing water releases huge amounts of energy that can be utilised in buildings and industry for heating. Production of heat and power in one facility reduces fuel consumption by 40% compared to separate ones.

ELECTRICITY
Up to 60% of the energy in the biomass waste residues is converted to electricity, the highest form of energy.

Bio-FlexGen