

# ***Whole System Transformation:***

## **Technologies, Byproducts, & Basic Operation**

WST technologies run from those that are extremely simple and designed to be operated and run by a number of people to those that are either fully or partly mechanised or automated.

The main elements of a full system always include a biodigester, a gasifier, and a sanitation section that can be of various types and descriptions depending on location and the number of users and potential users. A chopper and a maceration unit should be used in every system for added efficiencies and increased production of usable by-product.

### **The steps of a basic system are as follows:**

**1. The breakdown into suitable size for processing of available feedstock for both the biodigester and the gasifier.** For this breakdown to be successful all metals and plastics must be removed from the community garbage and trash supply. This can be done manually or mechanically. The metals are sold to metal recyclers and the plastics are used as part of a mixed feedstock for the gasifier. All other remaining garbage and trash should then constitute what is termed "wet garbage."

The gasifier feedstock goes through a "chopper" with either manual or automated feed to reduce such feedstock to the correct size for gasification process. Feedstock for the biodigester is first chopped and then put through a similar piece of machinery to the chopper that finely macerates the feedstock. By so doing a system is created that does not need mechanical stirring of digestate but rather can use thermodynamics to move such digestate around the digester container.

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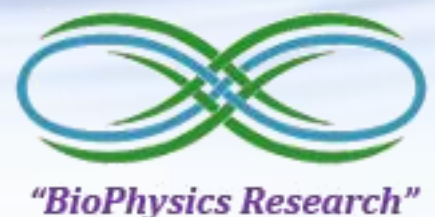
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**2. Biodigester.** Digestate and gas are extracted on a continuous basis as new feedstock is added. A typical digestion system will take place over five to seven days depending on the nature of the feedstock. The digestate is made up of water and solids; the water may be recycled as "A" Grade agricultural water and used in irrigation or is able to be made into potable water if needed.

The solids are then used as either mulch or fuel for the gasifier by pelletizing the digestate after removal of water. The gas obtained from the digestion process is a mix of 95% to 97% **methane** with the remainder being **carbon dioxide** with traces of other gases, such trace gas varying in composition depending on feedstock used. The gases may be "scrubbed" by passing through a small water tank and in some cases gas that is not needed may be "flared" off. Basic systems handle either 5-7 tonnes a week or 18-21 tonnes a week. Both are ISO container-based.

**3. Gasifier.** Feedstock is made up of chopped plastics, pellets from the biodigester, and general dry garbage and trash from a community as well as agricultural by-product that is not needed for biodigester. All of this may be put through the gasifier or in some cases two or four gasifiers depending on quantities to be gasified. The special eco-tech gasifier produces a prilled hard, dry char eminently suitable to be used as-is for agriculture or for sale. Once crushed to a fine powdery substance, mixed with water and Solutek, it becomes a first-class soil enhancement agent or fertilizer. The gasifier may be either manually or mechanically fuelled.

**4. Sanitation.** Sanitation may be approached two or three ways. The first way is to feed human and animal faeces into the biodigester system; the next is to feed faeces directly into a TreeWell system; and finally, if absolutely necessary, 20-foot and 40-foot ISO container-based sanitation systems are available that can be used stand alone or as part of an engineered overall system.



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**5. Potable water.** Water from the biodigester that is in the first instance "A" Grade agricultural water may be turned into potable water by passing it through the TreeWell system and then sterilising it in one of several inexpensive ways, for example by the use of a fine four-micron filter plus ultra-filtration if needed and then a strong ultraviolet (UV) light source.

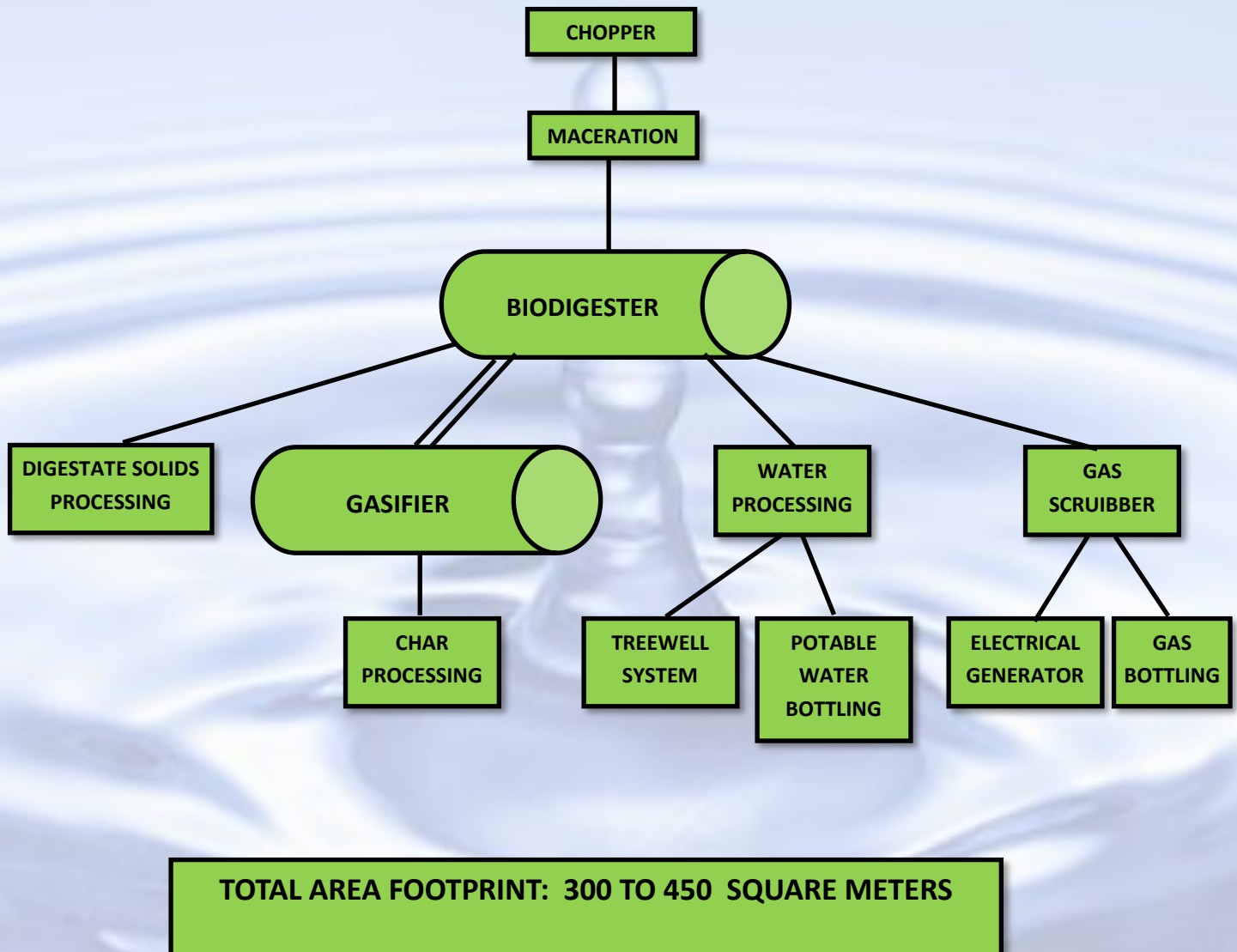
**6. Byproducts** include a fine, dry char and BioChar, as well as mulch for gardens, vegetables, and orchards. The system also produces various types and styles of fertilizer and water both for irrigation or drinking (potable). Gases produced can be used to generate electricity or used as gas for cooking, heating and hot water.

Heat from the gasifier may be used to kiln dry timber or heat hot houses (glass houses) in which vegetables and fruit may be grown for most of the year. The water from the biodigester may be used in a hydroponic system in such hot houses. Fish farming may be developed rapidly using what was in the past wasted water. These fish can either be sold or used in the community as added protein in people's diet. Parts of the digestate may be used as fish food. The addition of SoluteK to the fish tanks makes for increased growth of fish, a huge reduction in disease, and removes all scum from the walls of the tanks and sludge from the bottom of the tanks.



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## ***FOR MORE INFORMATION:***

**E. Hugh Pettman**

[pettman@soleco-technology.com](mailto:pettman@soleco-technology.com)

+61 43 44 33 565

**Dr. Tony Michell**

[tonymichell@kabcltd.com](mailto:tonymichell@kabcltd.com)

**Rafal Serafin**

[rafal.serafin@fpds.pl](mailto:rafal.serafin@fpds.pl)

+ 48 12 430 24 43

**Col. (Ret.) Barrie Town**

[barrie@towntechsolutions.com](mailto:barrie@towntechsolutions.com)

+1 719 641 5915

**Colette Labate**

[Colette@towntechsolutions.com](mailto:Colette@towntechsolutions.com)

+1 719 963 4687

**Keith Peters**

[keith@katzenbar.co.za](mailto:keith@katzenbar.co.za)

+27(0)83 974 2168

