



Technical Details

NISARGRUNA plant has following components.

- Waste processing room
- Mixer/grinder
- Pre-digester tank
- Air compressor
- Solar heater for water heating
- Main digester tank
- Gas holder/gas balloon
- Gas blower
- Power generator (optional)

Space/water requirement (for a 1 MT/day plant)

- 100 m² space
- 1 ton/day water for slurry making

For details, please contact

Head, Nuclear Agriculture and Biotechnology Division
 Bhabha Atomic Research Centre, Trombay, Mumbai 400085
 Email: vpvenu@barc.gov.in / panabtd@barc.gov.in

NISARGRUNA

A basic tenet that governs the sustainability of our planet is conservation of matter and energy. Continuation of Nature's biogeochemical cycles of various elements is central to this sustainability. The concept of *NISARGRUNA* (which means Nature's loan) is to understand the laws of Nature and, accordingly, play our part as responsible inhabitants of this ecosystem. There is no word called waste in the dictionary of Nature. Viewed in this perspective, waste is not something to be dumped in total disregard to the ecosystem. Wealth contained in waste, in the form of matter and energy, must be recycled and reused.

Unfortunately, waste is associated with a number of negative qualities. Apart from the stink and unsightliness, generation of waste is invariably decentralized. Modern urban societies centralize the collection of waste and, in the process, create problems of mammoth size. Large areas, difficult to find in urban settings, are required to dump our wastes. Dump yards spread stink and ill health and leach toxic substances into ground water. Biodegradable waste materials can reduce the value of dry recyclable waste, when both are mixed. If the biodegradable wastes can be processed separately, subsequent value addition in the remaining waste, mostly recyclable, can lead to economically viable waste management.

Organic matter content of soil is an important component of sustainable agriculture. Though Indian soils have been productive over thousands of years, organic matter in our soils has considerably declined over a period of time. Application of organic manure is a time-tested method to replenish the organic content of soil. Biodegradable wastes generated in kitchens and vegetable markets and agro-wastes generated in agricultural fields are important sources of organic manure. However, these wastes need to be processed before they can be applied as manure. *NISARGRUNA* technology offers a comprehensive solution to handling biodegradable wastes and is based on the concept of maintaining the elemental balance in nature.

NISARGRUNA plant is designed around the basic concept of safe and environment-friendly treatment of biodegradable wastes, combined with generation of energy in the form of biogas. It offers a decentralized alternative for processing the biodegradable waste generated in human settlements. About 150 *NISARGRUNA* plants are operating across the length and breadth of the country. Basically, it is a biphasic biomethanation plant that can generate about 60-80 m³ of biogas per tonne of waste processed. The gas can be used either for cooking or for electricity generation. Manure, obtained after waste processing, is rich in nitrogen and can be used as an excellent soil conditioner. The carbon to nitrogen ratio of this manure is similar to that of fertile land (12:1). It has small quantities of phosphorous, potassium, iron and magnesium. Moreover, it is weed-free and does not have any offensive smell.

The Process

It uses a biphasic process. In the aerobic pre-digester tank, thermophilic bacteria are selectively enriched using hot water (55-65°C). These bacteria degrade waste quickly and generate acidic slurry containing a large amount of organic acids. After pre-digestion, the waste is sent to an anaerobic main digester, where methanogenic bacteria metabolise the organic acids, generating methane. Higher temperature of operation helps in partial hygeinisation of the waste and inactivation of weed seeds. Hot water for the process is obtained using a solar water heater or produced using the biogas generated in the plant. The plant can use recycled water for making waste slurry for the pre-digester. Therefore, *NISARGRUNA* is a "zero garbage-zero effluent" plant.

Advantages of *NISARGRUNA*:

- Decentralized processing of biodegradable wastes
- Generation of 60-80 m³ of biogas from 1 MT of waste, which can produce about 90-120 KWH power.
- Generation of good quality manure (about 80 kg/day from a 1 MT/day plant).
- Prevents methane escape to atmosphere, thereby helping reduction of global warming.
- Contribution to *Swachh Bharat* mission of Government of India.

Biodegradable wastes that can be processed in a *NISARGRUNA* plant include:

- Waste/uneaten food from households, restaurants and industrial canteens
- Vegetable wastes from vegetable markets and kitchens
- Shredded paper
- Abattoir waste, especially cattle intestinal materials
- Cattle dung and night soil
- Green lawn cuttings, algal/plant material removed from water bodies etc.
- Green agro wastes (should be finely chopped before processing)

Certain materials are to be strictly avoided. They include:

- Coconut and egg shells
- Coconut coir, feathers, hair