

निसर्गरुण प्रौद्योगिकी

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निसर्गरुण प्रौद्योगिकी का राष्ट्रव्यापी विकास

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निसर्गरुण संयंत्र

सारांश

विभिन्न प्रकार के जैव अपघटनीय अपशिष्ट के प्रक्रमण के लिए निसर्गरुण प्रौद्योगिकी विकसित की गई है जो “शून्य अपशिष्ट, शून्य बहिःस्त्राव” का दृष्टिकोण अपनाकर जैव अपघटनीय अपशिष्ट के प्रबंधन के लिए एक व्यापक, विकेंद्रीकृत एवं पर्यावरण के अनुकूल समाधान प्रदान करती है। हालांकि, प्रारंभिक विकास महत्वपूर्ण था, लेकिन संपूर्ण भारत में इसका व्यापक परिनियोजन चुनौतीपूर्ण साबित हुआ है, जिसके लिए देश भर में प्रचालन संयंत्र स्थापित करने के लिए विभिन्न कार्यान्वयन एजेंसियों से व्यापक प्रयासों की आवश्यकता पड़ी। इस प्रौद्योगिकी का परिनियोजन विभिन्न कार्यान्वयन एजेंसियों के सहयोगात्मक प्रयासों के माध्यम से प्राप्त हुआ है, परिणामस्वरूप, पूरे भारत में 400 से अधिक संस्थापन स्थापित किए गए हैं। इस अध्याय में स्रोत पर अपशिष्ट के प्रबंधन में प्रौद्योगिकी की प्रभावशीलता को प्रदर्शित करने वाली प्रमुख सफलता की कहानियों को वर्णित किया गया है।

NISARGRUNA Technology

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Nationwide Deployment of Nisargruna Technology

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Nisargruna plant

ABSTRACT

Nisargruna technology has been developed for processing different types of biodegradable waste which provides a comprehensive, decentralized, and environment-friendly solution for managing biodegradable waste, by adopting a “zero garbage, zero effluent” approach. While the initial development was significant, its widespread deployment across India proved challenging, requiring extensive efforts from various implementing agencies to establish operational plants nationwide. The deployment of this technology has been achieved through the collaborative efforts of various implementing agencies, resulting in over 400 installations across India. Key success stories demonstrating the technology’s effectiveness in managing waste at the source has been narrated in this chapter.

KEYWORDS: Nisargruna, Biogas, Bio-waste, biodegradable waste

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Introduction

Achieving a greener future requires changing waste management from simple disposal to proactive reduction, reuse, and recycling, necessitating both individual actions (composting, choosing reusable products) and collective efforts (improved infrastructure, policy support, and community engagement). This comprehensive approach reduces environmental pollution, conserves resources, and supports a sustainable circular economy. Nisargruna technology strongly supports the scientific solution to the society. Success stories of the deployment of the technology has been given below.

Nisargruna Biogas Plant Matheran Hill Station, Karjat, Maharashtra

Matheran being an eco-sensitive zone due to presence of several rare flora and fauna, there are many restrictions imposed by environmental authorities including no vehicle movement and no dumping the waste in open area. Horses are the main mode of transportation which leads in littering the roads with horse dung. There are several hotels and restaurants to cater large number of tourists and such establishments produce several metric tons of biodegradable kitchen wastes.

Mumbai Metropolitan Region Environment Improvement Society (MMR-EIS) signed MoU with Mumbai Municipal Corporation and BARC during 2005 for setting up five-ton capacity plant for processing kitchen waste and horse dung. The plant became functional in February 2007 (Fig. 1). Since then it is functioning in an uninterrupted way till the date. The plant also achieved milestone when it received ISO 9000 certification for its functioning and safety aspects. The plant gave lot of confidence for the technology implementation and successful running for several years.

Organic Solid Waste Management at BARC, Mumbai and Anushaktinagar

Anushaktinagar township, the residential hub for the Department of Atomic Energy (DAE) in Mumbai, houses approximately 40,000 to 50,000 residents. It is a self-contained community covering over 1000 acres, featuring over 9,500 residential flats and 280 buildings. The colony generates 12-15 tons of total waste every day. Out of this, 50%

is biodegradable waste. Nisargruna technology has done strong impact on management of the biodegradable waste in the colony. The details of the plants installed at Anushaktinagar is as follows.

First Nisargruna plant was installed during June 2001 at Nursey (Fig.2), opposite to PP inside BARC campus. The design of the plant is shown in Fig. 1. The capacity of this plant was 0.5 MT/year. The plant is running with full capacity over the years and the gas has been given to CFB canteen. The plant was close for 6 months during the Covid pandemic period and was restarted immediately after the normalization of the situation[2].

Second Nisargruna plant was developed at Training School Hostel during 2003 which was developed for processing 2-ton waste per day (Fig 2). The plant is running successfully for last several years. The plant is supplying the gas to the TSH canteen.

Third Nisargruna plant has been installed at BARC hospital site for processing the canteen waste as well as part of the colony waste. The plant has a capacity of 2.5-ton waste processing per day (Fig. 3). The plant has developed during Covid period and started functioning from 2022. Gas has been supplied to the Hospital canteen regularly.

Fourth plant has been installed at BARC Northgate CISF canteen during 2017. The plant has a capacity of 100 kg waste processing per day (Fig. 4). The gas is supplied to the canteen.

Other installations have been done by DCS&EM who is looking after the management of daily waste generated in the colony. DCSEM has installed 6 Nisargruna plants of 500 kg capacity each during 2018. Further the facility was scaled up to processing 3-ton waste plant at Tapti site during 2021 (Fig. 5). Recently another 3-ton capacity plant has been installed at Mandala for processing wet waste. Now all the waste generated in the colony is processed inside the colony only.

NISARGRUNA for Community Kitchen

Kurudampalyam is a small village, 20 Km away from Coimbatore city, with most of the villagers falling below poverty line (BPL), Coimbatore (rural) district authority decided to install a 2 MTPD Nisargruna plant at the village (Fig. 6). In 2014 the plant was completed. Biodegradable waste from the



Fig.1: Nisargruna plant, Matheran and Nisargruna plant at Nursey and the biogas stove at canteen located at 3rd floor of CFB Building.



Fig.2: Nisargruna plant at Trining School Hostel, Anushaktinagar.



Fig.3: Nisargruna plant at BARC Hospital, Anushaktinagar.

adjoining part of Coimbatore city is delivered to the plant every day. The biogas produced at the plant is supplied to a community kitchen across the road. The community kitchen has 12 biogas burners (Fig. 6). Villagers come there with their raw ingredients and cook their meals.

Nisargruna at the Doorsteps of Software Techies

Several corporate houses including Tata Consultancy Services (TCS), WIPRO, Tata Motors, NABARD Bank etc have adopted this technology to make their corporate campuses and premises zero waste facility. TCS has Nisargruna plants at many of their campuses including their largest campus at Chennai. The Chennai campus has a 3 ton plant where the gas is converted to electricity using a biogas generator. TCS, Thane plant is working for more than a decade now (Fig. 7).

Handling Abattoir Waste - Nisargruna gave a Solution

A MoU was signed between BARC and MCGM, Mumbai for processing slaughter house waste (15-ton capacity). Deonar abattoir being the biggest slaughter house in Mumbai was selected for setting up the plant. Slaughterhouse animal wastes like blood, intestines, feathers and hair are generated in huge quantity and used to be dumped at the Deonar dumping ground, due to which there were allegations by nearby residents of foul smell and pollution. This was necessitated after the



Fig.4: Nisargruna plant at CISF Headquarter, BARC.

National Green Tribunal had ordered the abattoir to cease slaughter of all animals for export after activities at the slaughterhouse were found to violate environmental norms.

Nisargruna plant was installed during 2016 (Fig. 8) and is running successfully for last 09 years. Substantial amount of electricity has been generated which is used for running Gas turbine.

Use of biogas plant for processing slaughter house waste was done for the first time and it has proved to be very



Fig.5: Nisargruna plant installed at Tapti waste processing site, Anushaktinagar.





Fig.6: Waste collected from the city and processed at the plant to get the gas.



Fig.7: Nisargruna plant at TCS, Thane and Wipro, Kochi.

successful. Plant has been under continuous operation for almost 42 months. Thus the technology has made significant contribution in solving problem of slaughter house waste.

Subsequently the technology was spread to different slaughter houses in Chennai, Rajkot, Bengaluru, Solapur etc for effective management of the waste.

Large Scale Deployment of Nisargruna Technology to the State of Chhattisgarh

Nisargruna technology was transferred to Chhattisgarh biofuel development authority (CBDA), Government of Chhattisgarh during 2023. During first phase, biogas plants were installed at seven locations from tribal districts of Chhattisgarh. First plant at Janapad Panchyat, Jagdalpur was inaugurated by Shri Bhupendra Baghel, Hon. ex-chief minister on 25th Jan 2023 (Fig. 9). The plant has a capacity of 500 kg cow dung processing per day. The plant has also successfully completed production of 10 KW electricity per day and it is connected to the grid.

Nisargruna for Swachha Bharat Mission

Nisargruna technology has been recommended by Swachha Bharat mission of Government of India for making cities clean. The technology was installed by many municipal

authorities throughout the country. Further 2nd phase of Swachha Bharat Mission was launched for rural part of country and Nisargruna technology has been introduced for implementation purpose.

Swachha Bharat Mission, Government of India has made a manual on different technologies suitable for management of waste in cities and mentioned the importance of Nisargruna technology (Fig. 10).

Integration of Nisargruna Technology under Government Schemes

The technology has been supported by Ministry of Development of North Eastern Region (MDoNER) for installation of biogas plants at different locations of the North East Region and implemented successfully. Government of Maharashtra also made this technology mandatory for local bodies to treat the solid waste generated in the state.

GOBAR-Dhan (Galvanizing Organic Bio Agro Resources Dhan) Scheme under the Ministry of Drinking Water & Sanitation, GOI has been conceptualized with an aim to convert waste into bio energy, gas and compost which would not only benefit the people but also maintain cleanliness in the villages. Nisargruna technology has been adopted as a part of this scheme. Many technology holders have registered under



Fig.8: Nisargruna plant installed at Deonar Abattoir, Mumbai.



Fig.9: Nisargruna plant was inaugurated by Chief Minister, Chhattisgarh.

this scheme for setting up the plant at village levels. As a part of this programme, the southern state of Kerala has taken the lead by setting up the country's first bio-gas plant during 2019. The Thuruthi waste treatment plant in Pappinissery Gram Panchayat of Kannur district is treating bio waste collected from public spaces, including community and commercial spaces such as markets. The plant has a capacity of treating 1-ton waste per day. Loni-Pravaranaagar Dist Ahilyanagar MS has set up one ton capacity plant under this programme during 2023.

Application of Nisargruna Technology with Reference to Villages.

Nisargruna technology has played significant role in processing biodegradable waste generated at different places including village panchayat. There are many plants constructed in rural area and working satisfactorily for processing waste and making the village clean.

Nisargruna biogas plant has started functioning at Sevalaya campus, Kasuva village, Pakkam PO, near Thiruniravur (TN). The District Rural Development Agency

(DRDA) has executed a waste-to-energy plant project at Yercaud near Salem (TN). The plant has a capacity of 02-ton waste processing per day[3].

Pune district of Maharashtra has decided to set up one plant in every tahasil based on Nisargruna technology for treatment of kitchen waste. During first phase 3 plants are ready for commissioning during 2026.

Nisargruna Technology Supported the Gas Supply during LPG Crisis

India's LPG supply is facing serious disruption as tensions in West Asia impact tanker routes through the Strait of Hormuz. With nearly 62 per cent of India's cooking gas imported, the crisis is already hitting restaurants and hotels across major cities. The situation highlights the economic impact on the hospitality sector. Institutions that invested early in waste-to-gas plants saw significant relief from the situation. Nisargruna technology installed at Tata Institute of Social Sciences, Mumbai, BARC, Anushaktinagar, different establishments showed significance of the technology to supply the gas to kitchen.



Fig.10: Swachha Bharat Mission Manual highlighted the technology.



Fig.11: Nisargruna plant at Ozar Temple, Dist. Pune.

Another success story widely covered by the media during the LPG crisis was the Nisargruna plant at Ozar temple in Pune. The plant has been installed during 2024 and working efficiently with supply of the gas to the canteen (Fig. 11).

Conclusion

BARC's most enduring legacy is the widespread adoption of the Nisargruna biogas technology across India. Hundreds of installed plants are processing thousands of tonnes of organic waste daily, reducing landfill pressure, curbing methane emissions from decomposing waste, and providing clean cooking fuel and organic manure. This represents a significant contribution to India's clean energy and sanitation goals[4,5].

BARC's Nisargruna technology has transformed Indian waste management through several key impacts:

- **Environmental Benefit:** Hundreds of plants process organic waste daily, cutting landfill use and methane emissions.
- **Resource Recovery:** It generates clean cooking fuel and organic manure from "wet waste."
- **Urban Strategy:** The decentralized design helps cities meet Swachh Bharat Mission goals and national waste mandates.
- **Scientific Legacy:** It set a benchmark for biogas efficiency and proved the commercial viability of environmental biotechnology.
- **Economic Blueprint:** Successful commercialization bridged the gap between national labs and industry, maximizing the impact of public research.

Thus, Nisargruna turned a lab innovation into a nationwide standard for sustainable sanitation and clean energy. By successfully shepherding Nisargruna from lab to market, BARC created a blueprint for how other indigenous technologies can be commercialized, thereby amplifying the societal return on investment in public research and strengthening the link between national laboratories and industry.

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