



Discussion with stakeholder organizations held in Kochi on 3rd October 2017
Presided over by Sri. Hardeep Singh Puri, Hon' Minister of State (Independent Charge)
Ministry of Housing and Urban Affairs, Government of India

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INITIATIVES OF INTEGRATED RURAL TECHNOLOGY CENTRE (IRTC) FOR BIOWASTE MANAGEMENT

IRTC is knowledge based technology dissemination Institution established in the year 1986 and belongs to Kerala Sastra Sahithya Parishath (KSSP), a People's Science Movement having 50,000 active members linked through networking among 2500 functional units in the State. IRTC is led by renowned scientists, technocrats and professors

Bio-waste management is a focused activity of IRTC for the last 20 years. IRTC promotes technologies for processing bio-waste and KSSP sustains them by mobilizing people's participation.

The domain of IRTC is bio-waste management at Domestic as well as Community levels. Offering a comprehensive plan of action for the intervention area has been the mode of approach. This covers need assessment, data processing, project formulation, implementation, monitoring and maintenance as well as service delivery including trainings. One fourth of the 1000 Local Bodies in the State are currently the beneficiaries of IRTC. The uniqueness of IRTC's approach is that it could offer an integrated service package for bio-waste



management which includes manufacturing and supply of processing devises besides all other services stated above.

After having finalized designs and protocol for end use, IRTC is now equipped with supplying as per demand, eight models of composting devises (such as earthen ware worm bin, stacked clay pots, single clay pot, kitchen bin, staked FRP bio bin, bucket, ferro- cement ring and PVC pipe) and 12 models of portable biogas units (0.5 m³, 0.75 m³, 1 m³, 2 m³, 3

m³ and 4 m³ with and without water jacket). In addition to this IRTC takes up the task of installing stationary model biogas units of medium and large size (capacity 50 kg to 2000 kg per day, both floating as well as fixed dome). To accomplish these tasks IRTC

supports satellite production units functioning either as Joint Liability Groups or as Livelihood Support Groups established in Hub and Spoke working pattern. While biogas is being used as fuel, compost is marketed through a market promotion system by engaging promoters in eight Districts in Kerala, for end use in farm fields.

IRTC has supplied 1.2 Lakhs of composting devices and 14000 units of bio-gasification. Popularising the toilet linked biogas system is priority area undertaken by IRTC. There is a huge demand from the field to undertake

massive education campaign for overcoming people's inhibition to cook food using bio methane generated from toilet linked biogas plant. Grey water treatment systems are also given ample importance by developing customized units of domestic leach pits and soak pits as well as medium scale anaerobic baffled reactors. Trainings for skill development as well as capacity building are yet another activity under the integrated plan. Professional College students from Kerala and

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IRTC, Palakkad is a government accredited agency in the field of sanitation and waste management

Key person attended: Prof. V. R Reghunandan, Environmental Scientist

Tamil Nadu avail the advanced laboratory facilities for doing internship training in waste management. After considering the substantial services rendered by IRTC, the Government of Kerala has identified it, as an Accredited Institution for promoting bio-waste management, and approved it as a Centre for providing training in waste management to Local body functionaries. IRTC has been receiving additional grant assistance from the Government of Kerala since 2016 for infrastructure improvement of IRTC.

Models of composting devices promoted by IRTC



IRTC Made
Earthenware Worm Bin



IRTC Made
Stacked Clay pot



IRTC Made
PVC Pipe Compost



IRTC Made
Ferro-Cement Ring



IRTC Made
Ferro-Cement Tank

FOOD & TOILET WASTE MANAGEMENT IN MEDICAL COLLEGE CAMPUS, KOZHIKKOD, KERALA

OPERATED & MAINTAINED BY IRTC



Kudumbasree operated food waste collection and final sorting



Food and Toilet wastes based Hybrid Biogas plant under construction



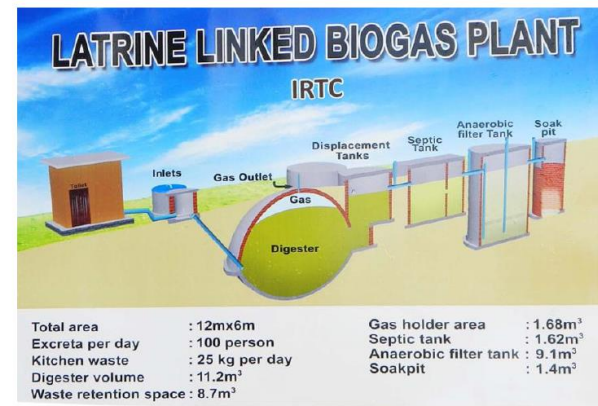
Food and Toilet wastes based Hybrid Biogas plant under working

FOOD & TOILET WASTE MANAGEMENT

WORKING MODEL, MAINTAINED IN IRTC CAMPUS



DIFFERENT STAGES OF THE CONSTRUCTION OF TOILET LINKED BIOGAS PLANT HAVING CAPACITY OF 25 KG/DAY FOOD WASTE AND 25 KG/DAY FAECAL WASTE (100%)



Diagrammatic representation of Toilet Linked Biogas plant

WELFARE SERVICES ERNAKULAM

The NGO, Welfare Services Ernakulam (WSE), has been actively involved in the development sector for the last five decades.

The NGO gives thrust to conservation of environment and natural resources management by propagating,

- waste management practices like bio-gas plants, composting methods, smokeless improved chulahs,
- Rainwater Harvesting technology
- solar systems etc. among the people in our operational area.

The NGO runs a massive program named “Sukrutham Prakruthi vicharam” for the propagation of environment friendly development culture among women and school children. Awareness programs, installation of waste management methods and family farming practices are part of the program.

Focus areas of WSE

- Community Mobilization & Microfinance programs
- Water and Sanitation programs
- Family Development Programs
- Housing Development

- Environment and Rural Technology Services like biogas plants, rainwater harvesting, solar energy and other waste management.
- Watershed development and NRM programs
- Rural Livelihood Development
- Relief and Rehabilitation programs
- Community Based Rehabilitation programs
- Community health
- Community based Disaster Management and Risk Reduction Programme
- Social security programs

Biogas Projects

- Constructed more than 32,000 biogas plants of various capacities during the past 32 years.
- Vast experience of treating wastes like cow dung, poultry waste, piggery waste, effluent water from rubber sheet processing, latrine waste, kitchen waste, slaughter waste and effluent from leather processing.
- Expertise to construct Biogas plant of 1 CuM to 50 CuM based on the quantity and quality of the waste.

Composting Projects

- Promotes aerobic methods like pipe composting, vermi composting (terracotta based and ferro cement tank based), mose-pit composting etc. for the treatment of degradable waste. WSE is the designer of terra

- Installed more than 8,000 terra cotta tanks for vermi composting and more than 1,500 ferro cement tanks of various capacities.

Support to ODF

WSE whole-heartedly supported the program as it helps to enhance the health and self-esteem of the rural poor. In collaboration with the authorities of the districts of Kottayam, Alapuzha and Ernakulam, supplied construction materials like closets to 148 families, given financial support to 21 families, 130 toilets were constructed at Kuttippuram Panchayath of Malappuram District.

Housing program

Constructed 29,472 houses with toilets and smokeless chulahs. In addition to this, implemented a housing project (41 Nos.) with RWH tanks of capacity of 5,000 ltrs, smokeless chulahs; terra cotta composting units in Narakal Grama panchayath with the support from Ministry of Rural Development, Govt. of India.

A few more interventions...

- 80,000 policy holders were supported with a financial benefit of 27.65 Crs. within a period of five years.
- Facilitated formation of 6500 women Self Help Groups with 74, 594 families as members 281 operational village.
- Intervenes in five districts of Kerala State bringing changes in the lives of 100,000 families the various self-help group platforms.

Welfare Services is an NGO Registered under societies registration Act

Key person attended: Rev Fr. Paul Cherupally, Secretary

- Assisted 22,300 families for constructing Cost effective and stable houses
- Old age home in the name of “Soukyaśadan” is run at Chethicode housing 55 poor and destitute.
- 30,000 families have been supported small scale economic activities
- Constructed over 32,000 biogas plants and 29,000 smokeless chulas as part of conservation of energy and promoting better environment.
- Constructed more than 10,000 Rain Water Harvesting Tanks for people, agencies, institutions affected by scarcity for potable water.
- Solar systems were distributed to more than 750 families as part of propagation of non-conventional energy applications
- Implemented World Bank assisted Drinking water supply and sanitation projects of Kerala Government in Alanallur, Thanur and Kuttippuram Grama Panchayaths
- Rainwater harvesting tanks (5000 ltr. Capacity) were constructed and provided to more 2500 poor families in the coastal areas of Alleppey and Ernakulam.



Vermi composting unit



WSE workers engaged in toilet construction

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The Socio-Economic Unit Foundation (SEUF) was registered as an NGO in June, 1995 has been working as an Accredited Agency of Government of Kerala in the field of Water, Environmental Sanitation and allied training programmes. SEUF is also a Key Resource Centre (KRC) for the southern states under Ministry of Drinking Water & Sanitation.

Sanitation**Construction of Toilets**

More than 3 lakhs household toilet units constructed across the state especially in coastal areas by SEUF with the support of various agencies during the last 3 decade paved the way for achieving the ODF status for the state. Community participation and awareness creation were integral part of the programmes. School Sanitation programme is also being implemented across the state with the support of various agencies. Mainly promotes low cost Two Pit latrines and its improvised models for the water-logged areas.

Open Defecation Free Kerala Campaign

SEUF had given training to around 700 field level functionaries from 14 districts identified by Suchitwa Mission with the support of World Bank and UNICEF for the ODF Kerala campaign. These

resource persons played a vital role in motivating the community to construct toilets and mobilize the programme in rural areas.

Solid Waste Management**Capacity Building Programmes****Training on 'Scientific Waste Management'**

SEUF had two full-fledged training centres at Alappuzha & Thrissur. We are providing training in Scientific Waste management to elected representatives and officials of various line departments. Around 2000 officials mainly health staff was trained till with the support of Suchitwa Mission.

Training to 'Green Technicians' (Haritha Karma Sena)

While community is taking responsibility of achieving the 'Waste Free' (Malinya Muktha) status, a lot of support services are required for the community for the proper waste management and there is huge entrepreneurial opportunity too. SEUF is providing technical support for selecting and providing capacity building for 'Green Technicians' selected by the local bodies.

Decentralised Solid Waste Management

SEUF had developed few pilot models in decentralized solid waste management. Currently supporting around 400 panchayath raj institutions

in the state to develop and implement projects with community participation and necessary awareness programmes. The programmes are focusing on increase the civic responsibility and the principle 'My waste is my Responsibility'. Various household waste management equipment are provided to the community to segregate the waste at source and process the bio degradable waste at source level itself. Operation and maintenance support also providing to the community as per requirement. Most of the families can make the compost and use it for farming in their backyards. For others having no space, bio methanation and composting devices are providing to the community for management of bio degradable waste.

Solid Waste Management Plants

SEUF is providing technical support in implementation and operation of solid waste management plants. Compost units and biogas plants are mainly doing for public places, markets and institutions. SEUF is a technology partner of Bhabha Atomic Research Centre for the construction of larger capacity biogas plants. Such plants are constructed at various Medical colleges, companies, Airport etc.

Management of Non-biodegradable waste

Government of Kerala is promoting Material Collection Centres (MCF) and Material Recovery

Facility (MRF) for the scientific management of Non- bio degradable wastes. The selected 'Green Technicians' will visit every door steps in a pre-fixed duration and collect the non-bio degradable waste

Ayutham Haritha Bhavanam Project

At Perumbavoor Municipality in Ernakulam district, we had introduced a model project namely "Ayutham Haritha Bhavanam" on 15th August 2017. 1000 students selected from 10 educational institutions will motivate 10,000 (each student -10 family) households to become 'Haritha Bhavanam's. A protocol including segregation of waste at source, source level management of bio degradable waste, source level management of liquid waste, handing over non bio degradable to Green Technicians, non-usage of disposables, keeping non plastic bags for shopping, total cleanliness of the house and premises etc., will be factors considering for awarding the Haritha Bhavanam status. Bio farming, Rain Water Harvesting, Energy efficiency etc. will be considered at a later stage. The students will conduct an initial survey at their allocated houses and the result of the intervention will be surveyed after 6 months. Green Technicians will extend support to the households for achieving the status. Students will be given certificates for their achievements at the end of the programme. Resident's associations and youth clubs are also supporting the programme.

from houses, shops and offices with a user fee decided by the local body. The collected wastes will be segregated and given for recycling. The lower quality plastics will be shredded and used for road tarring. SEUF is supporting various local bodies as 'Operating Partner' for the Zero Waste Programme.

Awareness Programmes through Schools

SEUF had initiated School Health Clubs from its inception. Students can play a vital role (Sanitation

ambassadors) in behaviour changes in sanitation and waste management. Various clubs in schools i.e. National Service Scheme, NCC, Student Police Cadets (SPC), Science club, Environment club etc can be participate actively for the awareness programmes.



Promotion of Jute bags for shopping as an alternative for Plastic kits (Perumbavur Municipality)



Distribution of Biogas digester pots for source level composting of biodegradable wastes (Perumbavur Municipality)

RAM BIOLOGICALS

Ram Biologicals is engaged in design, engineering and turnkey installations in the field of Rainwater Harvesting, Wastewater Management, Solid Waste Management and Water Purification for the past 17 years. Started in the year 2000 the initial focus was on biological control of mosquitoes. From 2005 onwards, the efforts were directed to solid waste management projects also which were implemented in most decentralized manner.

Ram biologicals worked as consultants for many Municipalities and Grama panchayaths of Kerala as a part of People's Plan Campaign. Also developed many compact designs for decentralized solid waste management and integrated vector management.

In 2010 Ram biologicals started a division for liquid waste management and water resource management. Apart from this, the institution entered different sanitation projects across Kerala. As a part of ODF Campaign Ram biologicals installed around 450 numbers of Portable toilets with advanced septic tanks and soak pits which is suitable for the fully water-logged areas. Moreover, Ram biologicals extended the service to rain water harvesting, reuse and recharge. Ram biological's team of experts includes

Microbiologist, Entomologists, Public Health Specialists, Environmentalists and Engineers. As an empanelled agency of Suchitwa Mission, Govt. of Kerala Ram biologicals are engaged in the preparation of DPR on liquid and solid waste management for Medical Colleges, Hospitals, Fish Markets, Slaughter Houses etc.,

At present Ram biologicals is focusing on food waste management by providing food crushers, organic waste convertors, biogas plants, community compost units, vermi compost, bio pedestal columns, aerobic bins etc., Apart from this, as a part of non-biological waste management programme, Ram biologicals supplied and commissioned more than 50 units of plastic shredding, bailing and reprocessing machines for various local bodies of Kerala. Ram biologicals is now actively engaged in R & D of solid and liquid waste management technologies.



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Pelican Foundation

Organization with a vision of creating wealth from waste – through green processes and by using carbon neutral and positive resources – thereby preserving and enhancing the eco-systems for healthy living of mankind.

Focus on product and process developments with plant and animal biochemical and develop technologies for waste management and efficient source level composting

Technology:

1. Comoposorb: the first indigenous lingo-cellulolytic microbial inoculums that can convert biodegradable waste into soil less planting media for terrace gardening. We are currently selling 30000L/month composorb to Bangalore, Kerala and TN, converting biodegradable waste from more than 3000000Kg biodegradable waste to soil less planting media for agriculture at source thereby preventing land fill
2. Multiple magnetron dehydration system: patent application pending in US, Europe, Australia, China and India. This can dehydrate market waste in solar power into animal feed
3. Mycochitin: a biocontrol substrate developed from prawn, crab, shells waste and silk worm cocoon waste. The patent is pending application in US, Europe, Australia

and India, supported by BIRAC, DBT, MOS&T, GOI.

4. Vertical garden: first time where city compost is used for vertical gardening and median filling of Metro rail line, Kochi. The same is applicable for road medians, fly over pillars across the nation wherever dump sites are available, the best dumpsite reclamation model.



Translation: the following technology is translated already

1. Byobin:300L and 600L composting bins made of FRP, to compost biodegradable waste at source. These bins are now installed in more than 100 apartments and 50 commercial establishments in south India. www.pelicanbiotech.com
2. Biogas plants of sizes varying from 1kg/day to 2000kg/day across south India
3. Bucket bin composting unit: 50L bucket bin composting solutions for individual houses, more than 20000 units already running across south India.

4. Sustainable non-biodegradable collection unit: we have established a model non-biodegradable waste collection program in which all non-biodegradables like plastic, glass, paper, Metal, rubber, cloth, rexin etc are collected door to door and forward linked with a user fee without any financial assistance from government. The model has been now taken up by Kerala government and Suchitwa mission as Beacon municipality program. Currently the same and similar programs have reached 70% of the households in Kerala enabling source level composting and non-biodegradable recycling thereby reducing landfills, centralised waste treatment plants and other associated issues.
5. we have developed a porous plastic/paper composting bin from paper waste and thermocol waste in association with Pelican Biotech & chemical labs P ltd, A DSIR recognised research lab

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A Non-Government Organisation working in the domain of municipal solid waste management based in Kerala, India for the last 7 years.

Plan@Earth aims to offer solutions for solid waste management we completely subscribe to the practices of Refuse, Reduce, Repair, Reclaim and Reuse as proactive methods to manage waste.

As of now Plan@Earth help over 16000 households get their dry waste recycled. Services are offered in



3 municipalities and 3 panchayaths recycling over 22600 kilos of dry recyclables and compost nearly 2600 kilos of organic waste. A nominal service fee per month from each household is charged.

Funding and operation

- 1) The CSR funds are used to pay salaries, collect and sort dry waste. The waste is then despatched for recycling and the income from this is used to run the operation. A nominal service fee is charged from the community too. This model is running successfully in the panchayath of Kodakara with the support of CSR funds of Apollo Tyres Ltd through the Clean My Village CSR Project
- 2) The "Community Contribution" model- This



model has been used in municipalities of North Paravur, Aluva, Angamaly and panchayaths of Kadungaloor and Karumaloor.

Achievements

- 1) Plan@Earth offer services to over 16000 households
- 2) Per year Plan@Earth recycle nearly 200 TONS of recyclable garbage
- 3) Using the **Self-Help Group Model** Plan@Earth has been able to empower financially and socially 70 women
- 4) Worked out upcycling methods for many non-recyclables like metallized polypropylene packing pouches, rexine bags, shoes, used clothes
- 5) Have been able to develop an "Eco-Brick" by fusing residual non-recyclable plastic packaging with gravel sand to make a strong paving/roofing tile.

Out of the Pipeline

This year Plan@Earth started Solid Waste management in two new municipalities and expect the number of households to cross 20000

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Plan@Earth is an NGO registered as a society in 2009
Key person attended: Sri. Sooraj Abraham, Secretary

Innovations and Research Society

Mainly focusing on domestic waste management solution in an innovative approach. Developed an integrated system named “Technomix home self-sustainable system”. It includes the following.

- Technomix Micro poultry farm, (5 Egg per day)
- Technomix Micro Fish farm with vegetable cultivation, (200gm Mixed vegetable per day)
- Biogas Plant, (0.6 m³ cooking gas and 200ml organic fertilizer per day)
- Bio bin, (Organic fertilizer)
- Grow bag
- Bio Pellet Stove
- Roof top Rain water harvesting (1000 ltr.)
- Roof Top Micro solar power generating station (1 unit per day)
- Plastic collection Bin
- E waste Collection bin

Implementation procedure

Counseling team: A group of trained volunteers give proper awareness to public, Students, House wife etc. in waste management, energy conservation and natural farming. Innovation and research society providing skill training in following area to the volunteers

1. Waste management techniques (Solid, Water, Electronic, Plastic)
2. Energy conservation and energy efficiency techniques

3. Rainwater harvesting techniques
4. Natural Farming techniques
5. Inter personal relationship
6. Personality development
7. Public Behaviour
8. Patient hearing
9. Presentation skill
10. Communication Skill in local language

Implementation team: this team consists of technical qualified and skilled volunteers. They fabricate and install the entire system in houses. Innovation and research society providing skill training in following area to the volunteers

1. Welding
2. Electrical works
3. Plumbing
4. Painting
5. Bio Gas setting and maintenance
6. Solar panel installation and testing
7. Natural farming (Grow Bad setting and Maintenance)
8. Communication skill
9. Inter personal relationship
10. Positive Attitude training

Maintenance Team: Will follow up the installed system and will provide adequate and routine maintenance timely. Innovation and research

society providing skill training in following area to the volunteers

1. Welding
2. Electrical works
3. Plumbing
4. Painting
5. Bio Gas setting and maintenance
6. Solar panel installation and Maintenance
7. Natural farming (Grow Bad setting and Maintenance)
8. Communication skill
9. Inter personal relationship
10. Positive Attitude training

Customer feedback collection Team: This team will regularly contact the households they implemented the system and collect the feedback and handed over to innovation & Development team and to Maintenance team for further action. Innovation and research society providing skill training in following area to the volunteers

1. Waste management techniques (Solid, Water, Electronic, Plastic)
2. Energy conservation and energy efficiency techniques
3. Rainwater harvesting techniques
4. Natural Farming techniques
5. Inter personal relationship
6. Personality development
7. Public Behaviour

8. Patient hearing
9. Presentation skill
10. Communication Skill in local language

Innovation and Research Team: develop prototypes of innovative products according to the community need in waste management, energy conservation, Agriculture etc. Innovation and research society providing skill training in following area to the volunteers

1. Waste management techniques (Solid, Water, Electronic, Plastic)
2. Energy conservation and energy efficiency techniques
3. Rainwater harvesting techniques
4. Natural Farming techniques
5. Welding
6. Electrical works
7. Plumbing
8. Painting
9. Bio Gas setting and maintenance
10. Solar panel installation and testing

Product Development Team: Will manufacture/Assemble and conduct field testing of final products and support the implementation team. **Innovation and research society** providing skill training in following area to the volunteers.

1. Waste management techniques (Solid, Water, Electronic, Plastic)
2. Energy conservation and energy efficiency techniques
3. Rainwater harvesting techniques
4. Natural Farming techniques
5. Welding



6. Electrical works
7. Plumbing
8. Painting
9. Bio Gas setting and maintenance

10. Solar panel installation and testing

Each team is constituted by conducting orientation programme aptitude and attitude test to identify the right person in right place.



Techno mix poultry farming

Northamps ENV Solution

Areas of Operation

- Preparation of detailed project report (DPR) for integrated solid and liquid waste management.
- Implementation of solid waste and waste water treatment facilities for individual houses, institutions and commercial establishments.
- Operation and maintenance of existing waste management units.
- Implementation of conventional (low cost) and modern waste water treatment facilities for institutions and commercial establishments.
- Awareness programmes on segregation and scientific management of waste for educational institutions (FDP).

Aim is to promote decentralized waste treatment and provide awareness and consulting in implementing decentralized waste management system.

The mission is to ensure the delivery of an integrated, cost-effective, and environmentally sound waste management system, and to promote sustainable community programs and policies throughout Kerala.

Vision is to create a better environment, promote an eco-friendly life style, support individuals and

local authorities towards better waste management, protection and sustainability of the environmental and natural resources, and contribute to improve the quality of life.

Objectives

- Incorporate state of the art scientific methods in waste management and thereby improve the standards in a cost-effective manner
- Promote the individual and corporate responsibility plan in waste management.
- Build partnership with providers of waste management solutions who have a history of service excellence
- Ensure compliance with the established standards and strive for quality in work
- Build community awareness of the need to minimize the production of waste, and the need to consider solid waste management from an environmental perspective
- Ensure that the best practices are deployed in the solid waste management field
- Keep in line with the Government policies and objectives in solid waste management.
- Promote the value of waste as a resource.

Biopot units



Biobin Composting Units



**Northamps ENV Solution registered as a
Company in 2015**

**Key person attended: Sri. Zacharia Joy
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St.Teresa's College, a pioneering institution in the field of Higher Education in India, was established on 15th June in the year 1925, as the first Women's College of the erstwhile Cochin State and the second in the whole of Kerala by the Congregation of the Carmelite Sisters of St.Teresa.

The students of St Teresa's College, Ernakulam, Kerala, a renowned women's college in the state, are actively involved in initiatives to promote Swachh Bharat. A research project involving a waste audit of four Panchayats in Kerala revealed a phenomenal increase of plastic waste in general and plastic carry bags in particular. Hence, a social entrepreneurship initiative of college girls- Society of Teresians for Environmental Protection (STEP) - was envisaged in May 2016. The society:

- Promotes eco-friendly alternatives to plastic carry bags Bhoomithram Sanchis / college bags made of rexine (Prakriti Bags)
- Up-cycles textile waste from tailoring shops in Kochi city which would otherwise be burnt
- Grants employment opportunities to the Kudumbasree women of the Anti-poverty cell of the Cochin Corporation
- Provides entrepreneurial training to girl students so as to create avenues for self-employment in the future.

Attractive, trendy and compact bags that are used as alternatives to plastic carry bags are made in

various designs - ball bag, strawberry bag, zip bag, etc. Zero-cost T-Shirt bags are also prepared. The outer cover of these Bhoomithram Sanchis are made from upcycled textile waste. More than 1000 UG students admitted into the college this year support this entrepreneurial venture by using these products and functioning as youth brand ambassadors of eco-friendly alternatives- Prakriti college Bags and Bhoomithram Sanchis which they tag on to their college bags so that they always have a carry bag with them.

The students are also implementing a project in seven schools in two Gram Panchayats and in our own college in Kochi Corporation to improve awareness regarding the malice of plastic waste and bring about a sustained behavioural change among youth to use such bags. Our students are master faculty in eco-friendly alternatives to plastic bags for the 'Haritha Kerala' mission of the Government of Kerala. Video tutorials with instructions to manufacture the various cloth bags and an awareness documentary on the hazards of plastic waste have been prepared by students and uploaded on the Suchitwa Mission of Kerala website for public access.

Students have also trained more than 1000 Kudumbasree members in 80 Panchayats in Ernakulam District and various self-help groups in the other districts of Kerala in stitching such bags. In rural areas the common strategy is to encourage people to get their own old clothes upcycled into such trendy products at very reasonable rates using the paid services of SHG groups.

The college is also implementing 'Ente Haritha Bhavanam' project in association with District Administration and Suchitwa Mission to promote



green habits- green protocol- among 1000 student households with the vision to extend it to 5000 households in one year.

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Hi tech bio fertilisers India

The organization started in the year 2002, to address the challenges of solid waste management faced by the cities of Kerala with a vision of “CLEAN INDIA GREEN INDIA”.

The Aim is to create role models of eco-friendly, economical, self-reliant, self-sustainable rejection management system at source.

Achievements

Design and development of composting equipment.

a. Community level composting:

Developed light weight FRP bio bins, suitable for community level aerobic microbial composting at source. The bio bins are in the size of 180cmx90cmx75cm, one unit (2 bins) will have the capacity to handle biodegradable rejections generating daily from 40 apartments. By investing Rs.2500/residence the facility can be installed. The compost generating will be 20% of the input material. It can be used as farmers friendly organic manure.

- Since 2007 onwards, the bio bins developed by us are being using in almost all the high raised building complexes in Kerala.
- 4000 bio bins are in operation.
- 80,000 residents are benefitted.
- 1250 persons are employed, majority are women from the low-income families.

- 2400 tons of biodegradable waste processing in aerobic microbial composting.
- 480 tones compost generated per month (20% of input material).

Composting for individual houses

Bio digester clay pots: Supplies bio digester pots having the size 30cm diameter and 30cm height. One unit will have three bio pots with a capacity to process 2kg biodegradable wastes daily to compost.

Biogas plants: Makes biogas plants of various models. R&D department developed closed dome type biogas plant which is free from foul smell and mosquito breeding. Already installed various models in different capacity ranging from 2.5kg to 2 ton/day. The product of the biogas plant is liquid organic manure enriched with micro nutrients and plant friendly bacteria. Above 3000 beneficiaries are using the biogas plants installed by Hi tech.

Usage of slaughter and chicken stall waste

Hi tech developed and introduced special purpose grinders for reducing the size of all biodegradable rejections to juice form. The size reduction of organic materials enhances the capacity and life span of biogas plants.

Conversion of septic tanks to biogas plants: Hi tech developed new designs for converting septic tanks to biogas plants.

Prevention of ground water pollution due to discharge from septic tanks: Hi tech designed biogas to septic tanks in such a way to prevent the discharges from septic tank joining the underground water. The septic tank discharges can be used for gardening after proper filtration, the pathogens developing in the septic tanks get naturally destroyed in the presence of oxygen and ultraviolet rays preventing ground water pollution.

Introduction of plastic for road tarring: In 2008, Hi tech introduced usage of shredded plastic for road tarring. Using the plastic shredded by Hi tech roads in M.A. College Kothamangalam, Rajagiri College Kalamassery, Manappatippambur Road at Kochi corporation, Gosree bridge road near High Court, were tarred using shredded plastics. Hi tech also supplied plastic shredding machines to various local self-governments and took initiative to convince state government, the viability and need for its usages for road tarring. Recently government declared the usage of plastic in road tarring as a government policy.

Initiative to create role model at Kochi Corporation:

In 2006, Hi tech installed bio bins in the shoulder road at Palarivattom Bypass, Ernakulam to demonstrate the eco-friendly management of waste generated from the residences of Vennala Division of Kochi Corporation.

Clean Kochi movement

Hi tech taken initiative to enable residences of high raised apartment complexes to handle their own waste at source with the slogan “Do not mix.

Provided separate containers for wet and dry waste in the residences. Conducted education and awareness classes with the help of builders’ fraternity in Kochi. It was a relief to Kochi Corporation as the Corporation did not have proper waste handling facility.

Introduction of SWM system at Technopark, Trivandrum

The 25-year-old Techno park, Trivandrum, the biggest IT park in the country providing employment to 50,000 employees spread over 165 acres of land housing 350 companies didn’t have ecofriendly waste management system till 2013. Due to closure of Vilappilasala dumping ground, the park decided to introduce SWM system at their own campus. Hitech prepared DPR and introduced an integrated eco-friendly economical SWM system, in the year 2014. 3tons of biodegradable waste are processing in biobins and biogas plants whereas non-biodegradable rejects are sorted at the material collection center and forwarding to recycling units. The unit is now a destination of solid waste management training programmes



conducted by Suchitwa mission, Government of Kerala.

Services to government hospitals

Hi tech provided biogas plants to the ESI hospital, Ernakulam. The plant with a capacity of 50kg of food waste is running very well for the last four years.

Sewage waste and waste water treatment

The sewage waste treatment plant with a capacity of 2mld, constructed by Hi tech during the year 2010, at Nangelil Ayurveda Medical College, Kothamangalam, Ernakulam district still functioning without any operational issues. This is one of the major plants designed by us.

Recognitions to our work

Hi tech won the best technology award for the period 2008 from the Minister of State Mr. S. Sharma for the best works done in the Kochi Corporation.

Entry in Solid Waste Management manual 2014

The best role model recorded in the Solid Waste Management manual 2014, in the Page No.93 in the head “Decentralized waste management system for apartment complexes, a public private initiative in Kochi” is about the biobin technology introduced by us in association with builder’s fraternity of Kochi.

Hi tech initiative to create role model assembly constituency for “Swachh Bharat”

Hi tech joined hands with the Ernakulam district Suchitwa Mission targeting Kothamangalam assembly constituency as zero waste constituency. It includes 8 gramapanchayaths and one municipality. The population is 2, 50,000, housing in 75,000 residences.

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Hitech bio fertilisers India is a sole proprietorship firm registered in 2002

**Key Person attended: Sri. Jose Joseph Moonjely
Managing director**

Waste Management

REDUCE, REUSE & RECYCLE

Back in 1999 recycling began at Amritapuri Ashram. Rather than just throwing trash into the landfill, proper sorting makes it useful again and saves precious natural resources. The Ashram recycling program has grown and expanded dramatically over the years. Now more and more items are separated to maximize their recycled use. Detailed sorting makes it easy for the items to be reused rather than going to a landfill.

The Recycling Centre is a source of inspiration and education to thousands of Ashram visitors. The visitors see Amma's teachings being realized and are inspired to do more recycling themselves.

Sorting is the heart of recycling. The items are sorted in the following categories: Hard plastic, soft plastic, glass (unbroken and broken sorted separately), clear water bottles, aluminium cans, scrap metal, different quality of paper and cardboard, used electronic items, medicine "blister" packs, bottle tops, used batteries, milk packets, food waste, "Tetra" packs, burnable wood and coconut shells, quality clothing and other reusable items.



How It is Done

There are about six recycling stations placed around the Ashram. Stations are set up to be the first stage of sorting. At the stations residents separate their trash into paper, recyclable items (hard plastic, glass, metal, etc), soft plastic, food waste and garden waste (leaves, sticks, coconut shells, etc). Signs at the stations indicate which bins are for which items. With this system Ashram

residents learn to sort their trash and be more aware of what they throw away.

Once or twice a day trash is collected and all waste is brought to the Recycling Center for detailed sorting. At the Centre two sorting tables make it easy and fast to do all the detailed separation. Volunteers gather around the tables and separate all the trash into bags. The sorting tables makes it easy for volunteers to trade stories and jokes during the sorting, thus building community spirit among people from all over the world. Amma's bhajans and chants play in the background accompanied by the sharing and laughter of the sorting team.

Once the bags are filled, they are tied and properly labelled. On a regular basis the sorted and bagged waste is transported to the large Amrita Institute of Medical Sciences (AIMS) hospital which has a system for transferring the sorted items to organizations which recycle and reuse it. AIMS has its own large recycling centre. Some of the bags also go to Amrita Ettimadai University which sends it to other recyclers.

Reduce, Reuse, Recycle

Also, all usable items, which people donate to the ashram instead of throwing away, are cleaned, repaired, and eventually reused by someone else. In this way, less plastic or other waste materials need to be sent to landfill or burned, protecting the atmosphere from toxic fumes. Moreover, the amount of new raw materials produced is also

reduced. If, e.g., plastic containers are reused, less new plastic needs to be produced. The same holds true for cloth, metals, glass, etc.

Even though plastic, paper, glass, and metal can be recycled, this process uses quite a large amount of water and electricity. So if objects made from these materials are in good enough condition, it is even better to reuse them directly. This is Amma's way of recycling.

The waste collection is done using bicycles. The sacks of waste collected from bins and brought to the recycle centre at the campus are sorted out properly and recycled. Food waste and other kitchen waste are used to make compost.



Organic Waste Converter

OWC 500 combines both the shredding and mixing actions: the food waste is mixed in the rotating tumbler and at the same time shredded by two sets of blades attached to the inner side of the tumbler. This ensures a final mixture made of small particles which allows a faster decomposing process. The machine can process up to 170 kg of food waste at a time. Before loading the machine, the food waste



is sorted manually to remove any non-organic item such as plastic bags etc. Coco peat and shredded waste paper and cardboard are added to the food waste and mixed together in the machine. Beneficial bacteria are also added to help the decomposition process. After 15 minutes, the mixture falls on a conveyor belt to be collected in a wheel barrow and piled on the ground. Besides saving time and effort, the main benefit of the machine is to make a very homogeneous

mixture that turns quickly into compost. It saves time and the final product will probably be of better quality. The compost is used the garden to grow organic plants and vegetables.



Paper bags made by the women of the villages that are part of Amma's Amrita Serve project- a source of income for the women

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12 Green Worms

Green Worms, Kozhikode A social impact enterprise, committed to provide sustainable and scientific solid waste management solutions. Green worms work on three principles, Minimize the Waste generation, maximize waste recycling, dignify people working with waste. Green worms offer various Products and services of composting and recycling which meets the requirements of various waste producers. • Apartments / Villas • Hotels and Restaurants • Shopping malls, other commercial establishments • Hospitals • LSGI, ULB, Corporations

Community and Household wet waste composting solutions.

Green worms developed various manual and mechanical composting solutions both for the small scale and large scale wet waste composting requirements. The current customer base is apartments, Schools canteens and individual



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households. The composting solutions are easy to operate, faster and foul odour free.

Events Waste Management services (weddings, conference, exhibitions, etc)

This is a novel concept; Green worms is the only sustainable waste management company in Kerala who provide this professional service. Green worms help the event organizers to manage their waste sustainably and scientifically whether it can be simple wedding to multi lakhs people attending conferences. successful in organizing many zero waste weddings and conferences in Kozhikode, Malappuram and Wayanad districts.



Apartments and shopping malls waste management services

Green worms provide complete waste management services to bulk waste generators like apartments, housing villas and shopping complexes, etc. Follow a decentralized model,

compost the wet waste at the source itself and recycle the dry waste by transporting to green worms recovery centre. This will include the training of the staff and awareness programs with waste generators.



Waste management and literacy trainings to Schools, Colleges and similar institutions.

We strongly believe the waste management problem can be solved easily, only if there is attitudinal shift from waste producer itself. We impart practical and hands on training to students, youths and adult on various aspects of waste management in which they learn the basic principles of waste and its management techniques.



Setting up Waste Recovery Centres for Private and Public sector agencies

Green worms help to set up small scale waste recovery centers where we install suitable composting systems and the dry waste segregation and recycling unit. We believe the small units of such waste recovery centers would solve the larger picture of waste issue in India.



Municipal Solid Waste Management Consultancy to Local Self Government's.

We do assist the government bodies to prepare plan for the MSW and helps them to execute the projects scientifically. We have worked with a couple of LSGs to modernize their waste processing plants and recommend strategies to implement it.



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