2018, Excellence Award Entry

Categogry	:Composting system
Entrant Organization	:RUR Greenlife Pvt Ltd
Contact Person	: Mrs. Monisha Narke
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Title of the Entry	:Decentralized and Sustainable Composting system by RUR Greenlife Pvt Ltd.
Jurisdiction	:Mumbai, India, Maharashtra, India 400016
Population	: 18 million
Cost per household for project	:90 USD, Fixed one time investment

Executive Summary

RUR – Are you Reducing, Reusing, Recycling? is a socio-environment organization, started in 2009, evolved to provide end-to-end cradle-to-cradle approach for urban waste management. Our vision is to create eco conscious citizens who make their waste worthwhile for the planet by adopting good green practices. We design, build, install and train customized turnkey waste management solutions for homes/schools/organizations, both decentralized and sustainable.

Under composting system category, RUR provides a unique in-vessel technology solution, driven by sustainability and circular economy. The aerobic composting in RUR's Greengold biocomposter - patent filed replicates the forest way of recycling and produces nutrient rich organic compost. We believe we deserve to win as our systems are unique, decentralized, replicable and scalable leading to higher mitigation of GHG and supporting enhanced green cover. Our current impact is over 1 tonne of kitchen waste and horticultural leaves daily being composted, over a 6-8 weeks cycle time across 40 decentralized project sites.

https://www.youtube.com/watch?v=PdOwQubs3k8

Section 2: Design and Planning of Composting System

2.1. Planning Thought-process

RURs concept of bio composting system was established keeping circular economy as the core factor. The model is essentially *decentralized* which ensures maximum waste is recycled in-situ resulting in very low to negligible carbon footprint. Our goal is to ensure that waste is not transported to landfill causing green house gas emissions.

Our design focused on maximum bio waste being treated in-situ, transforming it into rich, stable and 100% organic compost which is again used to create/maintain green cover on site. We "*Gives earth back what the earth gives us".*

2.2. System Design Approach

RUR began as a volunteer forum in 2009 and many joined our mission to spread awareness about segregation at source. . However it was getting mixed downstream due to city's collection and disposal pattern . This later resulted in diluted motivation to practice segregation and we realized there was a lack of technology to bridge the gap between citizens and solutions for waste management. Visionary Monisha Narke, founder of RUR Greenlife then decided to design a state-of-the-art model to manage the waste at source. Daily trucks plying across the city , as well as air pollution levels rising causing

respiratory symptoms to many citizens, that lead to design of systems that's decentralized and sustainable for waste management.

Additionally, being passionate for environment, the inspiration for the design was adopted from the forest. It was important to keep the process of composting natural and simple in order to map it to the overpopulated and overly polluted metropolitan city. The composting process was adopted to bring about carbon mitigation by diverting 80-90% waste generated at source towards recycling. While practicing bucket composting on smaller scale, it was observed that key parameters required for efficient composting process is an optimal balance of ATM (Air, Temperature and Moisture). Thus the system design was going to be essentially aerobic, insulating and capable of removing excess moisture from the system.

Thus, the model includes a holistic solution of training, sensitization and awareness of citizens about importance of segregation at source into 3 bins viz. biodegradable, dry recyclables and nonrecyclables, which further culminates to responsible treatment of each type of waste. The biodegradable waste is added into RUR's GreenGold aerobic biocomposters (RGGC). The dry recyclables are further segregated into seven categories viz. thin guage plastic, thick plastic, paper, cardboard, metal, e-waste, Tetra Pak cartons and passed on to the chain of organized recyclers. The trash component is currently landfilled which is 10% of the total waste generated at site. This is gradually reduced by creating awareness about adopting good green practices.

The biodegradable waste is treated on site in RGGC, which was designed to make the system affordable and attractive to the bulk and small waste generators. Being sustainable, the key was to make it zero energy and use mechanical gear based system for easy operation.

2.3. Important Design considerations

To summarize, following were the key points taken into consideration while designing the composting system

- Decentralized
- Non electrical
- Aerobic
- Portable
- User friendly
- Odourfree
- Pestproof
- Affordable
- Durable
- Simple
- Sustainable
- Asthetically pleasing

2.4. Composting System Design

The equipment consists of the following components:

1) **Rotating Tumblers** - These are made from recycled HDPE. They are light weight for

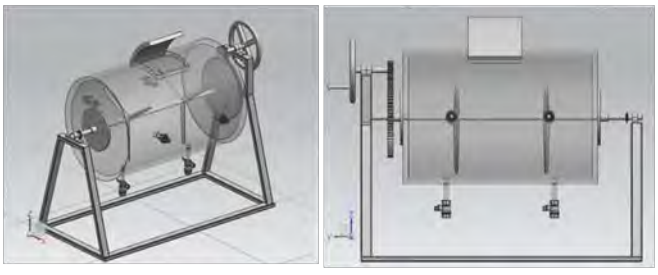


Figure 1. Schematic design of the Composting Sytem (RGGC)

ease of transportation, ensure high insulation for the process, and compact for rotation (Figure 1). Thus, when the composter gets heavier during process of decomposition, the light weight system helps to reduce overall load up making it easier for rotation. The tumblers are designed in 4 different sizes in order to cater to different input waste quantity (Figure 2).

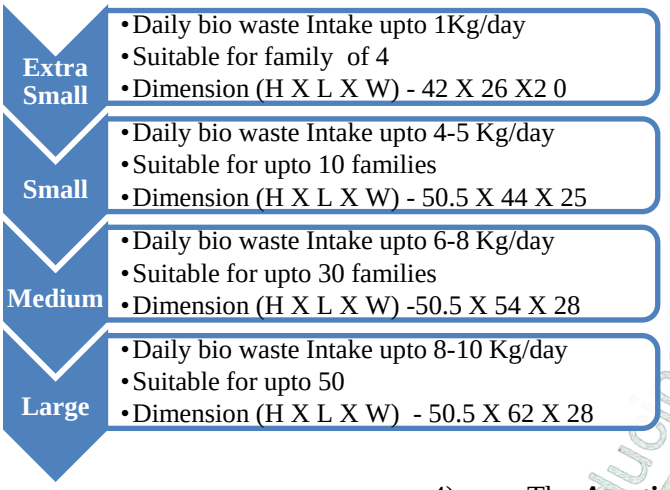


Figure 2 Available models of RGGC

2) **Manual gear -** A simple double gear mechanism for rotating the tumblers for aeration preventing any use of energy/power during the process. Overcomes high consumption of power in some existing systems.

3) All connecting parts are made in SS making it rust proof

4) The ***Aeration Port*** for RGGC is RURs innovation. This scientifically designed aeration port allows air to flow into the system from a cylindrical aeration port with that closes the holes during rotation of the tumbler. This ensure that the excess water generated through the process (compost tea) does not leak out into the system space area and spill over the walls of the tumblers making it a safe/hygienic and clean process.

- The Aeration Port breathes air into the system core as the chamber of the port is a cylindrical tube that goes all the way inside the core of the chamber and then ended into a T-shape pipe design at 90 degrees with extra holes for aeration, thus preventing any air holes getting clogged by decomposed waste matter inside the chamber during the process. This ensures continues aeration of the system in a good balance and replicating nature with high oxygen levels and leading to very low to zero levels of methane gas generation. Each system has the aeration port strategically placed such that it is above the level of load up of waste in the chamber keeping all the air entry pathways opens and allowing airto mix up well with heated air generated by the exothermic process and thus keeping temperature in optimum balance for accelerated composting process. This feature overcomes the surface system air vents that can get easily clogged and also allow the liquid/ leachate from inside the chamber to leak out everywhere.

5) **Drainage Port** – RUR's GreenGold composter has a special drainage port at the bottom that can be opened during static state of the system allowing both aeration and localised collection of liquid generated by process (fungicide) into a collection container; thus keeping it clean/easily collectable and safe for use in the garden. This eliminates stagnant water thus preventing unclean surrounding and breeding of mosquitoes.

6) The lid of the chamber is made from stainless steel and sealed with silicon gaskets to ensure that it is leak proof and easily cleanable. The lid is light weight making it easy to open and close for loading and unloading.
7) The inner chamber also has angular vanes designed like a fan across the centre rod for moving the waste matter inside the chamber and not allowing it to lump up on sides.
8) The equipment is patent filed (Indian Patent#201621007373) and certified as innovative green product by Confederation of Indian Industry and Indian Green Building Congress - 2017.

2.5. Compatibility of composting system with local governemnt

As per Ministry of Environment and Forest Mandate of 2016, all gated premises generating more than 100kg of waste are expected to segregate and compost at source. Swaach Bharat (Clean India) is a campaign driven by India's Prime Minister where decentralized composting is highly encouraged through media. We support the local solid waste management by reducing the burden of waste going into landfills. RURs bio composting model aligns and works on the principle of decentralized system that cuts the carbon emissions involved due to transport of waste and unhygienic environments at centralized sorting facilities. India is a tropical country and provides an excellent atmosphere throughout the year to bring about natural transformation of biodegradable organic matter to compost via aerobic decomposition. Decentralized systems are therefore more sustainable and hence are favored over centralized composting facilities.

2.6. Merits of RGGC

Composting through RGGC offers a payback model to the consumers by producing high quality compost used to maintain the green patch in the complex or terrace gardens. One Time capital investment with minimum operational costs makes this an economically viable solution.

Through nearly 40 decentralized projects managed by RUR Greenlife, nearly **400 tonnes of biodegradable** waste annually is recycled into organic and nutrient rich compost at source, resulting in mitigation of approximately 4 tonnes of carbon dioxide equivalent generated due to transportation of waste to the landfills from the site of generation.

It should be noted that RGGC is a mechanical biocomposter driven by double gear mechanism negating the requirement of electrical consumption. Additionally, the process does not involve any commercially synthesized accelerator further reducing operational cost to minimal for the operator. Therefore, technically speaking the composting system provided by RUR is essentially a onetime investment for the client for a long term solution. The compost tea is reused in gardens making the system have zero water footprint compared to other conventional electrical composting solutions. The compost brings about land

remediation and adaptation to climate change. We also sensitize people through various training modules to become eco-conscious bringing in change in mindset towards sustainable lifestyle.

2.7. RGGC a Unique system

Most unique aspect of RUR Greengold Bio Composter System- RGGC is that it ***replicates nature***. There are no artificial additives or laboratory made cultures inoculated to bring about composting. The natural flora is established and appropriate conditions are induced by balancing the carbon:nitrogen ratio. Naturally locally available additives such as cowdung, amrut jal (a mixture of cow dung and cow urine and jaggery) serve as source of lignocelulolytic bacteria and fungus. Compost from the previous harvest is used as inoculum to establish the beneficial microbial community. The pile is allowed to undergo natural decomposition and follows the mesophilic, thermophilic and mesophilic phase of degradation. Plenty of Black Soldier Fly larvae are seen during the active phase when the moisture content and fresh waste is abundant. These larvae again act as process accelerator and actively feed on fresh waste and fade away eventually once the transformation of waste has occurred. Such an autodriven process in an urban setup is a fundamentally magical creation. there is no carbon footprint associated with manufacturing and transport of such accelerators making the process holistic.

Being well balanced and aerobic, the system is odour free, hygenic and clean at all times.

Each pile in RGGC is small and easy to maintain, portable, scalable and cascadable. This provides flexibility to the consumer to adopt the practice in a phase wise, and thoroughly understand the process.

2.8. The Composting Process in RGGC

As per the EPA guidelines, composting is the controlled process whereby compostable organic wastes are pasteurized and microbiologically transformed under aerobic and thermophilic conditions for a period not less than six weeks, including the pasteurization phase. The composting process adopted in the RGGC is essentially the forest's way. We have nearly 40 decentralized waste management sites carrying out in-situ waste management practice. For sites that possess large cover of yard waste, a high speed shredder is recommended to shred the twigs, branches, fronds, leaves, coconut shells, which then become suitable for composting and act as nutritive bulking agent.

2.8.1. Principle of composting in RGGC

The principle of the equipment is very simple; it involves addition of biowaste and dry leaves/saw dust in 2:1 proportion to maintain C:N ratio in final compost produced, and ensures balance of three key parameters ATM (Air, Temperature and Moisture) for the process during breakdown in three main stages: an active stage, holding stage and curing stage.

Air circulation in the pile is maintained with the help of Innovative Smart air vents for which a patent has been filed (Indian patent # 201621007373). Further, secondary aeration is provided due to rotation of the pile, which is facilitated with double gear system, in order to ensure easy rotation. A special vane

mechanism is in-built for allowing the pile to mix up well while it loses excess moisture and not get too lumpy.

The temperature is maintained optimally within the pile, as it is held in an enclosed HDPE tumbler. Additionally, the aerobic environment ensures that the breakdown of the biowaste occurs via aerobic method, which is an exothermic (heat generating) reaction. Thus, during the active degradation phase, temperature of the pile is maintained above 45 degree Celsius.

The moisture balance is another key parameter to ensure aerobic degradation, as excessive moisture retention in the pile will result in anaerobic pockets in the pile. The moisture is balanced with help of simple drain valve mechanism, wherein the excessive liquid that is generated during the composting is released out of the system, which is recycled into garden soil as a soil conditioner after dilution.

Principally, during the active stage, the fresh waste is added along with dry leaves; bacterial population establish during this stage and carryout initial degradation; due to which the temperature of the pile increases creating a favorable environment for fungus, which are lignin degraders. The fungus secretes variety of enzymes that result in degradation of the dry leaves and saw dust during high temperature. The final stage of degradation is completed by actinomycetes resulting in formation of humus, which imparts the rich earthy aroma to the degraded biowaste.

2.9. Compost Harvest:

Once earthy aroma is developed in the tumbler, it is harvested manually by rotating via handle. A simple mechanism of holding the lid open via clip is installed to ensure hassle free harvest.

Figure 3. Composting process depicting circular economy

2.10. Curing:

The harvested compost is allowed to mature further in an open and shaded area.

During this stage, further humification and moisture balance occurs. Excess moisture is evaporated and the compost attains right texture and moisture balance. At this stage any residual heat is dissipated and compost attains the desired stability. Curing stage can last between 2-3 weeks depending upon the time of harvest. Post this stage, the compost is either sieved to obtain fine compost for longer shelf life or applied to soil directly. Few large scale sites opt to shred the

obtained compost if desired. The entire process of compostingand the concept of circular economy is depicted in Figure 3.

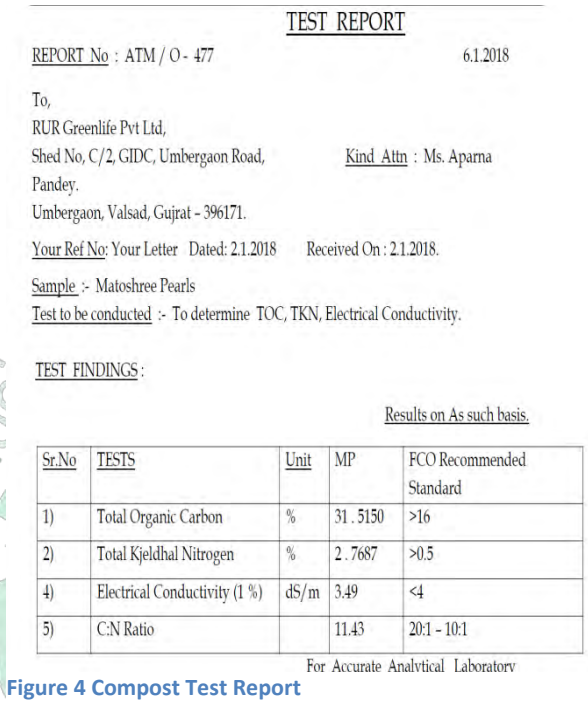
The obtained yield of compost is 20% of input biowaste, as the process ensures a 45-60day period to accomplish this. The daily waste input is weighed and recorded in a data logger to keep a close monitoring of the process by the operator. The pile is turned twice a week manually to ensure proper aeration.

2.11. Scientific monitoring of process:

We also monitor pH and temperature of the compost pile during each cycle to ensure continuous aeration of the process. Statistical analysis is carried out at the end of every cycle of composting, and the yield, cycle time and input waste is quantified.

The compost obtained is routinely tested for the key nutrient parameters such as Nitrogen, phosphorus, potassium, organic carbon and C: N ratio and is found to comply with BIS standard of compost. (Figure 4)

Finished compost takes on many of the characteristics of humus, the organic fraction of soil.



TEST REPORT

REPORT No : ATM / O - 477 6.1.2018

To,
RUR Greenlife Pvt Ltd,
Shed No, C/2, GIDC, Umbergaon Road, Kind Attn : Ms. Aparna Pandey.
Umbergaon, Valsad, Gujrat - 396171.

Your Ref No: Your Letter Dated: 2.1.2018 Received On : 2.1.2018.

Sample :- Matoshree Pearls
Test to be conducted :- To determine TOC, TKN, Electrical Conductivity.

TEST FINDINGS :

Results on As such basis.

Sr.No	TESTS	Unit	MP	FCO Recommended Standard
1)	Total Organic Carbon	%	31 . 5150	>16
2)	Total Kjeldhal Nitrogen	%	2 . 7687	>0.5
4)	Electrical Conductivity (1 %)	dS/m	3.49	<4
5)	C:N Ratio		11.43	20:1 - 10:1

For Accurate Analytical Laboratory

Figure 4 Compost Test Report

Section 3: Use of Equipment/Systems and Technologies

3.1. Equipment setup for efficient composting system

Pooling the ideas, RUR designed a system made up of HDPE horizontal tumbler supported with 4 smart air vents provides insulation and continuous aeration respectively creates a state of the art equipment which is capable of carrying out exothermic process and closed loop system. Simple drain valves allow optimal moisture balance by releasing excess moisture out of the system. The system is mounted on MS frame which provides sturdy and durable support system. In order to ensure proper mixing, the tumbler is provided with handle mounted on double gear for easy rotation. The equipment is designed to be compact and a single unit requires only 25 sq. ft area for operation. It is thus ideal for an urban setup.

The composting system is formed via a consortium of equipments working closely to bring in systematic, simple, traceable yet effective solution that is easy for understanding and operation by a layman. This includes

- **RGGC :** This is the core equipment that brings about transformation of biodegradable waste to organic compost.
- **A shed :** Since the process of composting is a scientific balance of ATM, a shed is constructed to protect the equipment from direct rain and sunlight. The shed is also generally walled with bird net or a metal wire mesh to ensure the area is pest/rodent/animal proof and well ventilated simultaneously.
- **Weighing scale:** In order to quantify the ongoing process of composting, and overall impact of waste management solution in terms of recycling and GH mitigation, it is essential to weigh the waste prehand.
- **High speed shredder:** For an organization with existing large green cover, it is advisable to install a high speed shredder to shred the sturdy yet biodegradable horticultural waste. The shredded yard waste can then be composted in RGGC or used as mulch.
- **Thermometer and pH paper** are substantiated for scientific evidence and evaluation of the process.
- **Accessories such as Sieve, rake:** Sieve is used to obtain the appropriate particle size of the compost. Rake is used during the active process in order to ensure that no anaerobic pockets are created in the pile during the active process. Since it is a tumbler based technology, formation of lumps is a common occurrence, which needs to be broken manually and periodically with an aid of a rake.
- **Curing Bin :** Post the partial breakdown of biodegradable matter, the material is removed and allowed to mature under shade to acquire the earthy aroma , rich texture and the desired bulk density. The process of curing can be as simple as spreading onto jute sheets or creating a bricklined shallow above-the-groound pit to ensure proper ventilation and access.

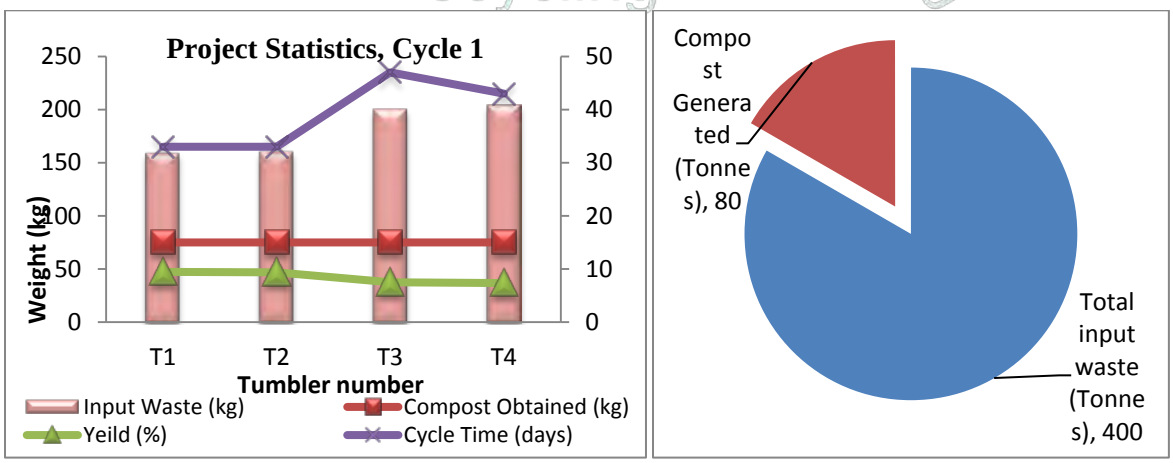


Figure5 Total biodegradable waste diverted from landfills versus compost generated.
Figure6 Sample Project Statistics (Site –Matoshree Pearls, cycle 1. Site consisting of 4 bio composter tumblers).

Composting through RGGC brings about 85-90% reduction in the input waste and results in a 10-15% compost yield over a period of 6-8 weeks cycle time. One of the decentralized project statistics is depicted in Figure 5 and 6.

The system is highly efficient and requires two laborers for a period of 3-4 hours a day to manage a project site of 100kg/day and there is no system downtime.

Section 4 : Regulatory Compliance

4.1. The Regulatory Law:

Landfilling has been a pivotal waste management solution by the local municipal corporations for decades. Mumbai , India alone generates about 8,000 Mt of waste daily, dumped into Asia's largest dumping ground located at Deonar. The mixed waste generated from households and industries are collected at points and designated vehicles carry it to the landfills generating carbon dioxide during transportation and other greenhouse gases viz. methane, nitrous oxide, and carbon dioxide. Methane is approximately 21 times more potent than CO2, while nitrous oxide even though generated in miniscule quantity, is 310 times more potent than CO2. There have been several fires reported from the dumping grounds leading to climate change. According to a report published by Intergovernmental Panel in Climate Change (IPCC) 2015, there is a steep rise in global CO2 equivalent emission to 10million metric tonnes in the year 2014. Rapid generation of green house gases generation have created an alarm, and the KYOTO protocol proposed in the year 2010 highlights the importance to reduce the GHG emissions with special emphasis on developing countries; an aim to reduce emissions by at least 5%. Alternative practice to reduce the methane emission is controlled incineration which releases CO_2 and partly provides solution to compact the volume of waste generated. However, these current practices of collection, transportation and disposal of solid waste follow the policy of linear economy which is not sustainable and lead to climate change.

4.2. Odor mitigation:

As mentioned above, the projects are decentralized, each project site individually handles a daily input from 2 kg to 200kg but not more than that. Anything beyond this capacity is broken into smaller systems to make it sustainable and manually manageable. Owing to smaller project sites which follow the forest way of recycling, there is minimal odor generation on-site. The odor if generated is attributed to volatile organic acids generated during the breakdown of waste; this is mitigated by 2 methods

- **Equipment design** – RGGC is an enclosed system that contains odour. Specially designed gaskets ensure no leakage occurs eradicating possibilities of odor generation.

- **Additives :** The volatile acids are neutralized by addition of pinch of Ash thereby neutralizing odour. If the odour is ammonical, it is due to anaerobic air pockets in the compost pile, in such cases saw dust/cocopeat/shredded dry leaves is added and the tumbler is rotated to aerate the pile. The bulking agents help absorb excess moisture which creates barrier for air circulation throughout pile. The housekeeping staff is given a graded pH paper strip which they use to check the cause of odor. The pH color reaction makes it simple for the staff to understand the cause of odour and take required action to the problem (Figure 7).

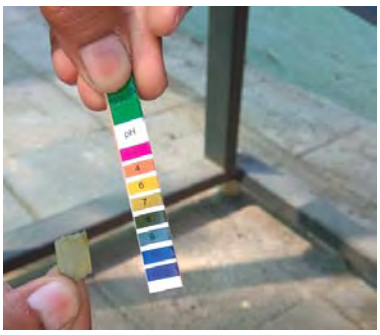


Figure 7 pH Test of Compost Tea

- **Biofilter :** As a preventive measure biofilter of shredded leaves is created (1-2 inch thick over pile) to mitigate volatile odorous molecules.

Figure 8 Temperature of an active pile recorded

4.3. Pathogen Reduction:

Safety is of utmost importance in RURs composting systems. Fertiliser Control order (FCO) which is standard used for city compost parameters, does not specify pathogen limit. However it does mention zero pathogen presence in organic fertilizer. Human pathogens are extremely temperature sensitive and most do not survive temperatures beyond 42ºC. Composting is an exothermic reaction, and a well balanced pile attains a temperature of 60ºC and above (Figure 8). This temperature is maintained for atleast three consecutive days to ensure sanitization of pathogens if any

4.4. Fire Safety:

Since the machine is aerobic and manual there is no fire hazard in our composting sites.

4.5. Endorsement by third-party:

Our Project 'Green Gold Bio Composters' was shortlisted in Top 3 nominations under the category of Solid Waste Management at the 3rd Smart Cities India Awards 2017.

- Monisha Narke, Founder, CEO RUR Greenlife Pvt Ltd was awarded the Entrepreneur of the year 2017 in service business under cleaning category organized by Franchise India.
- Additionally, Our decentralized projects have been appreciated by local media and Municipal corporations (Figure 9).
- RGGC has been certified as innovative green product by Confederation of Indian Industry and Indian Green Building Council.(Figure 10)
- Media Coverage:
    - *https://www.youtube.com/watch?v=qnU5hD_DpkE*

- https://www.hindustantimes.com/mumbai-news/mumbai-housing-complex-spends-1-5-lakh-reduces-its-landfill-waste-by-90/story-LTk70XpPwAG1ZM3QpCIxDM.html

- Accolades:
  http://rur.co.in/accol2.html

Figure 9 Certificate of Appreciation by Municipal Corporation

Figure 10 Green Pro Certificate

Section 5: Worker Health & Safety

Key features of RGGC include leakproof, and concealed environment that restricts interaction of waste with the person managing the site. The only interaction happens during the loading and unloading of the composter and secondary segregation of fresh waste.

During handling of fresh waste, the workers are provided with Personal protective equipments such as gloves and masks. Additionally, sanitizers and antimicrobial soaps are used for post operation sanitization. The composting pile auto-sanitizes itself due to exothermic reaction, and makes the final harvest is safe to handle.

Adequate danger signages are put up near the double gear as warning signal to ensure safety of handler. Safety instructions pertaining to operations are given during the installation and training program. Safety measures in a language understood by the worker is laminated in form of a poster and placed in a direct visible zone in the compost station.

There have been no injuries till date due to operations and equipment handling.

Section 6: Performance, Economics & Cost-Effectiveness

6.1. Success of Composting Program:

The process is analyzed during the course of composting cycle, parameters such as pH, temperature, odor, moisture balance is monitored. However, the final measure of composting success is analyzed practically by application to plants. Our model essentially closes the loop on-site and the compost generated at each

site is used to create organic fruit and vegetable gardens or maintaining the existing garden (Figure 11). Additionally, we also encourage our clients to create organic terrace gardens to create greener patch. The compost generated is mixed with equal proportion of red earth and used as potting mix to grow seasonal and perennial fruits, vegetables and flowers. The blooming gardens are clear indication of successful composting method. We also check yield of compost to be in range of 10 to 15 % to ensure maximum decomposition of the bio waste.

6.2. Key Learnings

Scale up of model size from medium to large showed us some interesting facts about the breakdown and we observed that increasing the size of the pile changes the equation for in-vessel composting and better pile management is recommended.

Figure 11 Terrace garden created using home grown compost

We also observed the seasonal variation brings about drastic change in the process; the odor problems are more prominent during monsoon and the cycle time increases, while the season between November to June is most conducive for composting. During this season temperatures are attained exponentially fast and maintained long term without much effort. Additionally there is also no odor in the premise, and the cycle time is shorter than monsoon, sometimes earthy aroma from the compost pile is attained within 3-4 weeks from inception of batch mode of composting.

6.3. Development for next quarter

We aim to attain shorter composting cycle by using natural accelerators and making it less labour intensive by reducing the frequency of rotation. Additionally, we also plan to reduce the space requirements for composting by chopping the wet waste and dry horticultural leaves which will increase surface area for microbial interaction, thereby faster composting cycle. This will result reduced hold period and hence shorter cycle time and finally lower space requirement.

We also aim to salvage the dry horticultural waste being landfilled. We have launched a program called *Linking leaves* wherein the organizations generating excess horticultural waste to complexes carrying out composting and do not have sufficient green cover, resulting in sustainable solutions for yard waste.

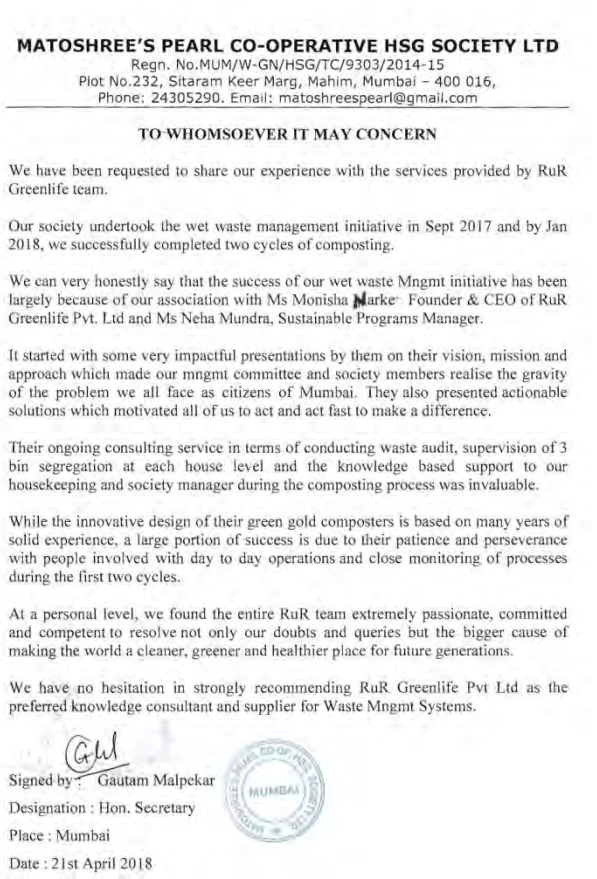
6.4. Downtime:

Being mechanical and connected in cascades, the equipment does not have a downtime. If an issue is encountered with one equipment, another one takes the load, and the waste does not leave the premise. The downtime is reduced by routine servicing of the equipment. During the first year, four routine services are given to the client to maintain the equipment, while during successive years annual maintenance contract is offered to client and two visits are given annually for maintenance and upkeep of equipment.Routine greasing of the gear ensures that rotation is smooth.

6.5. Customer satisfaction is of prime importance to us. We provide fortnightly/weekly scientific visits and training sessions during the first two cycle of composting. Additionally we provide 6 month back end support to the client too as part of the project.

We analyze the services and customer satisfaction through biannual survey and testimonials from the existing and new clients, and we incorporate all possible suggestions from the client.

"RUR has a team of very wellfounded scientists and engineers. They provided us with all relevant equipment for managing our garden- and kitchen waste. They come when required and actively follow up with us on the composting process going on in our tumblers. Their interactions with us are in such a way that we (initiators as well as staff) get to learn to manage the composting process on our own. They have heart for the case and are committed to doing the best possible for the environment which goes well beyond composting alone. RUR embodies "Nurturing Nature" through its work and people."- - Carolein Klep, Resident, Great Eastern Gardens Society



MATOSHREE'S PEARL CO-OPERATIVE HSG SOCIETY LTD
Regn. No.MUM/W-GN/HSG/TC/9303/2014-15
Plot No.232, Sitaram Keer Marg, Mahim, Mumbai – 400 016,
Phone: 24305290. Email: matoshreespearl@gmail.com

TO WHOMSOEVER IT MAY CONCERN

We have been requested to share our experience with the services provided by RuR Greenlife team.

Our society undertook the wet waste management initiative in Sept 2017 and by Jan 2018, we successfully completed two cycles of composting.

We can very honestly say that the success of our wet waste Mngmt initiative has been largely because of our association with Ms Monisha Narke Founder & CEO of RuR Greenlife Pvt. Ltd and Ms Neha Mundra, Sustainable Programs Manager.

It started with some very impactful presentations by them on their vision, mission and approach which made our mngmt committee and society members realise the gravity of the problem we all face as citizens of Mumbai. They also presented actionable solutions which motivated all of us to act and act fast to make a difference.

Their ongoing consulting service in terms of conducting waste audit, supervision of 3 bin segregation at each house level and the knowledge based support to our housekeeping and society manager during the composting process was invaluable.

While the innovative design of their green gold composters is based on many years of solid experience, a large portion of success is due to their patience and perseverance with people involved with day to day operations and close monitoring of processes during the first two cycles.

At a personal level, we found the entire RuR team extremely passionate, committed and competent to resolve not only our doubts and queries but the bigger cause of making the world a cleaner, greener and healthier place for future generations.

We have no hesitation in strongly recommending RuR Greenlife Pvt Ltd as the preferred knowledge consultant and supplier for Waste Mngmt Systems.

Signed by : Gautam Malpekar
Designation : Hon. Secretary
Place : Mumbai
Date : 21st April 2018

Figure 12. Testimonial by Matoshree Pearls, Mahim, India

The composting solutions from RUR Greenlife come at an affordable one time capital cost of approximately Rs8lakhs ($12000) for a 100 kg per day bio waste solution and is scalable. Since the

machine is mechanical, replicates nature and comes with an integrated training module, there are no recurring costs to the client during operation. Financially, the cost of processing waste to generate compost over a period of 5 years is $0.07/day/kg of biodegradable waste. Besides, the organization gets continual supply of organic and nutritionally balanced compost (20% of the input waste quantity) which circumvents the amount spent in buying fertilizers to maintain the green cover on site.This compost if sold to a local plant nursery will partially recover the operational cost and the revised cost would then be $0.07. Additionally, segregation at sources results in recovery of high value dry waste which can be sold to local recycler to obtain revenue in form of cash or green points. This revenue is used to create green fund which is then used to support the waste management project. Collectively these sources offer an attractive return of investment model, however the real earnings are counted in creating eco-consicous citizens, reduced carbon footprint and increased green cover. Our mission drives margin. RUR strives to excellence and believes in importance of spreading awareness through various modules listed below

Sr. no	Programs	Stakeholders educated
1	Waste it or invest it	Housekeep staff and domestic help
2	Segregation programs	Customers and housekeeping helpers
3	Interactive streetplays	Participants of Green Events
4	Sustainable Consumption	Green champions
5	Green Awareness and action program	School children

Table 1: Various Awareness Programs Conducted by RUR

Section 7: Public Acceptance, Appearance and Aesthetics

Our Biocomposters are deigned to be aesthetically pleasing, non-messy, leakproof and odour proof. Our state of the art equipment has been placed in prime locations such as near swimming pool, in a window grill of bedroom, at the entrance of complexes and has been operating in these sites for more than a 3years without any complaints, which we consider as biggest public acceptance.

7.1. Public relations:

RUR has collaborated with Godrej Properties limited and BYN88 community in order to implement waste management systems at 5 different societies viz. Great Eastern Gardens (390 families), Gaothan Slum area (200 families), Shriram Arcade (Corporate society, school and bank), Deonar House (20 families) and Chetan Apts (15 families). This project has been creating a huge environmental impact in terms of green house gas mitigation and adaptation to climate change by directly educating nearly 1000 people to adopt good green practices, and decentralized waste management program. Local Municipal

Corporation has also encouraged the project by providing a 500 sq ft space in a public garden for composting activity.

Brainshare sessions are regularly conducted between volunteers, clients and employees to chalk out a plan action to spread awareness, strategize involvement of government bodies and discuss the improvisation needed for smoother functioning of projects.

Segregation at source also empowers ragpicker community as it improves sanitation and also provides source of employment to them by employing them in composting. Various campaigns are held such as composting with care, wherein the stakeholders and community is sensitized about importance of composting and waste management practices. On occasions such as World environment day, Earth Day various programs such as beach clean up drive, cycling rallies are planned to showcase importance of environment.

We organize tours for people to visit our project sites for hands-on experience on natural bio composting.

RUR has shown leadership and has been invited at many conferences as a thought leader to set industry benchmarks and has lobbied with government to make policy changes and bring in regulatory controls for waste management

7.2. Cleanliness: The leachate tray is cleaned daily, diluted 10 times with fresh water and put into larger trees as fungicide and soil conditioner. The tray is washed and restored for further collection of leachate. The tumblers are easy to clean and are wiped with wet cloth daily to ensure clean and hygienic environment.

The floor space is mopped with diluted lemongrass/citronella oil or garbage enzyme that masks any residual odor and slowly releases pleasant odor in the composting premise.

Our aim is to maximize reach of recycling by raising awareness and providing innovative products and services for sustainable and decentralized waste management. We have created role model in schools/societies/corporate/IndianRailways/Retail store chain/Municipal corporations that we now wish to scale up and spread far and wide.