MUNICIPALIKA™ 2008
Making Cities Work

31 Jan - 2 Feb 2008 • Mumbai, India
MMRDA Grounds, Bandra-Kurla Complex

CS 06

Integrated Waste Management Practices

(Collection, Transportation, Treatment and Disposal) - Domestic and Municipal Waste Management

Date: *1 February 2008* ***Time:*** 09.30-11.45

Chair	Shri.S M.Vijayanand Principal Secretary, Local Self Govt. Dept. Govt. of Kerala
Presenter	Shri.R.A.Rajeev Additional Municipal Commissioner, MCGM
Presenter	Shri. A.K.Dhussa Director, MNRES
Presenter	Ms. S. Padmaja Director, Ramky Infrastructures Pvt. Ltd
Presenter	Shri. Bakul Kanderia Transcend Projects Pvt. Ltd., Mumbai
Presenter	Ms Vandana Bhatnagar WSP (South Asia)
Presenter	Shri. Govindraj Joint Commissioner, BBMP
Presenter	Shri K Gopala Krishna Murthy MD, Shriram Energy Systems Limited
Presenter	Shri.M.B.Nirmal Advisor, Exnora International, Chennai
Presenter	Dr. Dato Laghbeer Singh Chahal Secretary General, CITYNET
Presenter	Mr. Amit Gossain General Manager, JCB India
Presenter	Shri Suresh Rege Chief Executive Officer, IL&FS, Waste Management and Urban Services Ltd.
Presenter	Shri Vinay Maheswari CEO, Neel Mettal Fanalca
Presenter	M/s.Eureka Forbes

MUNICIPALIKA™ 2008
Making Cities Work

31 Jan - 2 Feb 2008 • Mumbai, India
MMRDA Grounds, Bandra-Kurla Complex

CS 06

Integrated Waste Management Practices - Biomedical, Toxic and Hazardous Waste including e-Waste

Date: *1 February 2008* ***Time:*** 11.45-13.15

Chair	Shri. Shyamlal Goyal Principal Secretary , Department of Environment, Govt. of Maharashtra
Presenter	Dr. A.B. Akolkar Additional Director, CPCB
Presenter	Dr. K.S.M. Rao Director, (REEL), Ramky
Presenter	Dr. S.N. Misra Honorary General Secretary, Indian Medical Association
Presenter	Smt. Zinnia Khajotia CEO, Consolidated Waste Management India (P) Ltd
Presenter	Dr (Major) Shishir Basarkar The Indian Society of Hospital Waste Management
Presenter	Smt. P. Bineesha Environmental Advisor, GTZ, Bangalore

INTEGRATED SOLID WASTE MANAGEMENT PROJECT, MUMBAI

R. A. Rajeev, I.A.S.
Additional Municipal Commissioner,
Municipal Corporation of Gr. Mumbai.

1. PROJECT STATEMENT

The Integrated Solid Waste Management Project (ISWMP) is a holistic project comprising of different activities under Solid Waste Management (SWM) Department of Municipal Corporation of Greater Mumbai (MCGM) to achieve international level of cleanliness and to adopt best practices of waste transportation and processing in the city of Mumbai. It envisages host of initiatives like restructuring of the department to make it more effective, branding of its services to make it more visible and responsible, mechanization of sweeping to make it more productive and universalisation of use of safety kits by conservancy staff from health and hygiene point of view.

2. INTEGRATED SOLID WASTE MANAGEMENT APPROACH

Mumbai, spread over an area of 437.71 sq km with a population of more than 12 million people, generates around 6,500 tons per day (TPD) of MSW and 2,400 TPD of construction and demolition (C&D) waste. Characterized by high population densities, vast quantities of waste, large slum areas and proximity to sea coast with high humidity levels, and tidal inundation, Mumbai poses a unique challenge to the management of MSW in the city.

The ISWM approach has been adopted for dealing with the present inadequacies such as non-standardized collection bins, insufficient collection vehicles, commingling of C&D waste and MSW, and open dumping of waste. With the ISWM approach, emphasis is on reduction, reuse, recycle and recovery before disposal. This meant addressing issues right from public awareness, waste generation, collection, segregation, transportation, treatment and disposal of waste, keeping in view the increasing pressures due to urbanization and economic development. The challenge of SWM in the context of Mumbai involved the following:

1. Increase in at-source segregation of household waste.
2. Elimination of community bins and improvement of MSW collection efficiencies.
3. Separate collection and transportation of C&D waste and inerts from road sweeping.
4. Improvement of operational & environmental conditions at the MSW transfer stations
5. Development of adequate MSW treatment and processing facilities complaint to MSW (Management & Handling) Rules, 2000.
6. Provision of sanitary landfill for process rejects up to 2025, with space capacity to address the landfill requirements beyond the design period.

To achieve this magnanimous task of managing the solid waste of Mumbai city, MCGM appointed Infrastructure Leasing & Financial Services (IL&FS) as project consultants. A comprehensive SWM Plan for a design period of 25 years with special focus on treatment of waste and scientific management of waste disposal sites has been prepared by IL&FS as a part of the Consulting assignment.

3. AREAS OF INTERVENTION

3.1 Segregation and collection

- **The Greater Mumbai Cleanliness & Sanitation Byelaws – 2006**
  These Byelaws inter alia provide for norms of civic behavior, violation of which, results in levy of fines on all types of generators of waste, be it individual or an institution or a commercial or industrial complex. These Byelaws are basically to ensure that the city is maintained clean throughout.

- **Clean-up Marshals**
  In order to implement the Cleanliness Byelaws, MCGM has decided to adopt an innovative way, namely, the deployment of 'Clean-up Marshals' through private security agencies in different wards of the city. A third party audit is also introduced by involving citizens' groups and NGOs to supervise and give feedback for improving this system.

In addition to the above, following initiatives have been taken:

- Advance Locality Management (ALM), a partnership between MCGM and citizens for sustainable environment friendly waste management for the neighborhoods.
- Collaboration with NGOs in formalizing the role of rag pickers in waste segregation.
- Dattak Vasti Yojana or Slum Adoption Program for sensitizing slum dwellers; it also encourages citizens to take up initiatives at the grass root level.
- Declaration of 'Zero Tolerance Zones' in Mumbai
- Privatization of beach cleaning and road sweeping.
- Construction & Demolition and De-silting waste (Management & Disposal) Rules, 2006 to address the problem of unauthorized dumping of C&D waste and un-attended silt.

3.2 Transportation

The important initiatives taken by the MCGM in this context are:

- Issuance of Comprehensive Contracts for hire of vehicles for collection and transportation with aim to eliminate manual handling to comply with MSW (M&H) Rules, 2000
- Procurement of mechanised street sweeping equipments
- Improvement and augmentation of refuse transfer stations
- Standardization of containers and transportation system

3.3 Waste Processing and Disposal

The challenge in the context of Mumbai lies in developing scientific and environmentally compatible MSW processing and landfill facilities while keeping the site specific constraints in mind. The ISWM Project, which includes a comprehensive waste disposal plan, has been developed by MCGM on a Public Private Partnership (PPP) framework. MCGM would award the projects on a design, build, own, operate and transfer (DBOOT) basis for a period of 25 years which would enable the private operator to recover the investments along with reasonable returns. The Waste Management Plan, as presented below, is worked out as a set

of independent but well synchronized projects, for each of the disposal sites at Gorai, Kanjur, Deonar and Mulund. Together, these provide a long term, efficient and cost effective solution for management of MSW expected to be generated over next 25 years. Bidding process for these projects has already commenced.

1. The first of Mumbai SWM projects, the closure of the Gorai dumping ground, the first of its kind in the country, is underway. The project, being implemented by an international consortium in a period of 15 months, includes an impermeable surface cover, landfill gas collection, leachate collection and treatment system, and landscaping. The project envisages converting about 19ha of land at Gorai dumping ground into green landscaped spaces for the citizens of Mumbai.
2. The Kanjur site is the second project in-line which includes construction and operation of composting facilities - 8 plants of 500 TPD capacity, sanitary landfill, and site development works, including peripheral bund, roads, and boundary wall.
3. The Deonar site is the third project in-line to be bid on a PPP format. The project is similar to the Kanjur project, except some additional scope of work which will include relocation of garbage and partial closure, similar to works being carried out at Gorai site.
4. The Mulund site will be fourth project in-line also to be bid on a PPP format. Two Biomethanation units of 250 TPD capacities are being proposed at this site.

4. MCGM's ROLE IN MAKING PPP MODEL SUCCESSFUL

Through the PPP Model, the private sector will bring necessary technical expertise and financial capability of mobilizing the required resources and MCGM shall provide support through policy interventions, provision of budgetary funds, capacity building programs, provision of basic infrastructure, and seeking of government approvals.

4.1 Tipping Fees

MCGM is one of the first urban local bodies in India to have taken the initiative of implementing the concept of 'tipping fees'. The private sector operator makes the initial investments for the project and MCGM would pay tipping fees to the private operator in lieu of the services rendered by the operator and also pay an interest in case of delay in payment.

4.2 Regulatory and Environmental Clearance

MCGM is itself seeking all the necessary approvals from State and Central regulatory authorities prior to commissioning of the projects. This initiative facilitates smooth mobilization of the projects without approval related delays by the private parties.

4.3 Land Availability

MCGM is handing over the dumping grounds to the selected project operators on a long term nominal lease basis. This will eliminate the burden of site identification and land acquisition on the project operator.

4.4 Site Infrastructure

CGM has made budgetary provisions for the site infrastructure development necessary to overcome the environmental constraints. This forms a significant part of the total investments. This would help in keeping the tipping fee at a level comparable to a typical commercially viable MSW processing and landfill project and make the PPP Model sustainable.

4.5 Project Funding

MCGM proposes to implement all the activities related to collection, segregation and transportation through its budgetary allocations. However, the ISWM projects, which required very high upfront investments, will be jointly funded from public and private sector resources on a PPP framework with a mixture of grant funding, equity investments and debt.

4.6 Off-take Arrangements

A major constraint for the success of large scale ISWM projects in the country has been the lack of of-take arrangement for sale of MSW processing products (e.g. marketing of compost.) There are many drawbacks such as price vis-à-vis chemical fertilizers and farmyard substitutes, absence of a strong market maker, transportation customer resistance, quality and standards. These aspects have been taken care of by the MCGM through appropriate off-take agreements with fertilizer majors in the country.

4.7 CDM Revenues

SWM projects such as landfill gas capture through closure, composting, biomethanation, lead to reduction in GHG emissions, and hence they are eligible to avail funds under the Clean Development Mechanism (CDM). The CDM benefits would accrue over a period of time once the project facilities start operating. MCGM plans to share the revenue generated through the sale of Certified Emission Reductions with the operator to incentivise them leading to higher level of efficiency in their operations.

5. SUSTAINABILITY OF ISWM PROJECT

The ISWM Project developed by MCGM has a long term objective of resolving the MSW problems faced by the city. MCGM has taken utmost care to make the project viable by taking into consideration economic, social,environmental and health factors. It is a collaborative commitment from a government body and private sector operator in providing long term services for managing a public infrastructure project. This is a major factor contributing to the sustainability of such a project having purely a vision to provide a better living environment to citizens.

SWM projects such as landfill gas capture through closure, composting, Biomethanation, lead to reduction in GHG emissions, and hence they are eligible to avail funds under the Clean Development Mechanism (CDM). The CDM benefits would accrue over a period of time once the project facilities start operating. MCGM plans to share the revenue generated

through the sale of Certified Emission Reductions with the operator to incentivise them leading to higher level of efficiency and sustainability in their operations. To develop a robust and sustainable ISWM system, an active participation of all stakeholders has been ensured through institutional strengthening and capacity building. MCGM has undertaken the following steps:

- Restructuring of SWM department on functional lines
- Training and capacity building program for the MCGM staff and the general public by way of Information, Education and Communication and Community Development in collaboration with community organizations and NGOs.
- SWM information dissemination by way of educational films, posters, and calendars
- Branding of MCGM services
- Development of IT enabled systems such as Vehicle Tracking system, Route Optimisation and Management Information System for improved delivery of services

A Special Purpose Vehicle shall be formed for the implementation of the processing plants and sanitary landfill projects; this would ensure smooth operations and clear allocation of responsibilities among the various stakeholders involved in the project. MCGM has laid special emphasis on identification and management of project risks such as waste supply risk, waste quality risk, technology risk, and has developed the projects in a manner that is conducive for private sector participation.

5. CONCLUSION

The ISWM project with its aim to improve sanitation and health would provide healthy living space at every neighbourhood of the city. This project with its wide range of activities, involving every stakeholder in the process would act as a benchmark and a replicable model

for other cities. We have drawn open from best practices in the field of SWM from Developed Countries and have tried to adapt it to suit the Local conditions. Specific issues that arise in the ISWM plan due to the unique environmental setting of Mumbai, vast quantities of waste and its characteristics and the fast pace of population growth and economic development are of relevance to other growing economies. The project clearly demonstrates how new models of partnerships involving co-operation from the public, private and corporate sectors, NGOs, community associations and the citizens at large can contribute towards improving the quality of life in the city.

****

Programme on Energy Recovery from Urban Wastes In India

A.K. Dhussa
Director, Ministry of New and Renewable Energy
Block 14, CGO Complex, New Delhi 110003

India's population as per the Census 2001 is 1027 million, of which 285.35 million people reside in 5161 urban areas. It constitutes 27.8% of the total population of the country. The problem of urban waste management is notable not only because of large quantities involved, but also its spatial spread across the large number of towns and cities and the enormity and variety of problems faced in setting up of systems for collection, transportation and disposal of waste. According to a recent estimate, about 50 million tonnes of solid waste and 6000 million cubic metres of liquid waste are generated every year by 423 Class-I cities of our countries. These wastes are generally dumped on land or discharged into water bodies, without adequate treatment, and become a source of environmental pollution and health hazard. The challenge of effective waste treatment and disposal, as well as serious concerns about the contribution of wastes to methane emissions and global climate change have placed further emphasis on the development of effective waste-to-energy systems worldwide. In India, too, several initiatives have been taken on various aspects including R&D, pilot and demonstration plants, dissemination, promotion and commercialization.

The Municipal Solid Waste (MSW) is a mix of heterogeneous constituents, therefore, waste management system can be economically and environmentally sustainable only if it is based on an integrated approach i.e. it deals with all the constituents of solid waste. The concept of solid waste management through a combination of initiatives has been clearly brought out in the Manual on Solid Waste Management prepared by an Expert Committee constituted by the Ministry of Urban Development, Government of India, in May, 2000. The Manual has also outlined the 'Hierarchy of Waste Management Options' indicating that the waste needs to be managed in the following steps:

i. Waste collection and transportation.
ii. Resource recovery through sorting and recycling i.e. recovery of materials (such as paper, glass, metals) etc. through separation.
iii. Resource recovery through waste processing i.e. recovery of materials (such as compost) or recovery of energy through biological, thermal or other processes.
iv. Waste transformation (without recovery of resources) i.e. reduction of volume, toxicity or other physical/ chemical properties of waste to make it suitable for final disposal.
v. Landfilling.

Due to the presence of a variety of heterogeneous constituents in the MSW, it's disposal requires a mix of processes and technologies. In the developed world, there is an increasing emphasis on reducing the quantum of waste disposed of in the landfills, which are considered as the last resort of waste management by the European Union as well as the US Environmental Protection Agency. Given the paucity of land and competing demands for land from agriculture, industry and housing, this may not be an option for a country like India as well. The single most distinguished feature of the MSW (Management and Handling) Rules 2000 is the applicability of landfills only for inerts i.e. after all the recyclables have been removed and other usable components also exploited to ensure that none of these are buried in the landfills.

Since any material with a high proportion of organic matter can serve as a good substrate for energy recovery, Urban wastes with a significant proportion of organic constituents have emerged as a resource for generation of energy in environmentally sustainable manner. The urban wastes translate into a potential for generation of over 2600 MW of power. Energy potential of urban wastes can be realised by anaerobic processes (digestion or biomethanation) leading to the generation of biogas or by thermal processes namely combustion / incineration, gasification or pyrolysis. Global developments in the past three decades have focussed on a variety of Waste-to-Energy technologies utilising wastes from urban and industrial sectors with the triple objectives of power generation, waste management and reduction of Green House Gas (GHG) emissions for a better environment. India can also benefit from these developments to meet part of the immediate energy needs of the country by utilising urban and industrial wastes in environment friendly manner.

2. Technology Options

The technologies for recovery of energy from MSW include both thermal and biological processes. Biological method involves biomethanation of bio-degradable fraction of waste for producing methane-rich biogas, which can be used as fuel for generating heat and / or electricity. Thermal method involves combustion of organic waste as fuel with evolution of heat energy for generation of power. Advances in thermal conversion are based on destructive heating of organic materials with a limited supply of oxygen (gasification) or without any oxygen (pyrolysis) to produce combustible gaseous mix consisting of simple hydrocarbons and hydrogen. It is important that the waste processing/ treatment plans are based on the use of all the available options such as biomethanation / composting for the segregated biodegradable fraction, production of Refuse Derived Fuel (RDF) from mixed MSW by removal of inerts and moisture for energy recovery through combustion under controlled conditions, and the inerts used for making building materials or disposed of in the landfills. The processing and treatment of MSW for its safe disposal is a complex problem, which cannot be tackled with simple solutions. In the present scenario, it appears necessary to give equal opportunities to all the options for processing and treatment for safe disposal of Municipal Solid Waste as each option has its own merits and demerits and no single solution can be cost effective and suitable for universal application.

3. Programme for Energy Recovery from Urban Wastes

The Ministry of New and Renewable Energy has developed Accelerated Programmes for promotion of projects for Energy Recovery from Urban Wastes. The Programme on Energy Recovery from Urban Wastes provides for financial assistance for setting up projects on energy recovery from a variety of urban wastes. Financial assistance can also be provided for development of projects, Research & Development, dissemination of information and organization of seminars and workshops. Major components of the programme are as follows;

i. Energy Recovery from Municipal Solid Wastes

A new scheme for setting up five pilot projects on energy recovery from Municipal Solid Wastes (MSW) is under development in accordance with the directions of Hon'ble Supreme Court and the recommendations of the Expert Committee. Some of these recommendations are as follows:

- Project development including characterization of wastes, sizing of projects, technology selection, project design, management model, coordination, financial appraisal, etc.
- Adoption of an integrated approach to waste processing and treatment. This will necessitate deployment of more than one technology in tandem;
- Selection of technologies based on the quality of wastes to be treated and local conditions;
- Deployment of biomethanation technology only for segregated/uniform wastes;
- Need to take-up pilot projects that promote integrated systems for segregation / collection / transportation and processing and treatment of wastes;

ii. Power generation from biogas generated at Sewage Treatment Plants

Financial assistance of upto Rs 2.0 crore/MW shall be provided for projects for generation of power from biogas being produced at Sewage Treatment Plants.

iii. Energy Recovery from other Urban Wastes

Financial assistance of upto Rs. 3 crore per MW shall be provided for setting up projects based on biomethanation technology for power generation from cattle dung, vegetable market waste, slaughterhouse wastes, night soil and any other urban waste generated in the urban areas as defined by the Registrar General of India. In case of projects for generation of only biogas for thermal application, the financial assistance will be limited to Rs. 1.0 crore / MWeq (i.e. biogas production of 12000 cu.m / day).

iv. Power generation from mix of Urban and Agricultural / Agro-industrial Wastes

Financial assistance @ 30% of project cost subject to upper limit of Rs. 3.0 crore / MW shall be provided for setting up projects based on biomethanation technology for power generation from a mix of cattle dung, vegetable market

and slaughterhouse wastes along with agricultural residues and agro-industrial wastes.

4. Progress under Waste-to-energy programmes

Ministry of New and Renewable Energy (MNRE) has been promoting setting up of projects for energy recovery from Urban and Industrial Wastes since the year 1995 and so far projects with an aggregate capacity of about 20 MW have been set up in the country. Projects based on Municipal Solid Wastes have been set up at Hyderabad, Vijayawada and Lucknow. A few projects based on other urban wastes include: a 1 MW project based on cattle manure at Haebowal, Ludhiana; a 0.5 MW project for generation of power from biogas at sewage treatment plant at Surat; a 150 kW plant for vegetable market and slaughterhouse wastes at Vijayawada; and another 300 kW project based on vegetable market waste at Chennai. Brief write up on some of the projects based on Urban Wastes is given below:

i.6.6 MW Power from MSW at Hyderabad, A.P.

A Waste-to-Energy plant was taken up by M/s Selco International Ltd. (SIL) in 1999 based on the Refuse Derived Fuel (RDF) technology, for production of RDF pellets, which can be used as an alternative of coal for production of energy. While a project for production of RDF pellets was taken up in 1999 as Phase I of the project, the 2nd phase of the project for utilization of RDF for generation of power was completed in November 2003. Total cost of the project was about Rs 43.50 crore. The plant was commissioned in November 2003 and has been operational since then with maintenance shutdown for 1-3 days per month. Over 10 million units of electricity have so far been generated by this project.

ii. 1 MW Power from Biogas Plant at a Dairy Complex in Ludhiana, Punjab

All the dairies in Ludhiana city have been shifted to two dairy complexes in the outskirts of the city with one such location being Haebowal dairy complex, spread over an area of 50 acres. It has about 1500 dairies with an animal population of 1,50,000 and generates about 2500 tonnes of cattle dung. A demonstration project for production of biogas from about 235 tonnes of cattle dung has been set up in this dairy complex for generation of about 1 MW electricity and 45 tonnes per day of stabilized organic manure at a total cost of Rs. 13.66 crore. The project has been functioning satisfactorily since November 2004 and was recently awarded as best Green project in Asia by Asea Power.

iii. 0.5 MW Power from biogas at Sewage Treatment Plant, Surat, Gujarat

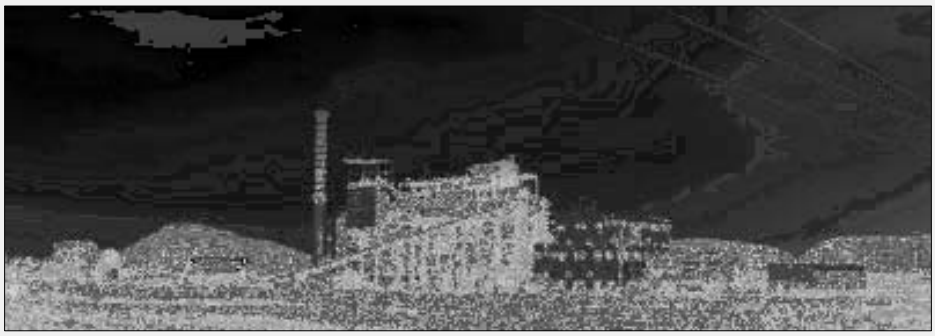
Surat Municipal Corporation has six sewage treatment plants (STPs), out of which four plants have sludge digesters wherein biogas is produced. The average biogas production is about 300 m^3 / hr at one of the STPs at Anjana. A project for generation of power from this biogas has been set up at a total cost of about Rs. 245.46 lakh. The biogas engine generator set of 0.5 MW capacity is the heart of this power generation plant. The rated efficiency of this engine generator set is 35.4 % at full load. The power is generated for captive consumption in the operations of the sewage treatment plant. The project has been functioning satisfactorily since March 2004.

v. Biomethanation of Mixed Urban Wastes at Vijayawada, Andhra Pradesh

A demonstration project for biomethanation of 20 tonnes mixed wastes per day for generation of 150 kW of electricity and rich bio-manure has been installed by Vijayawada Municipal Corporation at Vijayawada at a cost of Rs.283.00 lakh.. The daily feed to the plant consists of 16 tonnes of vegetable market waste and 4 tonnes of slaughterhouse waste. The sewage sludge from the adjoining Sewage Treatment Plant is used for making the slurry to be fed into the digesters. A biogas engine of 150 kW capacity has been installed for generation of power from the biogas after reducing its H_2S content. Part of the electricity is used for captive consumption and the rest is exported to the grid. The project has been functioning satisfactorily since it's commissioning in June 2004.

XXXX

Shriram Energy Systems Ltd.



Converting Waste to Energy

5th International Conference on
"Good Urban Governance for Inclusive and Sustainable Cities"

1st February 2008

ABOUT US

SESL

1.Name of the company: Shriram Energy Systems Limited
Hyderabad, India

2. Line of Activity : 6MW Power Plant based on Municipal Solid Waste

3. Plant Locations

Project Site-1 : Fluff Processing Unit and Power Generation Utility at Ajitsingh Nagar, Vijayawada

Project Site -2 : Pellet Processing Plant at Etukuru Road, Ramachandrapuram Agraharam, Guntur.

PROJECT DETAILS

SESL

- Project Cost : Rs.45 Crores
- Financial Assistance : Technology Development Board & Indian Renewable Energy Development Agency (IREDA)
- Technical Know how
  a) MSW Processing : TIFAC, Dept of Science and Technology, Government of India
  b) Combustion Technology : ALSTOM, Germany
- Project Status : Commissioned and synchronized to the APTRANSCO grid on 26th November, 2003

OUR EXPERIENCE

SESL

- Improvement of TIFAC Know how by incorporating the primary shredder for the first time
- Heterogeneous MSW mix needs special Combustion Techniques.
- Combustion technology vis a vis the conventional steam generators and consequential changes in the boiler parameters.
- Vagaries of various seasons and availability of other fuels to take care of outage of RDF.
- Civic bodies active participation is sought to implement "segregation of waste at source" so that the right waste reaches the process plant.

..\Good Governance\Municipalica.dat

OUR SUBMISSION TO GOVT./CIVIC BODIES

- As MSW projects are socially relevant, eco friendly and capital intensive projects, governmental support shall be proactive.
- Projects shall be evaluated more from the angle of returns to society than on economic viability.
- Financial participation by civic bodies improves the chances of completing the projects on a time schedule.
- Financial closures should be speedier as these projects are socially relevant

OUR SUBMISSION TO GOVT./CIVIC BODIES

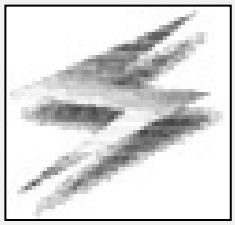
- Land requirement for re-dumping of ash, rejects etc shall also be considered.
- As these ventures are public -private initiatives, royalty for garbage, lease rentals for land and self lifting charges should be waived.
- Single window clearances for the project shall be made both at State and Central Government level.
- Concept of Tipping fee to the developer be implemented in order to encourage this sector.

CONCLUSION

SESL

Today's good governance should bring emerging technologies to develop, **build and lead to healthy and** eco**friendly society for future generations of India .**

Shriram Energy Systems Ltd.



thank you...

HAZARDOUS WASTE MANAGEMENT

Dr. K.S.M.Rao*, Mr. Arun Agrawal, Mr. M. Gautham Reddy
Ramky Enviro Engineers Ltd., Hyderabad

1.1. Introduction

The inappropriate and often careless handling of industrial hazardous wastes, has all too often created problems worldwide for human health and the environment. Lack of facilities have also compounded this problem. Effective control of hazardous wastes is of paramount importance for proper health, environmental protection and natural resources management.




Developing countries, as they experience rapid industrial growth as in India have a particularly urgent need to initiate programs for effective management of hazardous wastes. Consequently governmental initiative in management of all kinds of hazardous wastes has become necessary.

Hazardous wastes on a broad scale can be defined as any wastes other than radioactive wastes, which because of their physical, chemical, biological or infectious characteristics have the potential to damage the human health and/ or environment. The primary reason for major concern over hazardous wastes started as early as 1960's following the Minamata Incident in Japan Major incidents that have led to controls on hazardous waste management World over include:

Minamata Incident (Japan) in the late 1960's when many people died from eating fish contaminated with mercury discharged into the sea.

1972 when a major public outrage over the discovery of drums containing heat treatment cyanide salts on vacant lands where children were playing leading to a serious potential threat to life in UK.

During 1976, in the US the hazardous wastes control started with a large public outcry over the widespread discovery of pollution caused by past uncontrolled dumping of hazardous wastes.

Hazardous wastes can cause immediate, short-term, public health problems as well as long-term health effects and environmental pollution. Proper control of hazardous wastes does cost money, but experiences in a number of developed countries and developing countries suggest that cleaning up the "sins of the past" is much more expensive than the remedial measures for the present.

During the last few years starting 2000 more attention has been paid to the problems arising from not handling hazardous wastes properly. The Supreme Court has closed down polluting industries and forced others to take pollution prevention steps. Several effluent treatment plants (ETP's) have been set up, and numerous studies have been carried out by the Government of India as well as State Governments. Also, sectoral Environmental Impact Assessment Reports have been prepared by the Ministry of Environment and Forest, defining the key issues related to hazardous waste management.

Supreme Court Notification and Hazardous Waste (Management & Handling) Rules 1989 under Environment

(Protection) Act, 1986 specifies that all the hazardous waste generated from industries should be collected, treated, stored and disposed off only in such facilities' as authorised for this purpose.

Hazardous wastes are generated by chemical, petrochemical, pharmaceutical, paint, dyes, pesticides, paper, textile, tannery and several other categories of industries. These include solid, semi-solid and liquid wastes (non-aqueous). The indiscriminate management and unauthorised dumping of these hazardous wastes by industries all over has already caused serious damage to the environment and has led to wide spread contamination of soil, air, surface water and ground water. The primary reason for this can be attributed to the non-availability of common treatment and disposal facilities for the purpose.

1.2 Wastes and Waste Generation Scenario

The facility proposed is expected to receive varied nature of industrial hazardous wastes in the following major groups :

Inorganic Wastes

- Acid and Alkalis
- Cyanide Wastes
- Soluble substances
- Heavy Metal Sludges, spent catalysts and solutions
- Asbestos wastes
- Other inorganic solid residues

Oily Wastes

- Sludges from various oil storages and usages including from leaded petrol storage tanks.

Organic Wastes

- Halogenated solvents
- Non-Halogenated solvent wastes
- PCB (Poly chlorinated biphenyls) containing wastes
- Paint and resin wastes
- Biological Sludges from ETPs.
- Biocide wastes
- Soluble Organic substances
- Organic chemical residues

Putrescible Wastes

- Wastes from the production of edible oils
- Other oily wastes

High Volume Low Hazard Wastes

- Drilling muds
- Mine tailings
- Metaliferous slags

Important parameters in deciding upon the pathway of disposal to be employed include the content of:

- Organic matter
- Calorific Value
- Reactivity
- ToxicityIgnitability

1.3. Objectives of the Hazardous Waste Management

The primary objective is to provide a common facility to cater to the hazardous waste disposal needs of the industries primarily in districts in a radius of 250 kms or more from common facility. Developer of the facility will be

responsible for design, finance, construction, operation and maintenance of the CHWTSDF. The system so designed is reliable for now and for the foreseeable future.

The overall objective encompasses the following sub-objectives:

- To ensure that the environmental impacts are minimized.
- To ensure that resource conservation is maximized.
- To ensure techno-economic feasibility of the project
- To enable CHWTSDF to handle the hazardous wastes in a lawful manner.
- To prevent accumulation of the hazardous wastes at generator premises
- To establish an administrative framework and recommend the necessary infrastructure to ensure proper collection, transport, reception, treatment, storage and disposal of the hazardous solid wastes.
- To minimize the health effects associated with solid waste handling and management activities.
- To ensure the technical reliability of the adopted technology in terms of safety, flexibility and sustainability under local conditions.
- To prevent or minimize waste generation.
- To ensure compliance with regulatory requirements at every stage of hazardous wastes handling.

The outline scope of a common disposal facility is as mentioned below:

1. Establishment of the facility
2. Collection and transportation of solid hazardous waste from generating units
3. Fingerprint analysis and interpretation of results in terms of its pathway of disposal.
4. Carrying out Segregation, Recovery, Treatment, Storage and Disposal of hazardous waste residues
5. Monitoring on-site including emergency preparedness
6. Reporting to regulatory authorities as needed
7. Carrying out Public information and consultation
8. Undertaking closure and post closure measures on exhaustion of the site capacity
9. Compliance with existing state and central regulations and amendments made from time to time.

1.4. Pathway of Waste Treatment/ Storage/ Disposal

Direct Landfill
Treatment followed by Landfill
Direct Incineration
Treatment followed Incineration followed by Landfill.
Storage of Wastes until economically viable technologies are available
Alternate Destruction Technologies covering aspects like fuel blending, re-use/ recycling…

1.5. Project Location and Required Clearances

1. Site selection by experts, Geotechnical investigations, environmental impact assessment and public hearing to be conducted
2. Consent For Establishment – obtained from Local Pollution Control Board
3. Notification of site by State Government
4. Consent for Operation – obtained from Local Pollution Control Board
5. Authorization – obtained from Local Pollution Control Board

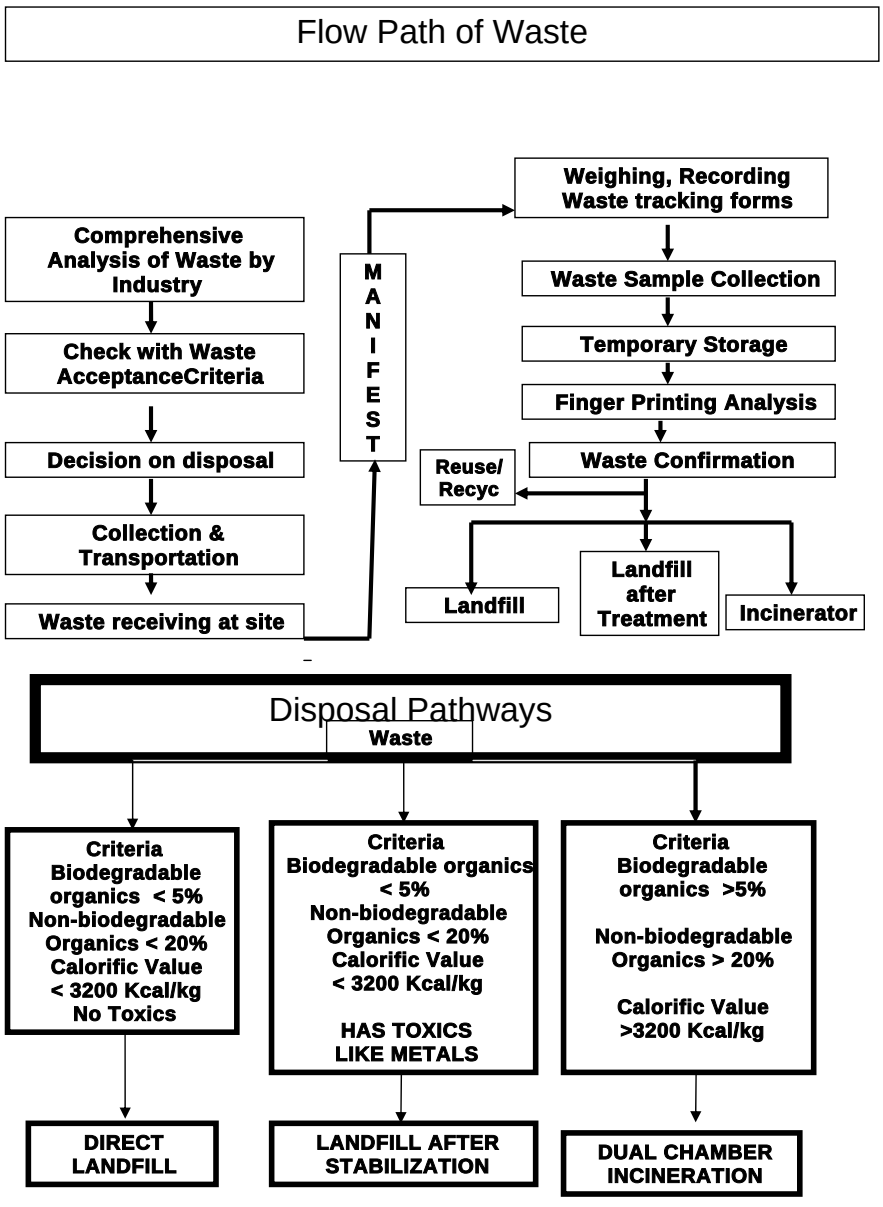
2.1 TECHNOLOGY AND OPERATIONAL DETAILS

A Common Disposal Facility has three principal unit operations viz. physico-chemical treatment plant, incineration plant and secure landfill. In addition to the three principal unit operations, there shall be temporary and permanent storages for interim storage and for intractable/ in-compatible wastes respectively. The facility shall also have provision for waste reuse/ recycling of waste that have potential uses after suitable treatment. Supporting infrastructure like wastewater and leachate treatment plant, air pollution control system, other pollution abatement units, laboratory, utilities, waste collection and transportation system, workshop for maintenance of plant machinery, automobile

maintenance workshop and electrical maintenance etc. shall be provided. Administrative infrastructure required for operations of the facility shall also be provided at the facility.

2.2 FACILITIES

On receipt of wastes at the Facility, incoming hazardous wastes or potentially hazardous wastes shall first be analysed to enable classification of wastes and for identification of its pathway of treatment/ disposal. Those wastes that are suitable for direct disposal into the landfill shall be directly sent to the landfill. Wastes that are suitable for direct incineration shall be sent to the incineration plant for destruction. Wastes requiring treatment prior to landfill disposal or incineration shall be processed at the treatment plant and then sent for the designated purpose after confirmation analysis. Wastes that have potential reuse options after processing shall be given the highest priority and such wastes shall be processed accordingly and then sent for reuse at appropriate plants after following statutory obligations mentioned in the Hazardous Wastes (Management and Handling) Rules, 1989 and amendments 2000 & 2003.



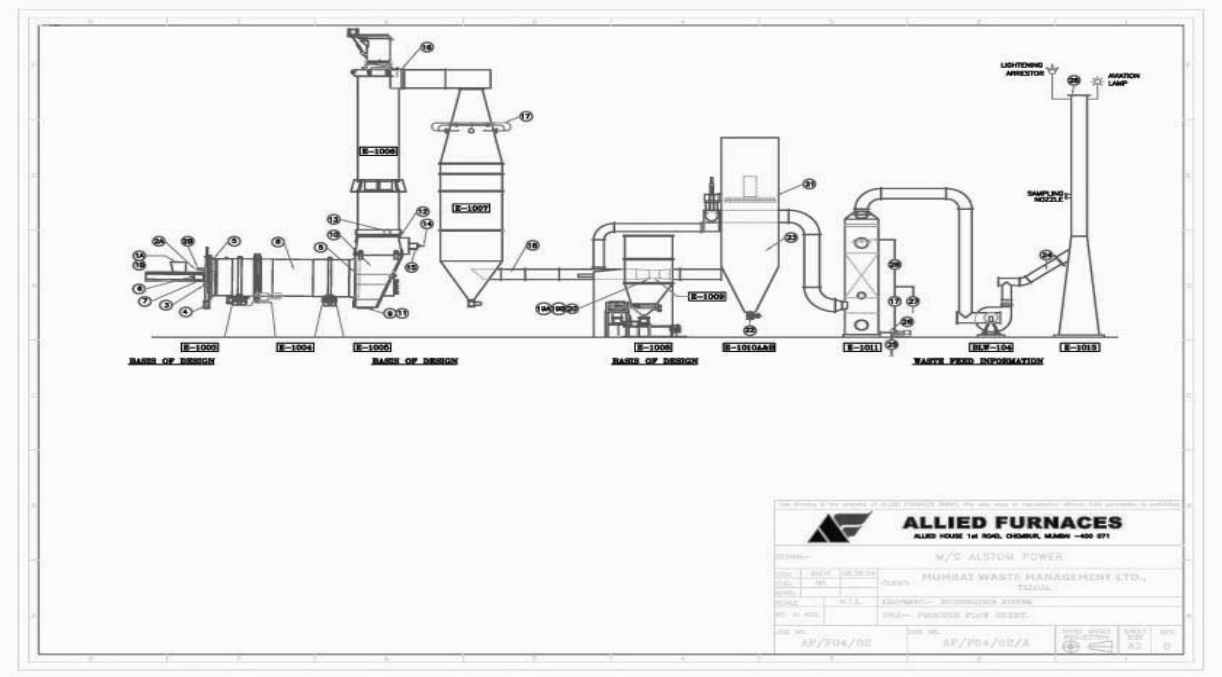
Leachate generated in the landfills, effluents generated at the treatment plant, scrubbing effluent generated during incineration and effluents generated in storage areas and other operations shall be sent to the effluent treatment plant. Any solid wastes generated during the treatment process shall be reprocessed as solid hazardous wastes and sent for landfill or incineration as required.

Treatment Facility: utilises a range of techniques and processes designed to change the physical, chemical or biological characteristics of the waste. This may include changing the composition so as to neutralise the waste, to recover energy or natural resources from the waste, to render the waste non-hazardous or less hazardous, safer to transport, store, or dispose off or to reduce its volume. This shall also include the leachate/ wastewater treatment facility.

Storage Facility: will temporarily store incoming hazardous waste which cannot be adequately treated, until sufficient quantities are available to warrant the same. Similarly the intractable/ non-compatible waste will also have to be stored which can not be treated with the existing processes and other facilities become available for treatment or disposal. It is pertinent to mention here that internationally there are certain wastes for which economically viable

treatment techniques are not yet available and are being stored until alternate disposal technologies are made available. The same shall apply at the proposed TSDF. These could include Mercury Wastes, Chloro Fluoro Carbons, Poly Chlorinated Biphenyls....

Incineration Facility: Certain categories of wastes needing total destruction will be sent to the incineration plant to burn these to ashes through a high temperature combustion process. The incineration plant will mainly consist of Rotary Kiln incinerator for primary combustion, secondary combustion chamber , cyclone, gas scrubbing system apart from material handling system.



The primary chamber's main purpose would be combustion of the waste materials into safe end products (ash). The temperature of the primary chamber would be 850˚C and above wherein, wastes shall be completely destroyed. The primary chamber would have an attached burner with auxillary fuel supply to augment the thermal capacity requirements. Sophisticated instrumentation for the control of temperature and various other operating parameters would be attached to ensure proper control over the operations of the incinerator. The purpose of the secondary chamber would be to burn the off-gases and ensure safe end products (gaseous). The secondary chamber would operate at a temperature of 1100˚C and above. The gases would be completely burnt and safe gases then shall be let out of the incinerator unit. A waste heat exchange boiler shall be attached to the flue gas system to capture the heat energy and convert it into steam which can further be converted into utilizable forms of energy or be utilized directly for drying of wastes.

The incinerator is completely automated with control panel and continuous recording of temperatures. The system is environmentally safe without any hazardous emission.

Disposal Facility: is the final placement area for treated hazardous wastes or wastes not requiring treatment where it will remain after closure. This facility will be an engineered secure landfill.

Costs of Disposal:

Landfill Cost	: Least
Stabilization followed by landfill	: Mediocre
Incineration	: Highest

****

E-Waste Recycling – Process of formalization of informal sector

Ms.P.Bineesha
Chief Environmental Advisor, GTZ-ASEM Project on Hazardous Waste Management
consulting firm ERM GmbH and implementing agency
Karnataka State Pollution Control Board.[1]

Introduction:
Electronic waste or E-Waste is the most rapidly growing issue in the world. The crisis is not only about the accumulation of E-Waste (quantity) but also the toxic ingredients such as the lead, beryllium, mercury, cadmium, and brominated flame-retardants that pose both an occupational and environmental health threat. Electronic waste or E-Waste can be defined as any refuse created by discarded electronic or electrical devices and components as well as substances involved in their manufacture or use.

In India electronic goods like computers, washing machine, television and refrigerators will drive the future growth of electronics hardware industry. The E-Waste generated from these four items during 2004-05 was found to be 1, 46,180 tonnes and it will exceed to about 16, 00,000 tonnes by 2010. *(Source: IRG Systems South Asia; BAN, Silicon Valley Toxic Coalition, 2005).*

Mumbai currently tops the list of major cities with E-Waste. India's financial hub has an estimated 11,017 tonnes of e-waste, followed by Delhi at 9,730 tonnes, Bangalore 4,648 tonnes, Chennai 4,132 tonnes and Kolkata 4,025 tonnes.

Need of the initiative:
Recycling sector is an integral part of E-Waste management. Around 5228 tonnes of E-Waste is being imported illegally. There are about some 270 medium and big scrap dealers in the country. More than 2000 small recyclers are involved in the recycling of e-waste. It involves the recovery of various components like gold, silver, copper, aluminium, brass, steel, etc.

The recycling sector is further divided into the formal and informal sectors;
The formal sector consists of licensed private companies working on scientific recycling of E-Waste. They adapt eco-friendly recycling processes and structured methodology in their recycling activities.

The informal sector consists of unlicensed private companies working on recycling of e-waste. They do not adapt eco-friendly recycling processes and do not follow any structured methodology in their recycling activities. About 80% of the E-Waste recycling is undertaken by the informal sector. More than 200 such informal recycling units exit in Bangalore. *(Source: Preliminary E-Waste Assessment Report, 2006, HAWA –GTZ-KSPCB project)*

Today, if the e-waste is kept away from the dumpsites, it is due to the informal recyclers. It is a large and complex network of small family business who make a profit out of the value they can extract from e-waste. Though this sector has been playing an important role, its activities generate a high occupational health hazard, some environmental and social impact (use of toxic chemicals, poor working conditions, child labour, etc.,). **The challenge therefore was not to take the business away from these people, but to integrate them in a transparent and fully organized system**.

Processes undertaken and outcome/result:

Establishing the link:
The HAWA project as part of its e-waste activity carried out a survey in 2003, through an NGO (Saahas), to identify the informal e-waste recyclers in Bangalore. Once the contact was established, then their activities and working conditions were assessed. Informal discussions with them gave approximate information about the number of such recyclers in the city. It was thus estimated to be about 200.

Ice-breaker:
Several interactions with the recyclers were undertaken to build confidence in them and to appreciate the reason of the project and to make them understand the hazards of their work. Awareness creation to the informal recyclers were undertaken in a structured way, but delivered in an informal mode. The result achieved was amazing as such a rapport was created that a very cordial relationship was built between the informal recyclers and the project team that the recyclers, began to seek even personal and professional advice from the team. This process took about two years.

5.3 Association building:
Interactions with the recyclers revealed that they have a collective mindset and work as an informal group. However, they were highly guarded about their contacts of raw material (e-waste), which is the crux of their business. However, through lot of efforts, the team could convince them to form an association. This was the first informal recyclers association, which was formed in the country. It was registered under the societies act on 29th April, 2006, called 'ECO-BIRD'. Further two more associations, E-WarDD (dismantlers) and Masha-Allah (Dealers) trust were also registered. This was a major step forward in terms of formalization.

5.3 Training:
Once the association was formed, then several training programmes were conducted on environmental health and safety and inventory management, etc,. A formal training programme called 'PREMA' was conducted on profitable environmental management for the units, as part of the clean e-waste channel establishment. Training on how to use protective equipment during work and to phase out harmful chemicals was also initiated. The recyclers were taken to formal recycling units and the working conditions there were shown to inspire them to become formal units.

5.4 Company formation:
The recyclers were happy to enjoy the status as an association, as they did not have to radically change their business operations. However, when they were given the option of forming a company, wherein they had to make radical changes, they were not very forthcoming. The consultants appointed by the Indo-German-Swiss e-waste initiative, M/s.Paradigm Environmental Strategies Private Limited, undertook several brainstorming sessions to convince them using business sense as to why this is useful. Several economical advantages and disadvantages of forming the company was listed to them and finally they chose to form the company.

An interaction meeting with a Chartered Accountant was organized by Paradigm to make an informed choice about the type of company to be formed. Finally in September 2006, a formal proprietary company called "EWARDD & Co", was formed. This was a major milestone in the formalization process.

5.5 Site selection:
The premises in which the informal recycling activity was being undertaken was at Ghoripalya, a congested site and in a residential area. If a formal unit satisfying all environmental norms were to be set up, then it had to be shifted to a new premises and location. This was one of the toughest activity as the land had to be inexpensive and in an industrial area. Finally a plot of 120 sq.mts, with a shed, was leased out in an industrial area. The newly formed company obtained this site for the affordable price.

5.6 Project report preparation:
The consultants, Paradigm prepared a Detailed Project Report (DPR), which satisfies the requirement of a financial institution and for the state pollution control board for authorization. The DPR also contained the plant layout and financial analysis of the company, which was made in consultation with the Ewardd & Co.

5.7 Pollution Control Board Authorization:
The Ewardd and Co. has now applied for authorization from the state pollution control board. This application for the 'Consent for Establishment' is under process and very soon they are expected to obtain a clearance.

The entire process took about 5 years. However, the time should not be a deterrent factor for the agencies who wish to undertake this approach, as there were several trial and error strategies which were used here. The lessons learnt are well documented and in case, it has to be replicated, the time will be less than halved.

Conclusion:

Although a formal legislation is a welcome outcome for a better e-waste management in the country, such legislation will affect the livelihood of the informal recyclers in the country. This paper reflects on one of the approaches towards formalizing the informal recyclers to avoid the problem of this section of the society getting affected. The lessons learnt from this approach can be used for uplifting other informal sectors and bringing them into the mainstream.

This case study is a good example of redefining the institutional framework through capacity building. This case study is also an example for retaining the employment of the weaker section of the society. It is recommended that any policy changes or legislation in the country should be sensitive to this issue to effect good governance.

Acknowledgement:

The author wishes to acknowledge the e-waste initiative partners and the HAWA-GTZ-ERM project members. The e-waste management initiative is driven by the Indo-German-Swiss e-waste Initiative, constituted by the Ministry of Environment and Forest (MoEF), Government of India, the German Technical Cooperation (GTZ), and EMPA (the Swiss Federal Institute for Material Testing and Research). In Bangalore, the activities began with the HAWA – GTZ project and is being scaled up through the E-Waste Agency (EWA), which is a non-profit, non-government, voluntary agency, which is supported by the Indo-German-Swiss e-waste initiative.

The author also wishes to specially acknowledge the support provided by Dr.Jurgen Porst, Senior Advisor, HAWA project and all the staff.

Authors' special thanks to the informal recyclers association E-Ward for being part of the process and providing necessary information.

The author wishes to thank the staff of Paradigm Environmental Strategies Private Limited for providing the information on the Detailed Project Report, site selection process and the company formation.(Footnotes)