BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI
ORIGINAL APPLICATION No. 536/2024

In the matter of:

NEWS ITEM TITLED "WASTE TO ENERGY: SMOKESCREEN OR SOLUTION?" APPEARING IN THE INDIAN DEVELOPMENT REVIEW DATED 27.03.2024

Index

(Filed by Adv. Suman Arora)
On behalf of Central Pollution Control Board

Place: Delhi
Dated: 11.11.2024

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEW DELHI

ORIGINAL APPLICATION No. 536/2024

In the matter of:

NEWS ITEM TITLED "WASTE TO ENERGY: SMOKESCREEN OR SOLUTION?" APPEARING IN THE INDIAN DEVELOPMENT REVIEW DATED 27.03.2024

REPONSE ON BEHALF OF THE CENTRAL POLLUTION CONTROL BOARD, RESPONDENT No. 1.

1. That the Hon'ble NGT vide Order dated 15.05.2024 has issued notice to the Central Pollution Control Board (CPCB) in the instant matter. A copy of the said Order dated 15.05.2024 is annexed as **ANNEXURE – I.** That in compliance of the said order the reply by CPCB is being made in the succeeding paragraphs.

2. That, CPCB is a statutory Board constituted under Section 3 of The Water (Prevention and Control of Pollution) Act, 1974. It performs the functions under The Water (Prevention and Control of Pollution) Act, 1974, The Air (Prevention and Control of Pollution) Act, 1981, and The Environment (Protection) Act, 1986.

Preliminary Submission:

3. Hon'ble NGT registered O.A No. 536/2024 suo-motu on the basis of the news item titled "Waste to energy: Smokescreen or solution?" appearing in the Indian Development Review dated 27.03.2024 which highlighted the following issues:

NOTARY PUBLIC
R.L. Chaudhary
N.C.T. of Delhi
Regd. No. 1513
GOVT. OF INDIA

- **Mixed Waste handling and High Moisture and Low Calorific Value of Waste:** WtE plants in India often receive mixed waste, including organic and recyclable materials, leading to inefficient burning and increased pollution. It has high moisture content and low calorific value, making it unsuitable for efficient combustion in WtE plants without supplementary fossil-fuel energy.
- **Air Pollution Due to Incineration of mixed waste:** Incineration of mixed waste produces toxic emissions, including carbon monoxide, nitrogen oxides, and Sulphur dioxide, leading to respiratory ailments and chronic lung diseases among nearby residents.
- **Bottom Ash Generation:** Inefficient burning results in the generation of a large amount of bottom ash, constituting 30-40% of the total feed. This ash can contaminate soil and groundwater and pose health risks to waste pickers.
- **Compliance to Stipulated Norms:** The article alleges potential violations of the Solid Waste Management Rules, 2016 and the Environment Protection Act, 1986.

4.0 **CPCB's Response to Issues raised in the News Article:**

It may please be noted that the SPCBs/PCCs are required to submit the Annual Report on Solid Waste Management (SWM) in their jurisdiction as per provisions of SWM Rules 2016. Further CPCB has also monitored several Waste to Energy (WtE) plants in compliance of various Court Orders issued on the matter. Further in compliance of EPR Guidelines notified by MoEFCC as Amendment to PWM Rules, 2016 the Plastic Waste Processors including the Waste to Energy Plants are required to register on

the Centralised Extended Producer Responsibility (EPR) Portal for Plastic Packaging developed by CPCB.

CPCB has accordingly prepared the response to the Hon'ble NGT Order in subsequent paragraphs.

4.1 Mixed Waste handling and High Moisture and Low Calorific Value of Waste:

Waste receipt at WtE plants depends on level of segregation. Partial/not fully segregation leads to receiving wastes which may include organic and recyclable materials. Such unsegregated wastes may have higher moisture content and low calorific value, impacting combustion in WtE plants and emissions thereto.

4.1.1. **Provisions of Solid Waste Management Rules, 2016**

a. Related to segregation of waste

As per Clause 4 of the SWM Rules 2016, it is the responsibility of waste generators (individuals, households, event organizers, street vendors, resident welfare and market associations, gated communities and institutions with more than 5,000 m^2 area, hotels, and restaurants etc.) to segregate, and store the waste generated by them in three separate streams namely bio-degradable (wet waste), non-biodegradable (dry waste) and domestic hazardous wastes, in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities.

Moreover, sanitary waste is required to be securely wrapped and placed in the dry or non-bio-degradable waste bin and construction waste is required to be stored separately and disposed of according

to the Construction and Demolition Waste Management Rules, 2016.

The purpose of "at-source segregation of waste" is to enable the efficient collection, transportation, processing, and disposal of municipal solid waste (MSW).

Further, clause 15 of SWM Rules, 2016 stipulates the duties and responsibilities of local authorities (Municipal Corporations, Municipal Councils, Village Panchayats, etc.), which include arranging for door-to-door collection of segregated solid waste from all households, including slums and informal settlements, as well as from commercial and institutional premises. They are required to direct waste generators to avoid littering and ensure waste is segregated at source for authorized waste pickers or collectors. Local authorities to set up material recovery facilities for sorting recyclable materials and transport segregated bio-degradable waste to processing facilities, prioritizing on-site processing. Additionally, they should educate workers and create public awareness campaigns to promote proper waste segregation, storage, and handover of segregated waste to appropriate parties. It is the responsibility of local to collect and transport segregated waste to processing and disposal facilities, usually managed by private contractors.

b. Related to Criteria for Waste To Energy Process

Clause 21 of SWM Rules, 2016 specifies the following criteria for waste to energy process:

Non-recyclable waste having calorific value of 1500 Kcal/kg or more shall not be disposed of on landfills and shall only be utilised

for generating energy either or through refuse derived fuel or by giving away as feed stock for preparing refuse derived fuel.

High calorific wastes shall be used for co-processing in cement or thermal power plants.

The local body or an operator of facility or an agency designated by them proposing to set up waste to energy plant of more than five tonnes per day processing capacity shall submit an application in Form-I to the State Pollution Control Board or Pollution Control Committee, as the case may be, for authorisation.

The State Pollution Control Board or Pollution Control Committee, on receiving such application for setting up waste to energy facility, shall examine the same and grant permission within sixty days.

It is observed that although mixed waste is being sent for disposal at most of the WtE plants, these facilities have facilities for segregation of waste through mechanical and manual methods based on density, size, and magnetic properties with the help of manual sorting, magnetic separators and trommels. Segregation facilities provided in a typical WtE plant include the following:

- Pre-sorting using trommels and ballistic separators to segregate waste.
- Combustible materials form RDF sent to Boiler for generating energy
- Organic fraction sent to windrows for composting. Coarse segregation to remove larger particles.
- Refined compost undergoes further quality improvement.
- Remaining non-recyclable, non-compostable materials sent to landfill

Through aforementioned segregation measures, Refused Derived Fuel (RDF) of higher Calorific value than mixed MSW is fed into the combustion chamber of the boiler.

4.2. Air Pollution Due to Incineration of mixed waste:

Incineration of waste produces toxic emissions, including carbon monoxide, nitrogen oxides, and Sulphur dioxide.

4.2.1 Emission norms for incineration as per SWM Rules, 2016

Solid Waste Management Rules, 2016 (Para-C of Schedule-II) specify the emission standard for the incineration of municipal solid waste (MSW) in India as given in Table 2.0:

Table 2.0: Standard for incineration as per Para-C of Schedule-II of SWM Rules, 2016

Parameter	**Emission standard**	
(1)	**(2)**	**(3)**
Particulates	50 mg/Nm^3	Standard refers to half hourly average value
HCl	50 mg/Nm^3	Standard refers to half hourly average value
SO2	200 mg/Nm^3	Standard refers to half hourly average value
CO	100 mg/Nm^3	Standard refers to half hourly average value
	50 mg/Nm^3	Standard refers to daily average value
Total Organic Carbon	20 mg/Nm^3	Standard refers to half hourly average value
HF	4 mg/Nm^3	Standard refers to half hourly average value

NOx (NO and NO2 expressed as NO2)	400 mg/Nm^3	Standard refers to half hourly average value
Total dioxins and furans	0.1 ng TEQ/Nm^3	Standard refers to 6-8 hours sampling. Please refer guidelines for 17 concerned congeners for toxic equivalence values to arrive at total toxic equivalence.
Cd + Th + their compounds	0.05 mg/Nm^3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.
Hg and its compounds	0.05 mg/Nm^3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.

As per note (g) below Clause C (Schedule-II) of SWM Rules,2016

All the facilities in twin chamber incinerators shall be designed to achieve a minimum temperature of 950 ^{0}C in secondary combustion chamber and with a gas residence time in secondary combustion chamber not less than 2 (two) seconds.

4.2.2 Details of air pollution control devices (APCD) provided in typical WtE facility

As per information provided by the registered WtE facilities on the EPR Portal, Air Pollution Control Devices (APCD) provided in a typical WtE plant include the following:

- **Scrubbers**: Used to remove acid gases from the flue gas stream.
- **Lime Spray Reactors**: Neutralize acidic components in the flue gases.

- **Activated Carbon Injection Systems**: Adsorb dioxins, furans, and heavy metals from the flue gases.
- **Bag Filters**: Capture and remove particulate matter, including the activated carbon particles.
- **Electrostatic Precipitators (ESP)**: Remove fine particulates from the flue gases using an electrostatic charge.
- **Reaction Towers**: Where additional treatment of flue gases occurs, often using a combination of activated carbon and other reagents.
- **Scrubbing Systems**: Ensure thorough removal of any residual contaminants from the flue gases.

4.2.3 Inspection of WtE plants

CPCB, in association with the concerned SPCB/PCC, in compliance of Hon'ble NGT Orders in OA No.640/2018 inspected three Waste-to-Energy (WtE) plants namely M/s Timarpur Okhla Waste Management Company Limited, M/s Delhi MSW Solutions Ltd., M/s East Delhi Waste Processing Company Ltd. The inspections reports for 2021 & 2020 are placed at **Annexure-II & Annexure II A respectively**

Overview of the Stack emission monitoring results of the three WtE plants is given below

M/s Delhi MSW Solutions Ltd, Bawana, Delhi.:

2020: All parameters found within stipulated norms

2022: Dioxin and Furans: 0.49 ngTEq/Nm^3 (exceeds limit of 0.1 ngTEq/Nm^3), Other parameters (PM, NOx, SO2, etc.) within stipulated norms.

M/s Timarpur Okhla Waste Management Company Limited, Okhla, Delhi:

2020: All parameters except Dioxin and Furan found within stipulated norms

2021: Dioxin and Furans: 0.99 ngTEq/Nm³ (exceeds limit of 0.1 ngTEq/Nm³), HCL: 198 mg/Nm³ (exceeds limit of 50 mg/Nm³), Other parameters (PM2.5, PM10, NOx, SO2, etc.) within stipulated norms.

M/s East Delhi Waste Processing Company Ltd., Ghazipur, Delhi:

2020: PM, NOx, Pb not meeting stipulated norms, Dioxin & Furan not monitored

2021: Dioxin and Furans: 0.49 ngTEq/Nm³ (exceeds limit of 0.1 ngTEq/Nm³), PM: 62.7 & 85.1 mg/Nm³ (exceeds limit of 30 mg/Nm³), NOx: 869 mg/Nm³ (exceeds limit of 350 mg/Nm³), HCL: 407 mg/Nm³ (exceeds limit of 50 mg/Nm³), Other parameters within stipulated norms.

The compliance status of WtE plants is observed to be fluctuating, complying in some cases and non-complying in the others. It is observed that WtE plants can comply with the stipulated norms provided necessary operation and maintenance practices are in place and adequate air pollution control measures are implemented.

4.3 Bottom Ash Generation

Inefficient burning results in the generation of a large amount of bottom ash, constituting 30-40% of the total feed. This ash can contaminate soil and groundwater and pose health risks to waste pickers.

a. Analysis of Bottom ash

The analysis reports of the bottom ash of the three units inspected by CPCB in Delhi (Refer **Annexure-II)** is given in Table 3.0:

Table 3.0 : Bottom Ash analysis

S.NO.	Parameters	Standard/Limit (mg/L*)	WtE facility (Timarpur)	WtE facility ((Bawana))	WtE facility (Ghazipur)
1.	Loss on ignition (for bottom ash only)	<5%	2.29	1.67	1.89
2.	Arsenic	5 mg/l	BDL	BDL	BDL
3.	Cadmium	1 mg/l	BDL	BDL	BDL
4.	Chromium	5mg/l	0.05	0.08	0.52
5.	Manganese	10mg/l	BDL	BDL	3.01
6.	Lead	5mg/l	0.03	BDL	0.08
7.	Selenium	1mg/l	BDL	BDL	BDL
8.	Copper	25mg/l	0.29	0.01	1.52
9.	Nickel	20mg/l	BDL	BDL	0.42
10.	Zinc	250mg/l	0.03	0.02	10.79
11.	Cobalt	80 mg/l	BDL	BDL	0.12
12.	Vanadium	24mg/l	BDL	BDL	BDL
13.	Antimony	15 mg/l	BDL	BDL	0.36

Based on the analysis of heavy metals, it is observed that the concentration of all the parameters are within the stipulated norms.

b. **Management of Bottom Ash:**

As per information provided in the Centralized EPR Portal for plastic packaging by registered WtE facilities, average ash generation from the incineration of municipal solid waste (MSW) in a typical WtE plant ranges from 22% to 25% of the incinerated quantity. The practices adopted for management of bottom ash in a typical WtE facility include the following:

- Bottom ash is collected from the combustion chamber in Waste-to-Energy (WtE) plants after the incineration of MSW
- A magnetic separator is employed to extract ferrous materials from the bottom ash.
- The remaining ash is sent to the bottom ash handling facility, where it is cooled and further processed.
- This process allows for the recycling of recoverable materials, such as metals.
- Non-recyclable bottom ash is disposed of in sanitary landfills or brick manufacturing

4.4 Compliance Status of WtE plants

As per the Annual Report provided by SPCBs/PCCs for the year 2021-22 , there are thirteen waste-to-energy plants operational in India (Andhra Pradesh – 2, Delhi-2, Goa-1, Haryana-1, Madhya Pradesh-1, Maharashtra -1, Telangana – 1, Uttar Pradesh-3, West Bengal-1).

Further in compliance to Hon'ble NGT order dated 15.5.24 in O.A No. 536/2024 matter, CPCB issued a letter dated 7.08.2024 to all SPCBs/PCCs requesting information on WtE plants in their

jurisdiction in the prescribed format. A copy of CPCB letter is attached as **Annexure-III**.

In response to the CPCB letter, 30 SPCBs/PCCs have provided the information & 06 SPCBs/PCCs namely Arunachal Pradesh, Delhi, Himachal Pradesh, Karnataka, Uttar Pradesh and Uttarakhand have not provided the requisite information.

The following 24 SPCBs/PCCs have reported that there is no operational municipal solid waste (MSW)-based Waste-to-Energy (WtE) plant in their regions, namely: Andaman & Nicobar, Assam, Bihar, Chandigarh, Chhattisgarh, DNH & DD, Goa, Jammu & Kashmir, Jharkhand, Kerala, Ladakh, Lakshadweep, Manipur, Meghalaya, Mizoram, Nagaland, Puducherry, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, West Bengal, and Odisha.

06 SPCBs/PCCs, namely Gujarat, Madhya Pradesh, Telangana, Haryana, and Maharashtra & Andhra Pradesh have reported that they have operational municipal solid waste (MSW)-based Waste-to-Energy (WtE) plants. Summary of information provided by the 6 SPCBs/PCCs related to WtE plants is attached as **Annexure-IV.**

Based on the information provided by SPCBs/PCCs, there are 9 operational SWM based WtE plants in 6 States/UTs. It is observed that out of 9 WtE plants, 6 have been monitored by concerned SPCBs/PCCs. 5 WtE plants have been found compliant & one plant in Maharashtra was found non-compliant w.r.t. Particulate matter and action was taken by Maharashtra PCB.

5.0 Guidelines/Documents Prepared by CPCB

5.1 Buffer Zone Guidelines

CPCB amended Guidelines on "Provision on Buffer Zone around waste processing and disposal facilities and submitted to all SPCBs/PCCs for implementation. The purpose of this Guideline is to specify adequate separation distances between solid waste management facility and its surrounding area having different land usage characteristics. The guideline is placed at **Annexure-V**

5.2 Selection Criteria for waste processing technologies

CPCB has prepared a Guidelines on "Selection Criteria for Waste Processing Technologies,". This report provides detailed guidelines for selecting appropriate waste processing technologies including Waste to Energy based on various factors such as the quantity and characteristics of waste, physical and chemical properties, land availability, social factors, capital investment, and treatment duration. The Guidelines are placed at **Annexure VI**

6.0 Conclusions

a. Technology for Solid waste processing, including Waste to Energy, should be selected in compliance with the Guidelines developed by CPCB on the subject

b. ULBs to ensure that Segregated waste is disposed at the WtE plants. Necessary provisions for further segregation of waste, as necessary, should be made at the WtE plant.

c. The WtE facilities should ensure that proper operation & maintenance facilities are followed. It should further implement adequate air pollution control measures to ensure that the emissions from the plant meet the stipulated norms.

d. WtE plants should ensure maximum utilization of Bottom ash for beneficial purposes like bricks manufacturing etc. and minimise the quantity disposed in the landfills.

e. The WtE facility should develop adequate buffer zone in and around its premises, in compliance with the Guidelines developed by CPCB on the subject

f. The concerned SPCB/PCC should regularly monitor the WtE facilities to ensure that the WtE plants are complying with the stipulated norms

7. That the answering respondent CPCB craves the leave of this Hon'ble Tribunal to file additional reply, if so directed.

8. That, in the light of the above submissions, it is respectfully submitted that the answering respondent CPCB shall abide by the orders (s) and/or direction(s) passed by this Hon'ble Tribunal in the instant case.

NOTARY PUBLIC
R.L. Chaudhary
N.C.T. of Delhi
Regd. No. 1513
GOVT. OF INDIA

(Divya Sinha)
Scientist 'F"
Central Pollution Control Board

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEW DELHI

ORIGINAL APPLICATION No. 536/2024

In the matter of:

NEWS ITEM TITLED "WASTE TO ENERGY: SMOKESCREEN OR SOLUTION?" APPEARING IN THE INDIAN DEVELOPMENT REVIEW DATED 27.03.2024

AFFIDAVIT

I, **Divya Sinha** working as Scientist 'F' in Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi, do hereby solemnly affirm, declare on oath and state as under: -

1. That I, the deponent herein is authorized representative to represent the Respondent CPCB in the present case, and as such, I am well conversant with the facts and circumstances of the present case on the basis of the information derived from the official records, and hence, I am competent and authorized to verify, sign and swear this affidavit on behalf of the Respondent CPCB.

2. That the accompanying reply may be read part and parcel of the present affidavit.

3. That the accompanying reply has been drafted and filed under my instructions and authority the contents thereof are true and correct on the basis of the record maintained during ordinary course of business of CPCB and available records and documents and the contents of the same are read over and explained to me and are not repeated herein for the sake of brevity.

NOTARY PUBLIC
R.L. Chaudhary
N.C.T. of Delhi
Regd. No. 1513
GOVT. OF INDIA

DEPONENT

दिव्या सिन्हा / Divya Sinha
वैज्ञानिक 'एफ' / Scientist 'F'
केंद्रीय प्रदूषण नियंत्रण बोर्ड
Central Pollution Control Board
(पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार)
(M/o Environment, Forest & Climate Change, Govt. of India)
परिवेश भवन, पूर्वी अर्जुन नगर, दिल्ली–110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032

VERIFICATION

11 NOV 2024

Verified at New Delhi on this day of _____ 2024 that the contents of the above reply are correct and true on the basis of the records of the case as mentioned in the day-to-day affairs of the CPCB. Nothing has been concealed therefrom or mis-stated.

DEPONENT

NOTARY PUBLIC
R.L. Chaudhary
N.C.T. of Delhi
Regd. No. 1513
GOVT. OF INDIA

ATTESTED
NOTARY PUBLIC
GOVT. OF INDIA
11 NOV 2024

दिव्या सिन्हा / Divya Sinha
वैज्ञानिक 'एफ' / Scientist 'F'
केंद्रीय प्रदूषण नियंत्रण बोर्ड
Central Pollution Control Board
(पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार)
(M/o Environment, Forest & Climate Change, Govt. of India)
परिवेश भवन, पूर्वी अर्जुन नगर, दिल्ली–110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032

Annexure - I

Item No.06 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No.536/2024

News item titled "Waste to energy: Smokescreen or solution?" appearing in the Indian Development Review dated 27.03.2024

Date of hearing: 15.05.2024

CORAM: HON'BLE MR. JUSTICE PRAKASH SHRIVASTAVA, CHAIRPERSON
HON'BLE DR. AFROZ AHMAD, EXPERT MEMBER

ORDER

1. This original application is registered *suo-motu* on the basis of the news item titled "Waste to energy: Smokescreen or solution?" appearing in the Indian Development Review dated 27.03.2024.

2. The matter relates to the utility of the waste to energy plants (WtE) and questions their suitability with respect to India's waste problem. As per the article, Waste-to-energy (WLE) technologies allow for the recovery of energy by burning or incinerating waste that cannot be recycled or composted. Their benefits are considered twofold. One, they offer an alternative waste disposal mechanism, diverting solid waste from landfills. Two, through the generation of electricity or heat by burning waste, they provide a renewable energy source that limits reliance on fossil fuels, thereby reducing greenhouse gas emissions. However, the article alleges that though WtE plants have seen relative success in the European Union, environmentalists and scientists have warned that they may not be a suitable solution for India's waste problem.

3. According to the news item, there are two pertinent issues with incineration as a waste management solution in India-

a. The quality of waste in India: As per the article, the potential of a WtE operation to meet its energy production target depends on the quality of its waste feedstock. Waste with low moisture content and high calorific value would be ideal for incineration. This includes materials such as non- recyclable plastics (multilayered packaging, plastic bags, styrofoam), contaminated non-usable household textile waste, and non-recyclable domestic hazardous waste, such as soiled paper, soiled cloth, pieces of leather, rubber, tyre, and non-usable wood.

   However. Domestic waste in India typically contains high moisture content and has low calorific value, making it unsuitable for efficient combustion in WtE plants, The news item alleges that the WtE plants in India often receive mixed waste, which includes organic, recyclable material. It alleges that mixed waste has high moisture content and needs supplementary energy to incinerate or it won't burn well. This energy is typically fossil-fuel-based, which undermines the claim that electricity produced by WtE plants is altogether clean.

b. Health and Environmental implications: As per the article, incineration of mixed waste produces toxic particles, including carbon monoxide, nitrogen oxides, and sulphur dioxide due to inefficient burning. These particles can cause respiratory ailments and also lead to chronic lung diseases, such as asthma among people who live near WtE sites.

   Another result of inefficient burning is the large discharge of bottom ash This could be as high as 30-40 percent of the total feed, which then ends up in open dump sites, contaminating the groundwater and soil with its toxic chemicals. It is also hazardous to waste pickers who work at these landfills.

4. The news item raise the question that if India doesn't have suitable waste for WtE plants and these plants are harmful to both human and environmental health, why are more of these facilities being built?

5. It states that In India, an estimated 55 million tonnes of municipal solid waste is generated annually by 377 million citizens residing in urban areas. With an urban population that's expected to grow to 600 million by 2030 and to 814 million by 2050, India is set to generate 165 million tonnes of waste by 2030 and 436 million tonnes by 2050. The waste composition and its characteristics are also subject to change drastically, with a rise in dry waste quantities, a trend observed in major cities. Therefore, there is an urgent need to adopt sustainable waste management practices, with incineration and land filling relegated to the back of the queue.

6. The above matter indicates violation of Solid Waste Management Rules, 2016 and the Environment Protection Act, 1986.

7. The news item raises substantial issue relating to compliance of the environmental norms and implementation of the provisions of scheduled enactment.

8. Power of the Tribunal to take up the matter *suo-motu* has been recognized by the Hon'ble Supreme Court in the matter of *"Municipal Corporation of Greater Mumbai vs. Ankita Sinha & Ors." reported in 2021 SCC Online SC 897.*

9. Hence, we implead the following as respondents in this matter:

(i). Central Pollution Control Board, Through its Member Secretary, Parivesh Bhawan, East Arjun Nagar, Delhi-110032.

(ii). Ministry of Forest Environment and Climate Change, through its Secretary, Indira Paryavaran Bhawan, Jorbagh Road, New Delhi- 110003.

(iii). National Environmental Engineering Research Institute, through its Director, Nehru Marg, Nagpur – 4400020.

(iv). Indian Institute of Technology, New Delhi, through its Director, Hauz Khas, New Delhi – 110016.

(v). Indian Institute of Technology, Mumbai, through its director, IIT Bombay, Powai, Mumbai – 400076.

10. Let notice be issued to the above respondents for filing their response at least one week before the next date of hearing.

11. List on 01.08.2024

Prakash Shrivastava, CP

Dr. Afroz Ahmad, EM

May 15, 2024
OA No.536/2024
HB

Annexure - II

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL,

Principal Bench, New Delhi

Original Application No. 640/2018

In

(Earlier O. A. No. 22/2013(THC))

In the matter of: -

Sukhdev Vihar Residents Welfare Association — Applicant(s)

Versus

State Of NCT of Delhi — Respondent(s)

Index

Sr. No.	Particulars	Page No.
1.	**Compliance Report** of Waste to Energy Plants in Delhi in Original Application No. 640/2018 (Earlier O. A. No. 22/2013(THC)) in the matter of Sukhdev Vihar Residents Welfare Association Vs State Of NCT of Delhi in compliance to the Hon'ble NGT orders dated 09.10.2017 & 27.09.2018 respectively.	
2.	**Annexure-I:** A copy of Hon'ble NGT orders dated 09.10.2017 & 27.09.2018.	

(Divya Sinha)
Scientist-E
Central Pollution Control Board,
Parivesh Bhawan, East Arjun Nagar,
Delhi- 110032.

Date: 22.03.2021
Place: Delhi

Compliance Report of Waste to Energy Plants in Delhi

(Period: September-October, 2020)

As per Hon'ble NGT Vide its Order dated 09/10/2017, in OA No. 22 of 2013 THC & dated September, 27, 2018 in OA No. 640/2018 (Earlier OA No. 22/2013)

CENTRAL POLLUTION CONTROL BOARD
(Ministry of Environment, Forest & Climate Change, Govt. of India)
'Parivesh Bhawan' C.B.D. Cum-Office Complex,
East Arjun Nagar, Shahdara, Delhi-110032
E-mail:divsinha@yahoo.com, Website- www.cpcb.nic.in

March, 2021

1. Background

1.1. Hon'ble NGT in its order dated 09/10/2017 in OA No. 22 of 2013 THC, directed Central Pollution Control Board to collect and analyse the samples of ambient air quality once in four months, and they shall also conduct at least two surprise inspections and analysis be made in a year from M/s. Timarpur Okhla Waste Management Company Ltd.

1.2. Further Hon'ble NGT vide its order dated September, 27, 2018 in OA No. 640/2018 (Earlier OA No. 22/2013), issued the following directions:

i. *In pursuance of earlier order of this Tribunal dated 18.04.2018, joint inspection of Waste to Energy (WtE) Plants at Delhi has been conducted by the CPCB and the DPCC. Findings of reports are that WtE plants at Okhla, Ghazipur and Bawana are non-compliant with respect to the standards of Particulate matter.*

ii. *"Directed CPCB to send a copy of its report to the project proponents of Okhla, Ghazipur and Bawana Waste to Energy Plant for compliance and conduct another inspection within one month in view of the fact that the earlier inspection was in February, 2018 and requirement of carrying out inspection is in every 4 months We do not find any ground to accept the prayer for reliving CPCB of its requirement in four monthly monitoring. If there is a manpower constraint, it is for the CPCB to make any other appropriate arrangement for discharging its functions. This cannot be the ground to avoid responsibility under the binding directions of this Tribunal"*

iii. *"It is made clear that if the project proponents fail to maintain the standards, even after carrying out the deficiencies noticed in the joint inspection Report, CPCB may recommend the amount of environmental damage required to be paid by them".*

In view of above directions, monitoring was planned during September & October, 2020 of Okhla, Bawana & Gazipur WtE plants. However, due to non-working of the Waste to Energy Plant Ghazipur on 16.09.2020 monitoring could not be carried out. The remaining two plants viz. Okhla & Bawana were subsequently monitored by CPCB & DPCC joint inspection team during September, 21-22, 2020 and September 24-25, 2020 respectively. The members of joint committee i.e. representatives from MoEF & CC , expert from IIT Delhi and representative of Sukhdev Vihar RWA (For Okhla Waste to Energy Plant) were informed vide email dated September 11, 2020 regarding the inspection schedule. Representative from MoEF &CC, expert from IIT Delhi were not present during the inspection of Waste to Energy Plants Okhla & Bawana and representative of RWA Sukhdev Vihar was not present during inspection of Okhla. Further, subsequent to Ghazipur Plant becoming

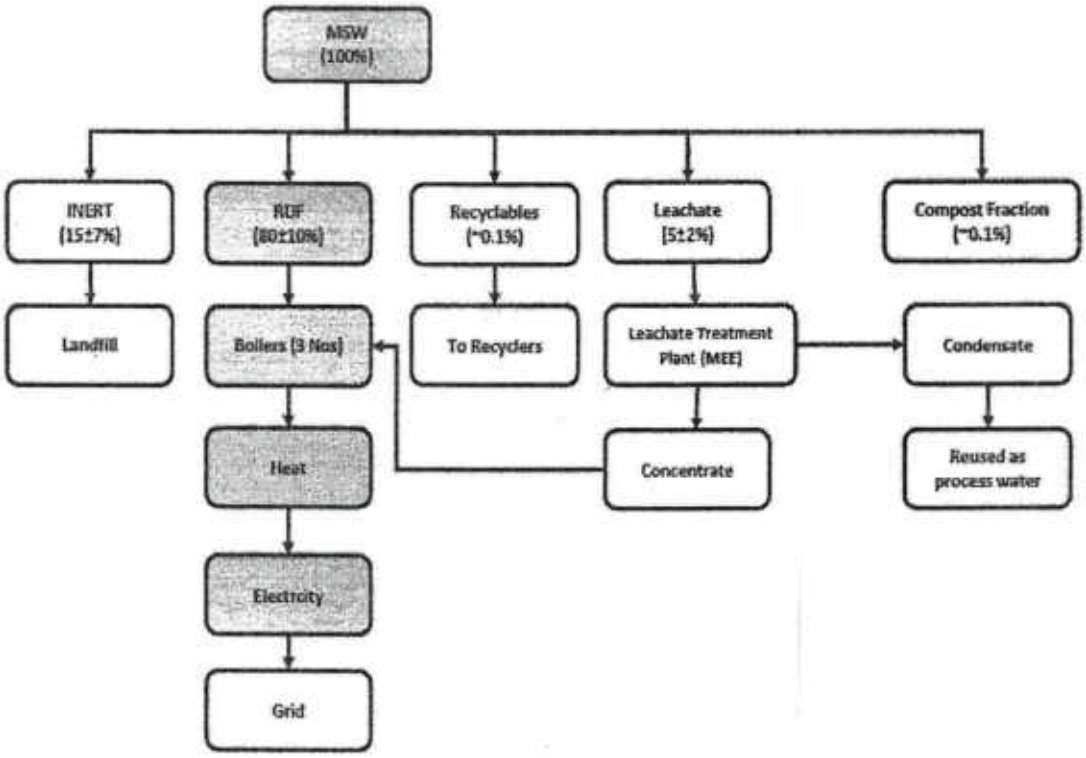
operational, joint inspection team from CPCB, DPCC and expert from IIT, Delhi monitored the plant on October 13-14, 2020. The inspection reports of the three WtE plants is given in the following sections.

Waste to Energy Plant Okhla

CENTRAL POLLUTION CONTROL BOARD, DELHI

1	Name and address of the industry	M/s Timarpur Okhla Waste Management Company Limited, Old NDMC Compost Plant, Behind CRRI, Mathura Road, New Delhi-110025
	Coordinates (Longitude & Latitude)	Lat. 28.553672 & Long. 77.280838
2.	Name of the occupier/contact person with	Mr. Sandeep Dutt
	Telephone	Mob. 09958360016
	Fax	
	E-mail	Sandip.dutt@jindalcopolis.com
3.	Date of inspection / monitoring	September 21-22, 2020
4.	Installed processing Capacity (as per consent)	As per DPCC Authorization letter dated 21.05.2020 the unit has capacity to process 1950 TPD MSW for subsequent generation of 23 MW power.
5.	Production status (on date of inspection)	Operational
6	Actual Power Generation	Details of power generation ranges during the said inspection

Date	Power Generation (MW)		
	Time	Minimum	Maximum
21.09.2020	6 AM to 6 PM	18.94	21.61
22.09.2020	6 AM to 6 PM	18.68	21.11

7.	**Process Flow Diagram** The unit has own segregation setup of MSW having two trommels with ballastic separators for segregation of MSW and production of RDF. The detailed materials flow sheet is as given below: 

8. Air Pollution – Emission Sources & Control

Sources of air pollution	Chimney Details	APC Equipment	Emission Quality
Stack of the Waste to Energy plant (Three boilers connected to one stack)	60 mtrs	Scrubber followed by bag filters	Stack Monitoring Conducted by CPCB team & results are tabulated at **Table – 1**

9.	OCEMS Status	Installed with stack & was found operational during the inspection.
10	Ambient Air Quality (Conducted at two locations namely Sukhdev Vihar & STP Okhla)	Ambient Air Quality Status are tabulated at **Table-2**

11.	Continuous Ambient Air Quality Station	**CAAQMS not yet installed**
12.	Bottom Ash & Fly Ash	Analysis results of LOI and heavy metals in Bottom ash and Fly ash are tabulated at **Table-3**

Table 1: Analysis results of the stack emission monitoring of the WtE plant Okhla

S. No.	Parameters	Monitor by	Standards as per Consent to Operate issued by DPCC	Standards as per Solid Waste Management Rules, 2016,	Date of Sampling	Measured values	
					21-22 September, 2020	Stack	
1.	PM	CPCB	30 mg/Nm³	50 mg/Nm³		10.7	4.4
2.	Hydrogen Chloride		50 mg/Nm³	50 mg/Nm³		198	
3.	SO_2		100 mg/Nm³	200 mg/Nm³		BDL	BDL
4.	NO_x (NO and NO_2 expressed as NO_2)		350 mg/Nm³	400 mg/Nm³		90.3	85.6
5.	CO		100 mg/Nm³	100 mg/Nm³		1.8	
6.	HF		0.5 mg/Nm³	4 mg/Nm³		BDL	
7.	Sb + As + Pb +Cr+ Co+ Cu+ Mn + Ni+ V+ their compounds		0.5 mg/Nm³	0.5 mg/Nm³		0.012	
8.	Cd + Th +their compounds		0.05 mg/Nm³	0.05 mg/Nm³		-	
9.	Pb		0.1 mg/Nm³	Not prescribed		0.004	
10.	Hg		0.02 mg/Nm³	0.05 mg/Nm³		BDL	
11.	Dioxin & Furans	M/s SRI, Delhi	0.1 ngTEq/Nm³	0.1 ngTEq/Nm³	22-10.2020	**0.99**	
12.	Total Organic Compounds(as C) at 11%O_2		20mg/Nm³	20mg/Nm³		7.2	

Table-2. 24 hourly average values of ambient air quality monitoring

Date of sampling	Monitored by	Parameters	Prescribed Standard* (in µg/m³)	Measured values	
				Sukhdev Vihar Location-I	STP Okhla Location-II
21-23 September 2020	CPCB	PM_{10}	100	85.66	72.33
		$PM_{2.5}$	60	**78**	39
		NO_2	80	41.66	28.33
		SO_2	80	8.166	39

**National ambient air quality standards as notified on dated 16.11.2009 under the Environment Protection Act, 1986.*

Table 3: Analysis results of Bottom ash and Fly ash

Date of sampling	Parameters	Standard/Limit	Measured values	
21.09.2020	Loss on Ignition (for Bottom ash only)	<5%*	2.29%	
			Bottom Ash	**Fly Ash**
	Arsenic	5 mg/l#	BDL	BDL
	Cadmium	1 mg/l#	BDL	BDL
	Chromium	5 mg/l#	0.05	0.26
	Manganese	10 mg/l#	BDL	BDL
	Lead	5 mg/l#	0.03	0.05
	Selenium	1 mg/l#	BDL	BDL
	Copper	25 mg/l#	0.29	BDL
	Nickel	20 mg/l#	BDL	BDL
	Zinc	250 mg/l#	0.03	0.15
	Cobalt	80 mg/l#	BDL	BDL
	Vanadium	24 mg/l#	BDL	BDL
	Antimony	15 mg/l#	BDL	BDL

*Standards prescribed by DPCC in the Consent to Operate.
#Concentration Limit to categorise as hazardous waste as per the Hazardous and Other Wastes (Management and Tran boundary Movement) Rules, 2016, notified under the Environment (Protection) Act, 1986.

13. Status of validity & compliance of consent and authorization

	Consent/Authorization	**Validity**
I	Under Water Act	Valid till 24.09.2024
II	Under Air Act	Valid till 24.09.2024

14. Observations:

a. The processing capacity of the plant is 1950 TPD. However as informed, the plant received only 1652.51 TPD of mixed Municipal Solid Waste (MSW) on 21.09.2020.

b. As informed, total RDF generation in the plant is approximately 1350 TPD. As per the logbook RDF used as fuel in boilers on 21.09.2020 & 22.09.2020 is tabulated at **Table 4**:

Table 4: RDF Feed Record

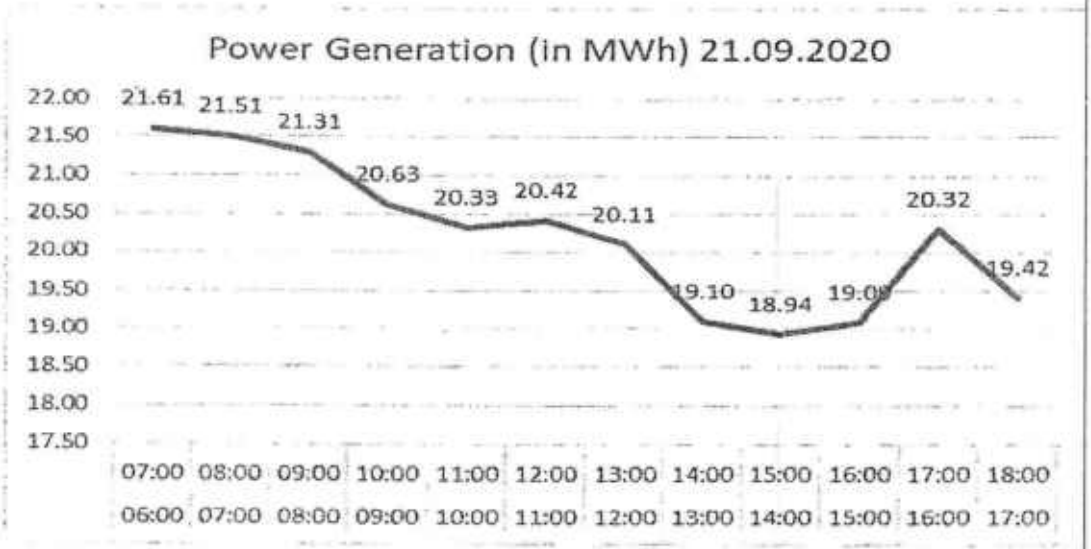
RDF Feed (21-09-2020)					
S. No	**Feeding Duration**		**Boiler 1**	**Boiler 2**	**Boiler 3**
1	06:00	07:00	17.8	17.3	17.6
2	07:00	08:00	17.1	17.8	17.2
3	08:00	09:00	16.9	16.8	16.7
4	09:00	10:00	17.4	16.7	17.7
5	10:00	11:00	17.0	18.2	19.1
6	11:00	12:00	18.0	17.0	16.9
7	12:00	13:00	17.4	18.0	17.5
8	13:00	14:00	18.0	17.2	17.8
9	14:00	15:00	18.0	16.8	16.1
10	15:00	16:00	17.6	17.2	17.9
11	16:00	17:00	23.4	16.4	17.7
12	17:00	18:00	17.2	16.6	17.7
	Total Feed		**215.8**	**206.0**	**209.9**

RDF Feed (22-09-2020)					
S. No	**Feeding Duration**		**Boiler 1**	**Boiler 2**	**Boiler 3**
1	06:00	07:00	24.8	18.2	18.5
2	07:00	08:00	17.2	18.6	18.8
3	08:00	09:00	21.6	18.0	17.7
4	09:00	10:00	17.3	18.2	22.7
5	10:00	11:00	16.6	18.6	15.5
6	11:00	12:00	18.4	20.8	18.1
7	12:00	13:00	18.7	18.6	17.8
8	13:00	14:00	19.0	18.6	22.4
9	14:00	15:00	25.2	18.2	18.2
10	15:00	16:00	18.6	23.8	18.5
11	16:00	17:00	18.1	18.3	18.6
12	17:00	18:00	18.3	18.6	18.3
	Total Feed		**233.8**	**228.5**	**225.1**

c. All the three boilers along with pollution control devices were found operational.

d. The temperature of furnace was maintained between 950-1050°C.

e. Details of power generation during the said inspection is plotted at **Figure 1.**



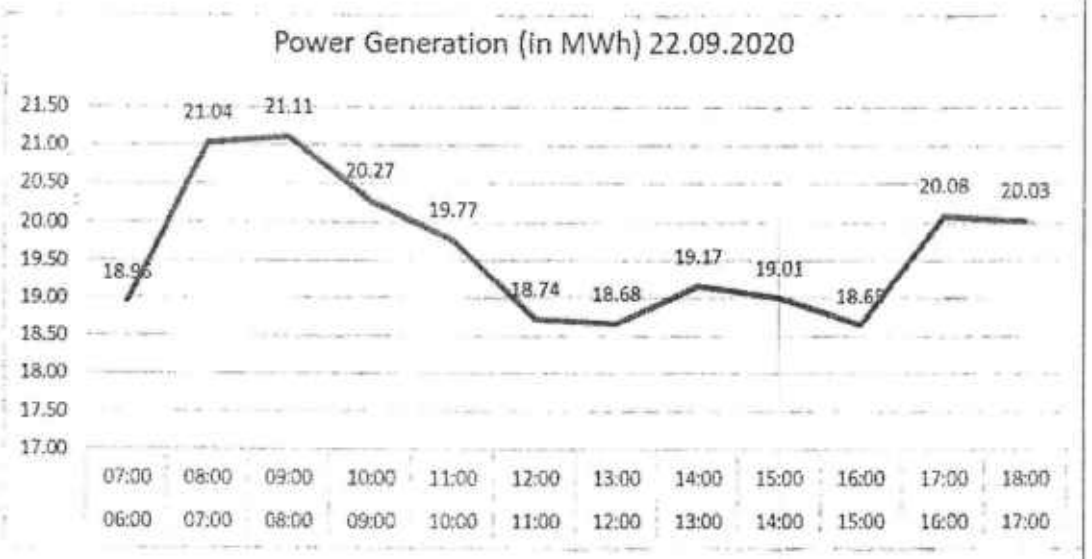


Figure 1: Time vs. power generation plot dated 21 & 22nd September, 2020

f. It is observed that power generation during the monitoring (18.5-21.5 MW) less than the rated power generation capacity (23 MW) of the plant.

g. Stack emission monitoring results are given in **Table 1**. Following are the observations:

i. The Dioxin and Furans values (**0.99 ngTEq/Nm^3**) of stack monitoring exceeded the permissible limit (**0.1 ngTEq/Nm^3**) monitored by Shriram Institute of Industrial Research (SRI), Delhi.

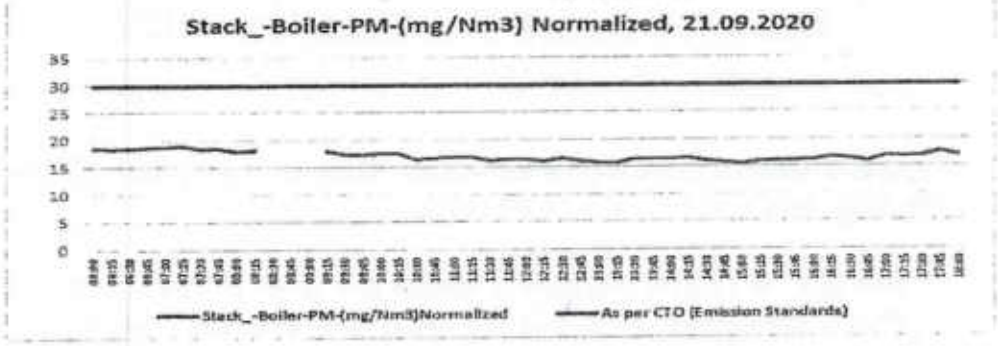
ii. **HCL parameter (198 mg/Nm^3) of stack emission monitored by CPCB exceeded the prescribed limit** (50 mg/Nm^3)

iii. Remaining parameters were within the stipulated norms.

h. Online Continuous Emission Monitoring System (OCEMS) for PM, SO_2, NOx and HCl in the stack emission had been installed and it was found working at the time of inspection. Result obtained from OCEMS on 21.09.2020 is plotted at **Figure-2.** Comparison of OCEMS data with joint monitoring results is also tabulated in **Table 5**. Comparison of OCEMS data with joint monitoring results reveals that the OCEMS data is not matching with the actual monitoring results. HCl level as per actual monitoring is higher than that reported by OCEMS. Also levels of PM, SO_2 and NOx as per actual monitoring is higher than that reported by OCEMS.

Table-5: Comparison of OCEMS and joint monitoring data of Stack emission

Sl. No.	Parameters	OCEMS	Joint inspection results
1.	PM mg/Nm^3	15-20	4.4-10.7
2.	HCL mg/Nm^3	10-30	198
3.	NO_x mg/Nm^3	150-200	85-90
4.	SO_2 mg/Nm^3	40	BDL



9

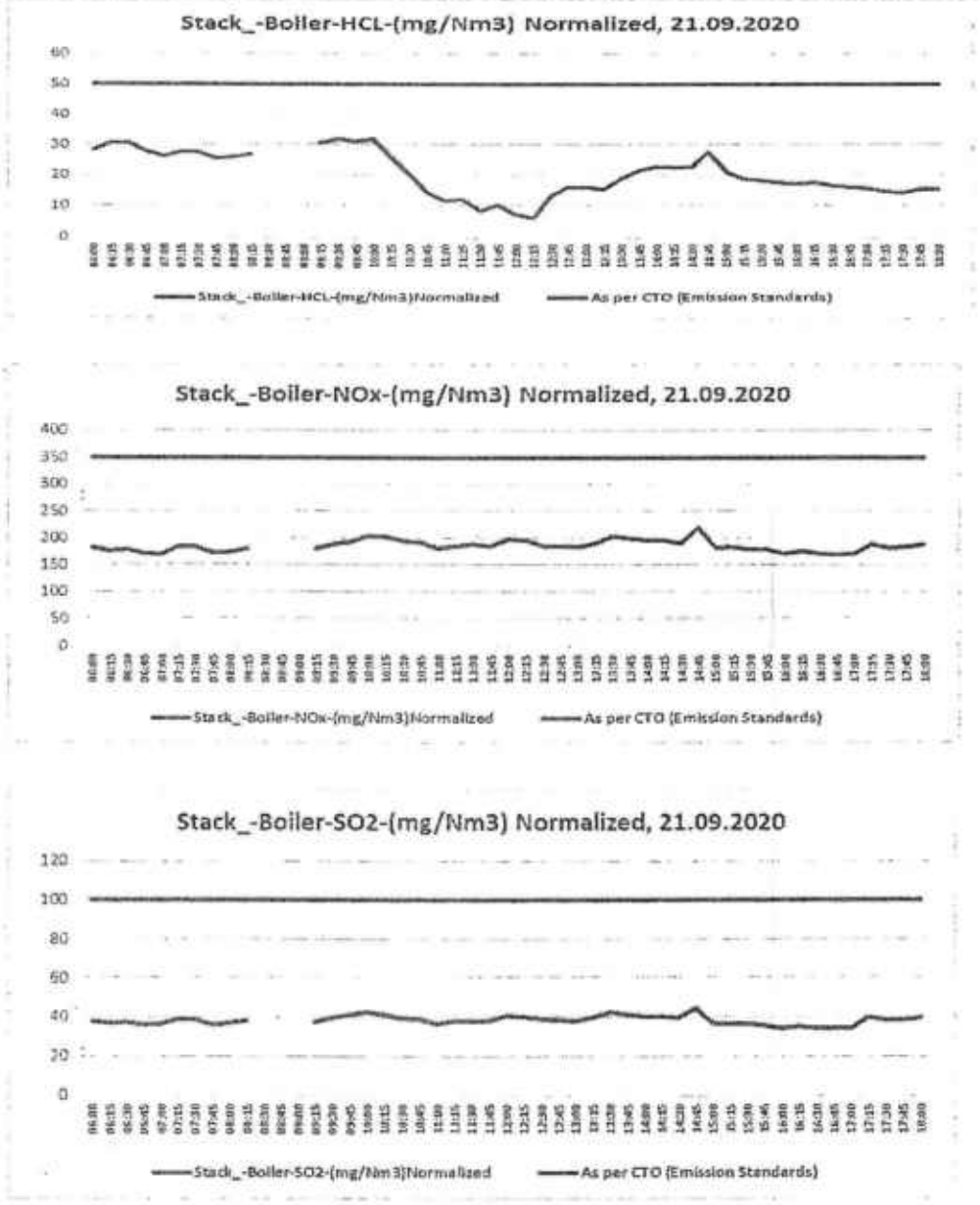


Figure-2: Online Continuous Emission Monitoring System (OCEMS) data for PM, SO_2, NO_x and HCL on 21.09.2020.

i. Ambient Air Quality monitoring results are given in **Table 2.** It is observed that PM2.5 (**78 µg/m³**) exceeded the prescribed limit (60 µg/m³) at Sukhdev Vihar monitoring station. Remaining parameters were found within the limit of both monitoring stations (STP Okhla & Shukdev Vihar).

j. M/s. Timarpur Okhla Waste to Energy plant has placed order to M/s JITF ECOPOLIS for purchase of Continuous Ambient Air Quality Monitoring Station (Copy enclosed).

k. Analysis reports of loss of ignition (LOI) and heavy metals in fly ash and bottom ash are in **Table-3.** It is observed that monitored levels of all the parameters are within the specified limit.

l. Fly ash bricks manufacturing unit is installed but was not operational during the inspection.

m. Plant has installed water sprinkling system for dust settlement.

n. To control the emission of flue gas, the unit is using $Ca(OH)_2$ and Hydrophobic Organic Carbon (HOC) as dosing and approximately 172 Kg/h and 54.2 Kg/h of $Ca(OH)_2$ and HoC used for dosing during inspection on 21.09.20.

o. During inspection, Multi effect evaporator (MEE) was found operational for treatment of leachate and the treated water was reused as process water.

p. As informed average 250 MT of inerts are produced every day and disposed of at Jaitpur site.

q. Radioactive sensors are installed at gate no. 2 of plant.

r. Plant has maintained considerable greenery inside the premises and along boundary wall.

15. Recommendations

i. Plant to properly control production process and pollution control equipment to ensure that all parameters including Dioxin & Furans and HCl are within the stipulated norms.
ii. Plant should implement necessary measures to improve ambient air quality (including $PM_{2.5}$ concentration) in and around the plant.
iii. OCEMS to be calibrated properly to ensure that OCEMS data matches with actual monitoring results.
iv. Okhla plants should utilize 100 % Fly ash for beneficial purposes like bricks manufacturing etc. and time bound Action Plan to be submitted for the same.
v. The plant to specify the timeframe within which the online continuous ambient air quality monitoring station shall be installed.

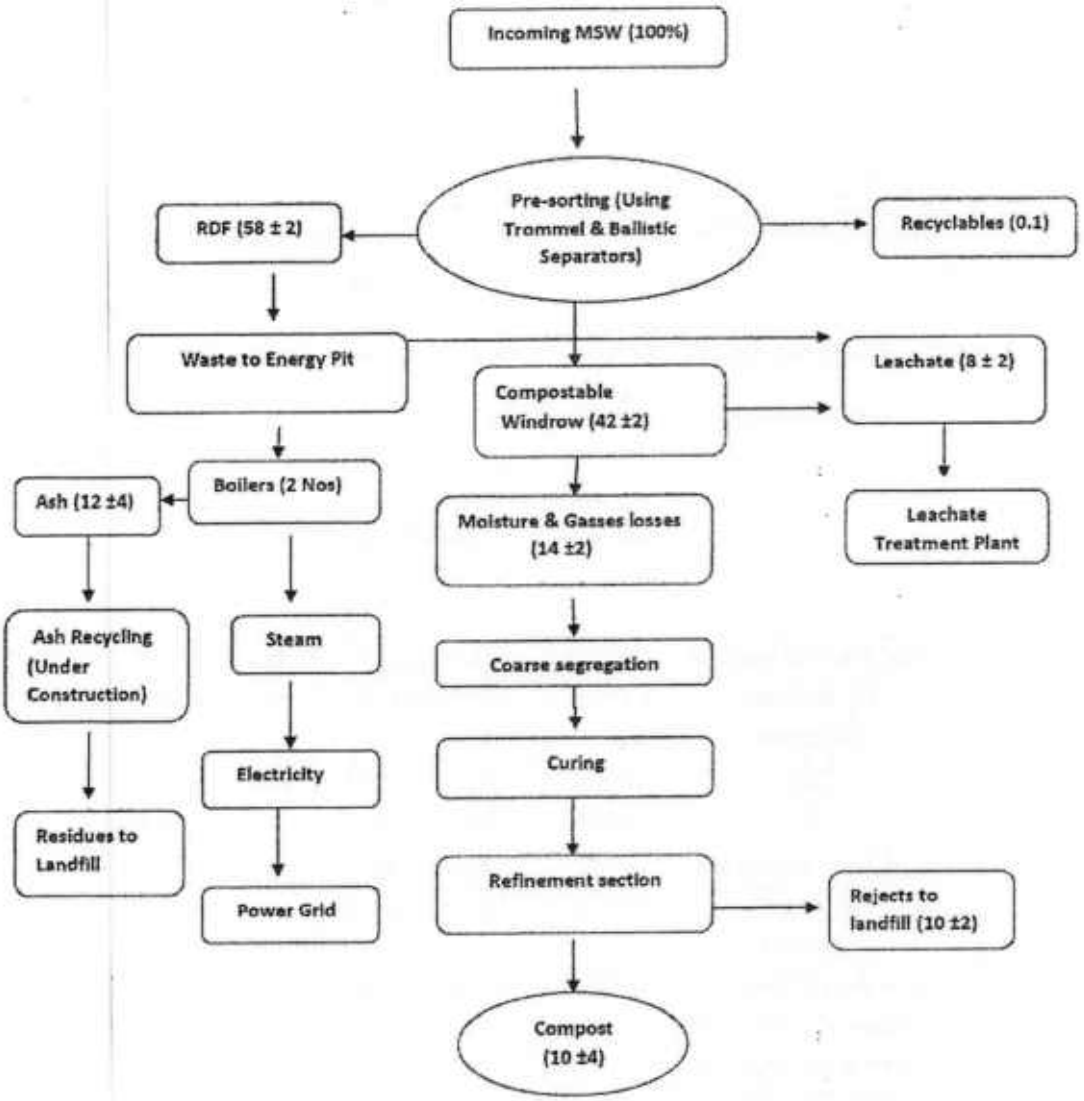
Waste to Energy Plant Bawana

CENTRAL POLLUTION CONTROL BOARD, DELHI		
1	Name and address of the industry Coordinates (Longitude & Latitude)	M/s Delhi MSW Solutions Ltd. Pocket N-1, Sector-5, Bawana Industrial area, Behind Pragati Power Plant Delhi-110039 Latitude Extension: 28°47'58.36"N Longitudinal Extension: 77° 04'11.79"E
2.	Name of the occupier/contact person with Telephone Fax E-mail	K Vijay Kumar Reddy Mob. 9821124350 laboratorynarela@ramky.com
3.	Date of inspection and monitoring	September, 24-25, 2020
4.	Installed processing Capacity (as per consent)	2000 TPD Processing and Disposal facility with 24 MW Waste to Energy Plant
5.	Production status (on date of inspection)	Operational
6	Actual Power Generation	Details of power generation ranges during the said inspection

Date	Power Generation (MW)		
	Time	Minimum	Maximum
24.09.2020	6 AM to 1 PM	22.3	21.1
25.09.2020	6 AM to 6 PM	21.4	20.1

7. **Process Flow Diagram:**

The unit has own segregation setup of MSW having 13 trommels with 4 ballastic separators for segregation of MSW and production of RDF. The detailed materials flow sheet is as given below:



8. Air Pollution – Emission Sources & Control

Sources of air pollution	Chimney Details	APC Equipment	Emission Quality
Stack of the Waste to Energy plant (Two boilers connected to one stack)	60 mtrs	Reaction Tower (lime Spray reactor), Activated Carbon Injection followed by Bag filters.	Stack Monitoring Conducted by CPCB team & Dioxin & Furans by M/s SIIR, Delhi. Results are given in **Table-6**

9.	OCEMS Status	Installed with stack & was found operational during the inspection.
10	Ambient Air Quality monitoring Conducted at two locations at near main gate of the plant and fire station Bawana	Ambient Air Quality Status given in **Table – 7**
11.	Continuous Ambient Air Quality Station	CAAQMS installed & was working
12.	Bottom Ash & Fly Ash	Analysis results of LOI and heavy metals in Bottom ash and Fly ash result in **Table-8**

Table 6. Analysis results of the stack emission monitoring of the WTE plant Bawana

S. No.	Parameters	Monitored & Analysed by	Standards as per Consent to Operate issued by DPCC	Standards as per Solid Waste Management Rules, 2016,	Date of Sampling	Measured values in mg/Nm³
1.	Particulate Matter	CPCB	30 mg/Nm³	50 mg/Nm³	24-25 September, 2020	16.7, 12.8
2.	Hydrogen Chloride	CPCB	50 mg/Nm³	50 mg/Nm³		3.35
3.	SO_2	CPCB	100 mg/Nm³	200 mg/Nm³		BDL, BDL
4.	NO_X	CPCB	350 mg/Nm³	400 mg/Nm³		17.7, 82.0
5.	Carbon Monoxide	CPCB	100 mg/Nm³	100 mg/Nm³		0
6.	Hydrogen Fluoride	CPCB	0.5 mg/Nm3	4 mg/Nm³		BDL
7.	Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V+their compounds	CPCB	0.5mg/Nm³	0.5mg/Nm³		0.058
8.	Cd + Tl + their compounds	CPCB	0.05mg/Nm³	0.05mg/Nm³		-
9.	Pb	CPCB	0.1mg/Nm³	Not prescribed		0.006
10.	Hg	CPCB	0.02mg/Nm³	0.05mg/Nm³		BDL
11.	Dioxin & Furans	M/s SRI, Delhi	0.1 ngTEq/Nm³	0.1 ngTEq/Nm³	28.10.2020	**0.49**
12.	Total Organic Compounds(as C) at 11%O_2		20mg/Nm³	20mg/Nm³		5.1

* BDL for SO2 is <1.0 mg/Nm³, BDL for HF is <1.0 mg/Nm³, BDL for Hg < 1.0 µg/Nm³

Table 7: 24 hourly average ambient air quality monitoring conducted by CPCB at WtE Plant Bawana

Parameters	Date of sampling	Monitored by	Prescribed Standard* (in µg/m³)	Measured values	
				Fire Station Bawana Location-I	Near main gate Location-II
PM_{10}	23-25 September, 2020	CPCB	100	**131.33**	89.33
$PM_{2.5}$			60	**84.00**	40
NO_2			80	36.33	17.00
SO_2			80	11.66	10.66

**National ambient air quality standards as notified on dated 16.11.2009 under the Environment Protection Act, 1986.*

Table 8: Analysis results of LOI and heavy metals in Bottom Ash and Fly Ash

Date of sampling	Parameters	Limit	Measured Values	
24 September, 2020	Loss on Ignition (for bottom ash only)	<5%*	1.67%	
			Bottom Ash	Fly Ash
	Arsenic	5 mg/l#	BDL	BDL
	Cadmium	1 mg/l#	BDL	BDL
	Chromium	5 mg/l#	0.08	0.69
	Manganese	10 mg/l#	BDL	BDL
	Lead	5 mg/l#	BDL	BDL
	Selenium	1 mg/l#	BDL	BDL
	Copper	25 mg/l#	0.01	BDL
	Nickel	20 mg/l#	BDL	BDL
	Zinc	250 mg/l#	0.02	0.04
	Cobalt	80 mg/l#	BDL	BDL
	Vanadium	24 mg/l#	BDL	BDL
	Antimony	15 mg/l#	BDL	BDL

BDL: for Lead <0.013 ug/l, Selenium < 0.019ug/l, for Copper < 0.003 ug/l, for Nickel < 0.003 ug/l, for Cobalt < 0.002 ug/l and Vanadium < 0.16 ug/l.
#Concentration Limit to categorize as hazardous waste as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, notified under the Environment (Protection) Act, 1986.

13. Status of validity & compliance of consent and authorization

	Consent/Authorization	Validity
I	Under Water Act (Copy enclosed)	Valid till 05-05-2021
II	Under Air Act (Copy enclosed)	Valid till 05-05-2021

14. Observations

During the inspection on 24-25, September, 2020 following observations were made.

a) The processing capacity of the plant is 2000 TPD. However, the plant receipts 2794 MT and 2600 MT of Municipal Solid Waste on 24.09.2020 & 25.09.2020 respectively, which is more than the consented capacity of the plant.

b) The unit has own segregation setup of MSW having 6 trommels with blastic separators for segregation of MSW and production of RDF. Ferrous waste is segregated manually as well as through magnetic separator installed at conveyor belt of ballistic separators. Plant Machinery Details DMSWSL Bawana is tabulated in **table 9**:

Table 9: Detailed machinery used during segregation of MSW

Section Wise	Equipment Name	Number of Machinery
Pre Sorting	Trommels- 50 mm	6 No's
	Ballastic Separator	4 No's
Preparatory Section	Trommels- 20 mm	4 No's
Refinement Section	Trommels- 4 mm	3 No's
Bio Mining	Puzolana	1 No's

c) As informed, total RDF generation in the plant is approximately 1500 TPD. As per the logbook RDF used as fuel in boilers on 24.09.2020 is tabulated at **Table 10**:

Table 10: RDF Feed Record on 24.09.2020

Sl. No.	Time	RDF Feeding (TPH)
1.	9-10 AM	54
2.	10-11 AM	52
3.	11-12 PM	56
4.	12-1.0 PM	58
5.	1.0-2.0 PM	56
6.	2.0-3.0 PM	52

d) Details of power generation ranges during the said inspection period is placed at **Figure 3.** It is observed that power during the monitoring was less than the (20-22.5 MW) below the rated power generation capacity (24 MW) of the plant-although the plant was processing waste at full capacity.

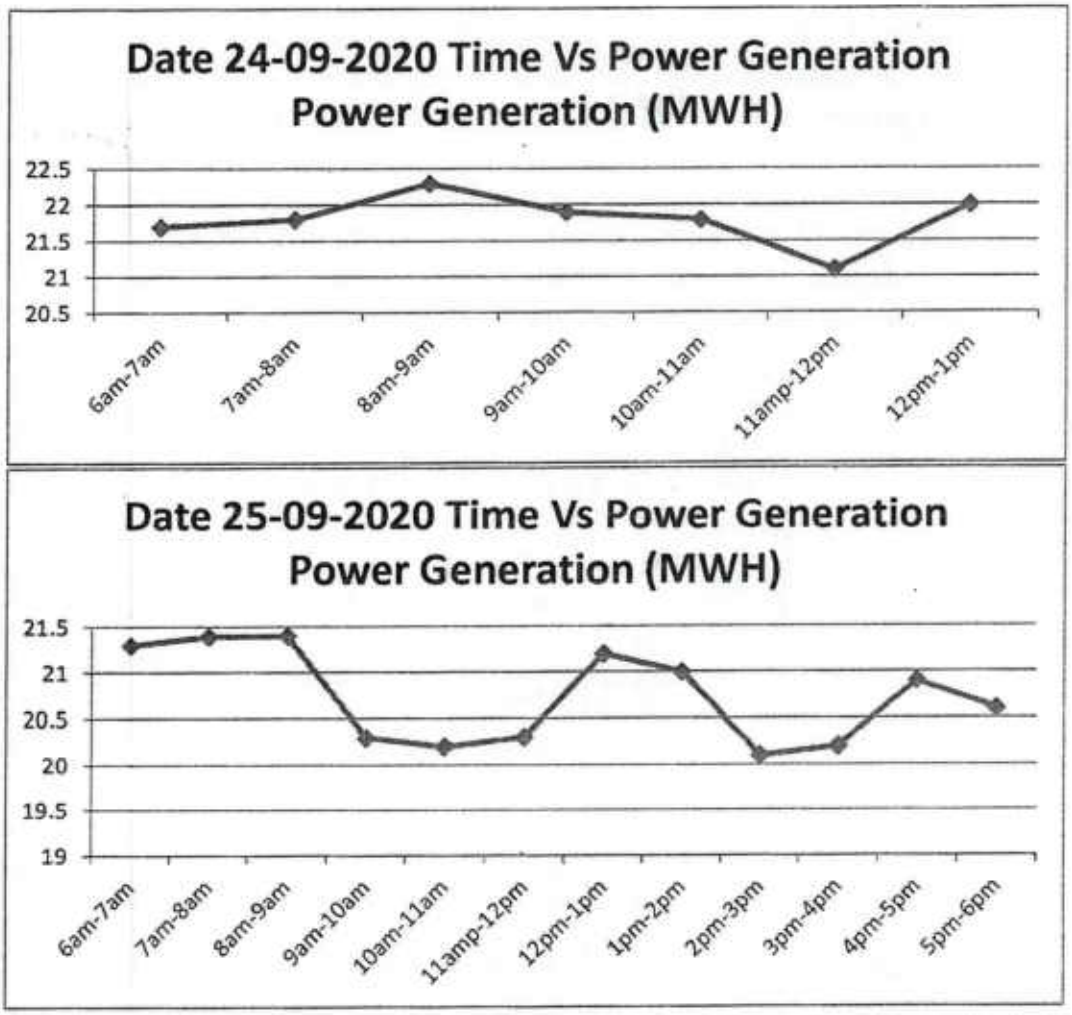


Figure 3: Time vs. power generation plot dated 24 & 25th September, 2020.

e) At the time of inspection on 24.09.2020, plant tripped due to grid fluctuation (High voltage) from 1 PM to 5.30 PM.

f) The two boilers and attached pollution control devices were found operational during monitoring. The temperature of furnace was maintained between 1142-1162°C.

g) Stack emission are tabulated in **Table 6**. It was observed that:

I. Dioxin and Furans values (**0.49 ngTEq/Nm³**) are exceeding the permissible limit (**0.1 ngTEq/Nm³**) monitored by M/s. SRI, Delhi,

II. Remaining parameters were within the stipulated norms.

h) Online Continuous Emission Monitoring System (OCEMS) for PM, SO_2, NOx and HCL in the stack emission had been installed and it was found working at the time of inspection. Result obtained from OCEMS on 25.09.2020 are plotted in **Figure-4.** Comparison of OCEMS data with joint monitoring results is tabulated in **Table 11**. Comparison of OCEMS data with joint monitoring results reveals that the OCEMS data is not matching with the actual monitoring results. HCL level as per actual monitoring is less than that reported by OCEMS. Also levels of PM, SO2 and NOx as per actual monitoring is less than that reported by OCEMS.

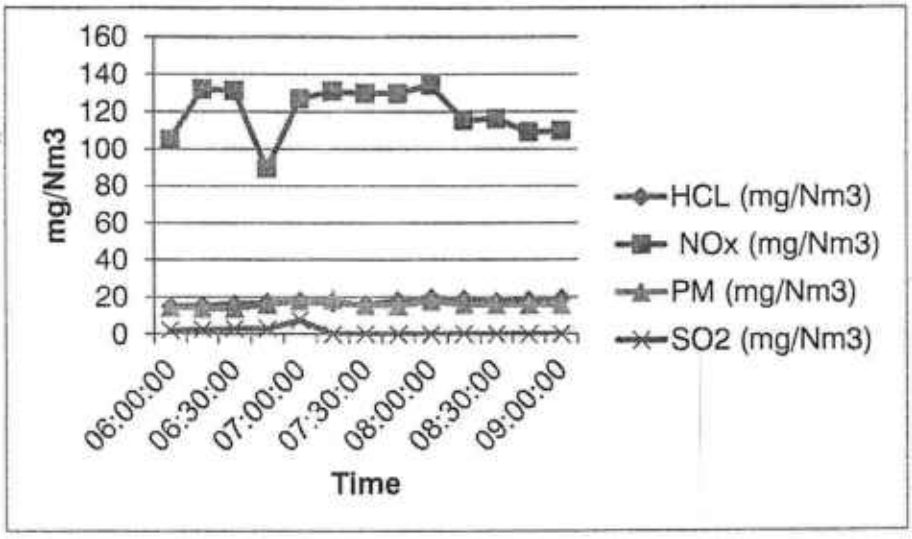


Figure 4: Online Continuous Emission Monitoring System (CEMS) data for PM, SO_2, NOx, and HCL on 24.09.2020.

Table 11: Comparision of OCEMS data and Joint monitoring data of Stack emission

Sl. No.	Parameters	OCEMS	Joint inspection results
1.	PM mg/Nm3	13.8-18.41	12.8-16.7
2.	HCL mg/Nm3	15.02-19.48	3.35
3.	NO_x mg/Nm3	89.4-131.94	17.7-82
4.	SO_2 mg/Nm3	0.01-7.6	BDL

i) Ambient Air quality monitoring results are given in **Table 7**. It is observed that PM2.5 (**84 µg/m³**) & PM_{10} (**131. 33 µg/m³**) exceeded the prescribed limit (60 µg/m³ &100 µg/m³) at Fire Station Bawana. Concentration levels of the remaining parameters are within the stipulated norms.

j) Online Continuous Ambient air quality monitoring station (CAAQMS) has been installed at facility & data is tabulated in **Table 12** for 25.09.2020. It observed that values of PM_{10} exceeded the standard limit at 12.00 noon (**176 µg/m³**), 2.30 PM (**166.5µg/m³**), 3.15 PM (**190.1µg/m³**) and 4.00 PM (**202.1µg/m³**) whereas the limit of $PM_{2.5}$ exceeded at 4.00 PM. Other parameters such as SO_2 (6-6.9 µg/m³), NOx (12.9-19.5µg/m³) were found well within the standard limit.

Table 12: Online Continuous Ambient air quality monitoring (CAAQMS) data on 25-09-2020

Time	Parameters						
	SO_2 µg/m³	NO µg/m³	NO_2 µg/m³	NO_x µg/m³	PM_{10} µg/m³	$PM_{2.5}$ µg/m³	CO mg/m³
12.00 noon	6.9	-1.2	15.9	14.7	**176**	56.4	-0.46
1.00 PM	6.6	-1.2	17.0	15.7	35.3	-1.0	-0.45
2.30PM	5.6	-1.1	13.9	12.9	**166.5**	-0.6	-0.42
3.15PM	6.0	-1.2	15.6	14.3	**190.1**	37.8	-0.38
4.00PM	6.9	-.4	19.9	19.5	**202.1**	**68.9**	-0.36

k) Analysis reports of loss of ignition (LOI) and heavy metals in fly ash and bottom ash

are in **Table-8.** It is observed that monitored levels of all the parameters are within the specified limit.

l) Segregated rejects, bottom ash and fly ash are disposed into the sanitary landfill site existing within the facility premise at Bawana.

m) Lime and activated carbon are used as a dosing agent in flue gas. Amount of dosing used at the said inspection is plotted as **Figure 5.** The quantity of lime and activated carbon doused is observed to be in the range of 572-667kg/h and 16-23 Kg/hr respectively.

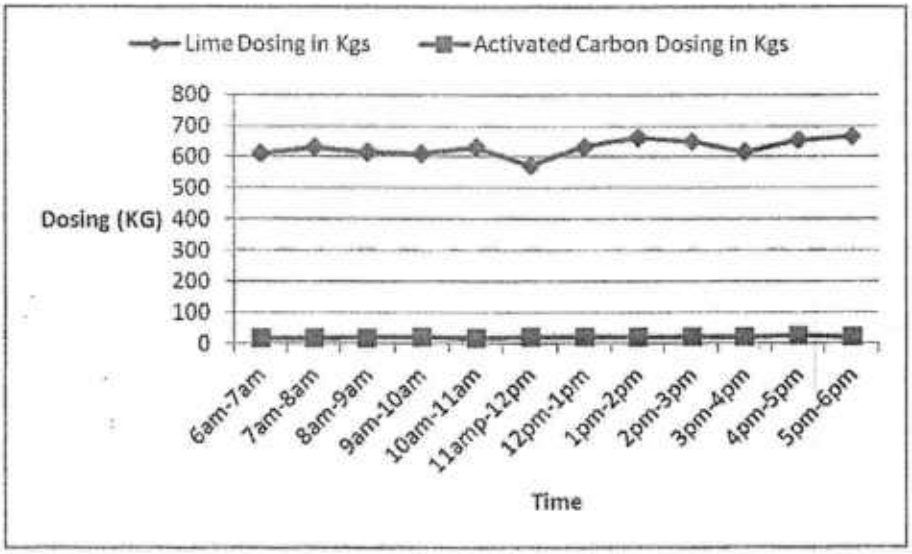


Figure-5: Amount of Lime and Activated Carbon used as dosing on 25-09-2020.

n) Leachate from Waste tipping floor, Windrows floor, sanitary landfill (within its premise) and the open pre-processed storage Area, are treated in the leachate treatment plant and treated water is being used for gardening, road wash etc.

o) Treated leachate analysis report is tabulated in **Table 13.** It has been observed that the values of TDS & Chloride of treated leachate exceeded the standard limit on Land disposal. It is observed that treated leachate is not complying the stipulated standards with respect to TDS & Chloride

Table: 13: Analysis report of treated leachate of Bawana WtE plant

S. No	Parameter	Land disposal (Standards as per SWM Rules, 2016)	Treated Leachate analysis report
1.	Suspended solids, mg/l, max	200	26
2.	Dissolved solids (inorganic) mg/l, max.	2100	**6744**
3.	pH value	5.5 to 9.0	
4.	Ammonical nitrogen (as N), mg/l, max.	-	1.7
5.	Total Kjeldahl nitrogen (as N), mg/l, max.	-	-
6.	Biochemical oxygen demand (3 days at 270 C) max.(mg/l)	100	25
7.	Chemical oxygen demand, mg/l, max.	-	261
8.	Arsenic (as As), mg/l, max	0.2	BDL
9.	Mercury (as Hg), mg/l, max	-	-
10.	Lead (as Pb), mg/l, max	-	BDL
11.	Cadmium (as Cd), mg/l, max	-	BDL
12.	Total Chromium (as Cr), mg/l, max.	-	0.02
13.	Copper (as Cu), mg/l, max.	-	BDL
14.	Zinc (as Zn), mg/l, max.	-	0.06
15.	Nickel (as Ni), mg/l, max	-	BDL
16.	Cyanide (as CN), mg/l, max.	0.2	-
17.	Chloride (as Cl), mg/l, max.	600	**1564**
18.	Fluoride (as F), mg/l, max	-	-
19.	Phenolic compounds (as C6H5OH) mg/l, max.	-	BDL

p) As informed, M/s. Waste to Energy plant Bawana has placed order to M/s. Spray Engineering Devices Limited for purchase of 200 KLD Low Temp Evaporator with Mechanical Vapor Recompression (MVR) System.

q) As informed, after segregation 80 MT of compost is being generated per day and sold to the market.

r) Radioactive sensors are installed at entrance gate of the plant & was found working on the date of inspection.

s) Storage and segregation process of MSW being done within a covered area.

t) The facility is collecting solid waste since 2009 and legacy waste of about 0.8 Million MT is being stored in an open area of about 9 acres. This waste is also being processed in the plant.

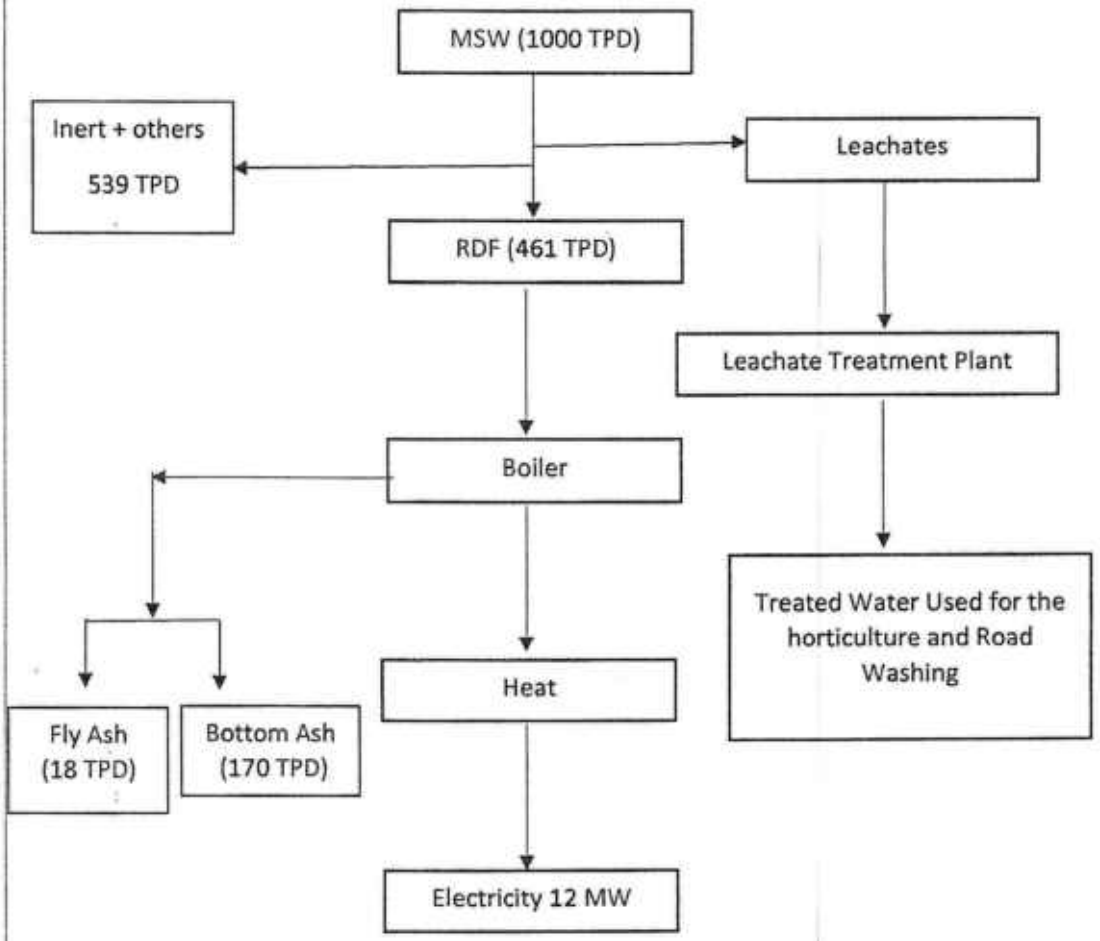
u) Plant has maintained considerable greenery inside the premises.

15. Recommendations

a) Plant should process the waste as per the consented capacity. The production process should be optimized so that power generated from the plant is as per the consented capacity of the plant.
b) Plant to properly control production process and pollution control measures to ensure that all parameters including Dioxin & Furans are within the stipulated norms.
c) Plant should implement necessary measures to improve ambient air quality (including $PM_{2.5}$ & PM_{10} concentration) in and around the plant.
d) OCEMS to be calibrated properly to ensure that OCEMS data matches with actual monitoring results.
e) Time bound action plan to be submitted for implementation of Fly ash and inert material utilization measures.
f) Time bound Action Plan to be submitted for installation of Mechanical Vapor Recompression (MVR) system for leachate treatment.

Waste to Energy Plant Ghazipur

CENTRAL POLLUTION CONTROL BOARD, DELHI		
1	Name and address of the industry Coordinates (Longitude & Latitude)	M/s East Delhi Waste Processing Company Ltd. Adjacent to Veterinary Hospital Behind Ghazipur DDA Flats Ghazipur, Delhi- 110096 Lat. 28.622653, Long. 77.323398
2.	Name of the occupier/contact person with Telephone Fax E-mail	Mr. Iype George 8448692608 Iype.George@ilfsindia.com
3.	Date of inspection and monitoring	October, 13-14, 2020
4.	Installed processing Capacity	1300MT of Municipal Solid Waste (MSW) per day for the generation of 12MW electricity.
5.	Production status (on date of inspection)	Operational
6a.	Power Generation Authorized	12MW
6b	Actual Power Generation	**Details of power generation ranges during the said inspection** Date: 13.10.2020 — Power Generation range (MW) 6 AM-6 PM: 3.45 – 8.75

7.	**Process Flow Diagram** The unit has segregation setup of MSW which consist of trommels with blastic separators for segregation of MSW and production of RDF. 

8. Air Pollution – Emission Sources & Control

Sources of air pollution	Chimney Details	APC Equipment	Emission Quality
One boiler connected with one stack of the waste to energy plant	60 meters	Scrubbing system	Given in **Table -14**

9.	OCEMS Status	Installed with stack & was found operational during the inspection.
10	Ambient Air Quality Conducted at two locations (Ghazipur Police station location-1 & Delhi Transco Limited Ghazipur Location-2)	Ambient Air Quality results are given in **Table – 15**

11.	Continuous Ambient Air Quality Station	CAAQMS installed but was not working
12.	Bottom Ash & Fly Ash	Analysis results of LOI and heavy metals in Bottom ash and Fly ash are given in **Table - 16**

Table 14. Analysis results of the stack emission monitoring of the WTE plant, Ghazipur monitored and analyzed by CPCB.

S. No	Parameters	Monitored by	Standards as per consent to operate issued by DPCC	Standard as per Solid waste Management Rules,2016,	Date of Sampling	Measured Values Stack-1 (Average)
1	Particulate Matter	CPCB	30 mg/Nm³	50 mg/Nm³	13-14 October, 2020	**62.7, 85.1**
2	HCL	CPCB	50 mg/Nm³	50 mg/Nm³		**407**
3	SO_2	CPCB	100 mg/Nm³	200 mg/Nm³		BDL, 3.4
4	NOx (NO and NO2 expressed No2)	CPCB	350 mg/Nm³	400 mg/Nm³		**869**, 104.3
5	Carbon Monoxide	CPCB	100 mg/Nm³	100 mg/Nm³		0
6	Hydrogen Fluoride	CPCB	0.5 mg/Nm³	4 mg/Nm³		BDL
7	Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V+their compounds	CPCB	0.5 mg/Nm³	0.5 mg/Nm³		0.164
8	Cd+Th+their compounds	CPCB	0.05 mg/Nm³	0.05 mg/Nm³		0.002
9	Pb	CPCB	0.1 mg/Nm³	Not prescribed		0.019
10	Hg	CPCB	0.02 mg/Nm³	0.05 mg/Nm³		0.21
11.	Dioxin & Furans	M/s SRI, Delhi	0.1 ngTEq/Nm³	0.1 ngTEq/Nm³	13.10.2020	**0.27**
12	Total Organic Compounds(as C) at 11%O_2		20mg/Nm³	20mg/Nm³		9.4

* BDL for SO2 is <1.0 mg/Nm^3, BDL for HF is <1.0 mg/Nm^3, BDL for Hg < 1.0 µg/Nm^3

Table 15. 24 hourly ambient air quality monitoring conducted by CPCB

Parameters	Date of Sampling	Monitored by	Prescribed Standard*	Measured values	
				Ghazipur Police station location-1	Delhi Transco Limited Ghazipur Location-2
$PM_{2.5}$	October 13-15	CPCB	60	**127**	**215**
PM10			100	**273.66**	**404**
NO2			80	42.833	31
SO2			80	BDL	15.66

BDL for SO2 is < 4ug/m3

**National ambient air quality standards as notified under the air (prevention and control of pollution) Act 1981.*

Table 16: Analysis results of LOI and heavy metals in Bottom ash and Fly ash

Date of sampling	Parameters	Limit	Measured values in %	
13.10.2020	Loss on ignition (For bottom Ash only)	<5%*	1.89	
			Bottom ash	**Fly Ash**
	Arsenic	5 mg/l #	BDl	BDL
	Cadmium	1 mg/l #	0.52	0.14
	Chromium	5 mg/l #	BDL	BDL
	Manganese	10 mg/l #	3.01	3.15
	Lead	5 mg/l #	0.08	0.04
	Selenium	1 mg/l #	BDL	BDL
	Copper	25 mg/l #	1.52	0.83
	Nickel	20 mg/l #	0.42	0.20
	Zinc	250 mg/l #	10.79	11.43
	Cobalt	80mg/l #	0.12	0.11
	Vanadium	24mg/l #	BDL	BDL
	Antimony	15mg/l #	0.36	0.05

Note: BDL for arsenic <0.022 mg/l BDL for Chromium<0.002 mg/l BDL for Manganese for Lead<0.013 BDL for Nickel BDL, 0.003 mg/l for Cobalt BDL< mg/l for Vanadium BDL<0.16 mg/l

#Concentration Limit of categorise as hazardous waste as per Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016, notified under Environment (Protection) Act, 1986. Facility for fly ash and inert material utilization are yet to installed.

13. Status of validity & compliance of consent and authorization

	Consent/Authorization	Validity
I	Under Water Act (Copy enclosed)	Expired on 08-12-2018, applied for renewal of the same
II	Under Air Act (Copy enclosed)	Expired on 08.12.2018, applied for renewal of the same

14.0 Observations

a. The plant is operating without valid consent. The plant was given Consent-to Operate which was valid upto 08.12.2018. The unit has applied for renewal of Consent.

b. The unit has segregation setup of MSW which consist of trommels with blastic separators for segregation of MSW and production of RDF. However, the same was not operational at the time of inspection. Operator informed that the same is under maintenance.

c. Segregation of waste was being done in partially covered area.

d. The plant was receiving RDF from bio-remediation of waste from Ghazipur dumpsite. No MSW was received from EDMC on that day. Hence, the plant was operating at level much below as per its last consent.

e. The plant does not have composting facility for wet waste and disposing wet waste when generated in the dumpsite.

f. Average feed rate of the RDF to one boiler was observed at 33 MT/hr. As per the logbook total RDF used as fuel in boilers from 6 AM to 6 PM on 13.10.2020 is given in **Table 17**.

Table 17: RDF Feed Record

Time	Fuel Feed to Boiler MT
6:00 AM	35.28
7:00 AM	35.1
8:00 AM	33.25
9:00 AM	35.89
10:00 AM	36.25
11:00 AM	28.95
12:00 PM	31.25
1:00 PM	32.25
2:00 PM	32.65
3:00 PM	33.25
4:00 PM	31.58
5:00 PM	32.58
6:00 PM	31.58
Total Feed	**429.86**

g. Details of power generation ranges during the said inspection period is given in **Figure 6**. The power generation on 13.10.2020 was in the range of 3.45-8.75 MW which is much less than the rated power generation capacity of 12 MW. Captive power utilization of the plant is about 2 to 2.5 MW.

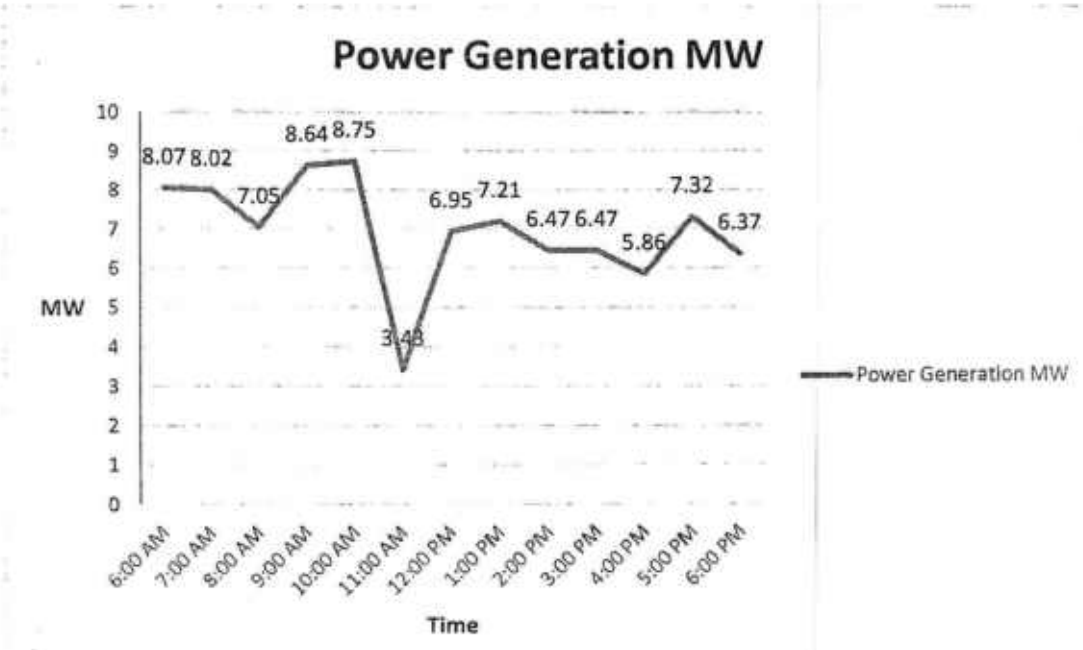


Figure 6: Time vs. power generation plot dated 13th October, 2020.

h. One boiler along with pollution control devices was found operational. The average temperature of furnace was maintained most of the time was 950° C.

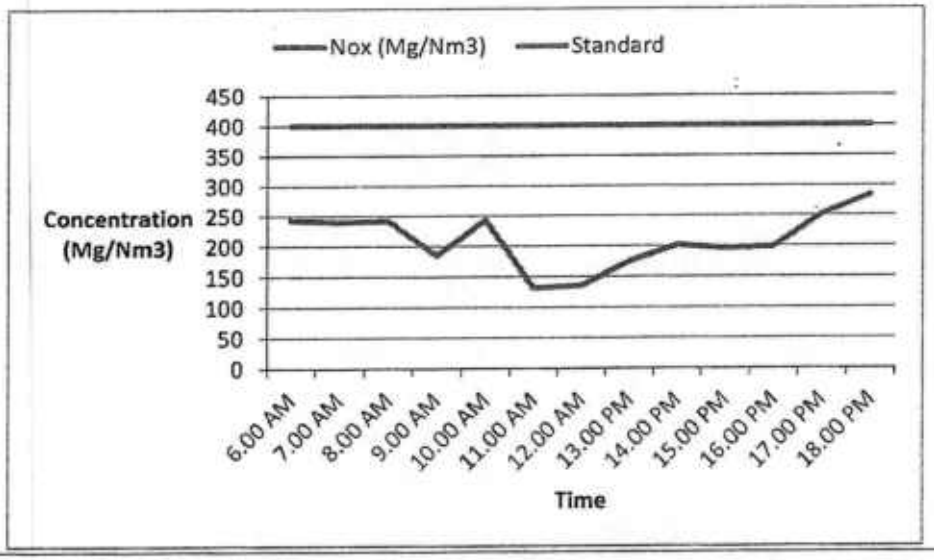
i. Stack emission results are given in **Table 14**. The following are the observations.

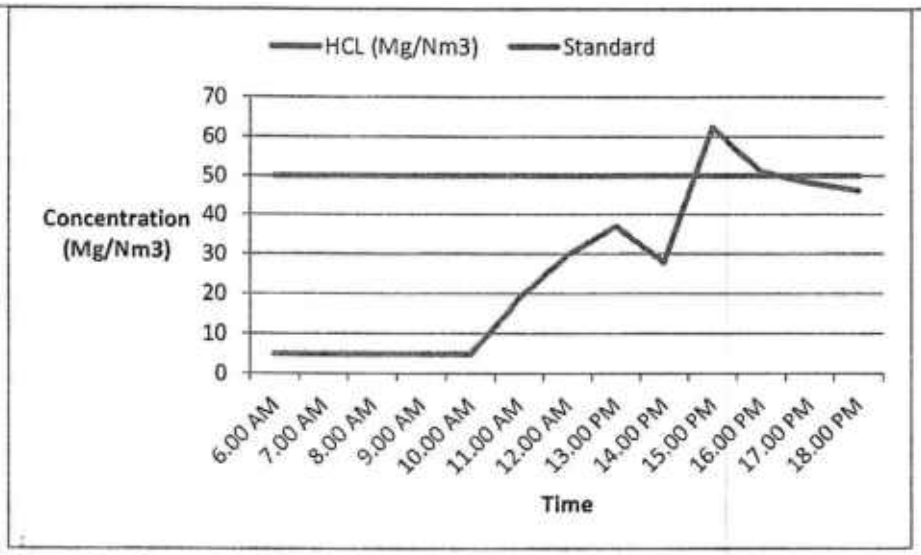
   i. **Dioxin and Furans** values (**0.27ngTEq/Nm³**) of stack monitoring exceeded the permissible limit (**0.1 ngTEq/Nm³**) monitored by M/s. SRI, Delhi.

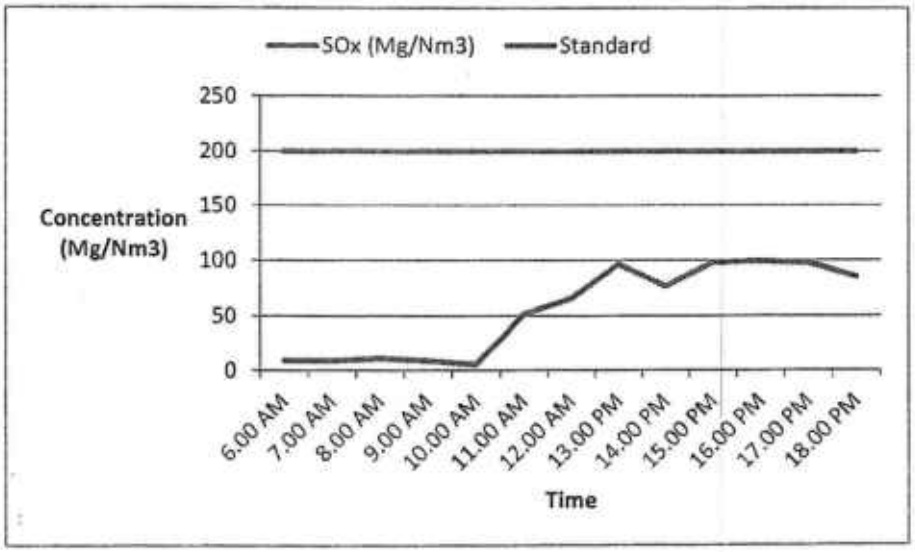
   ii. **PM (62.7 & 85.1** mg/Nm³**), NOx (869** mg/Nm³**) and HCl (407** mg/Nm³**) concentrations were exceeding the permissible limits** (30, 350 & 50 mg/Nm³ respectively)

   iii. Remaining parameters were well within the limit.

j. Online Continuous Emission Monitoring System (OCEMS) for PM, SO_2, NOx and HCl in the stack emission had been installed and it was found working at the time of inspection except for monitoring PM. Results obtained from OCEMS on 13.10.2020 are plotted in **Figure-7.** Comparison of OCEMS data with joint monitoring results is tabulated in **Table-18.** Comparison of OCEMS data with joint monitoring results reveals that the OCEMS data is not matching with the actual monitoring results. HCl & NOx level as per actual monitoring was more than that reported by OCEMS. Whereas, SOx as per joint monitoring is lower than the OCEMS result.




HCL (Mg/Nm3)
Standard
Concentration (Mg/Nm3)
70
60
50
40
30
20
10
0
6.00 AM
7.00 AM
8.00 AM
9.00 AM
10.00 AM
11.00 AM
12.00 AM
13.00 PM
14.00 PM
15.00 PM
16.00 PM
17.00 PM
18.00 PM
Time


SOx (Mg/Nm3)
Standard
Concentration (Mg/Nm3)
250
200
150
100
50
0
6.00 AM
7.00 AM
8.00 AM
9.00 AM
10.00 AM
11.00 AM
12.00 AM
13.00 PM
14.00 PM
15.00 PM
16.00 PM
17.00 PM
18.00 PM
Time

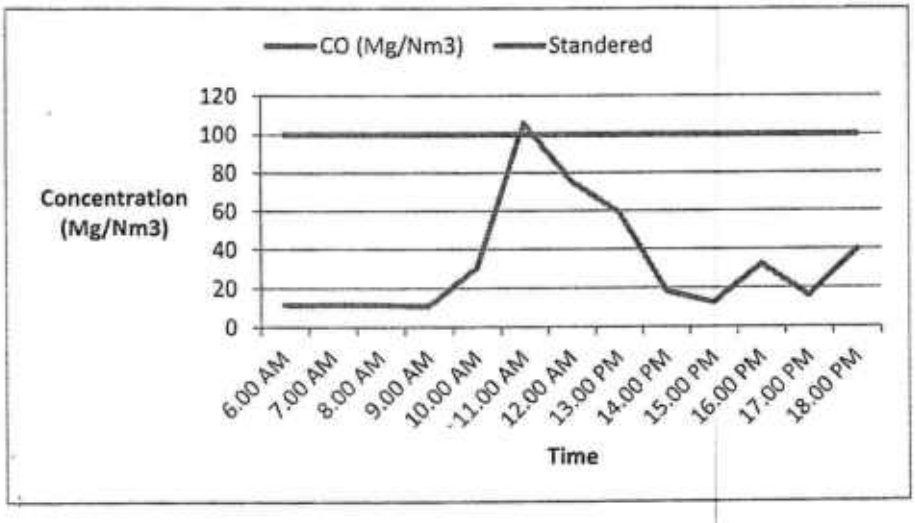

CO (Mg/Nm3)
Standered
Concentration (Mg/Nm3)
120
100
80
60
40
20
0
6.00 AM
7.00 AM
8.00 AM
9.00 AM
10.00 AM
11.00 AM
12.00 AM
13.00 PM
14.00 PM
15.00 PM
16.00 PM
17.00 PM
18.00 PM
Time

Figure 7: Online Continuous Emission Monitoring System (OCEMS) data for NOx HCL, SOx, and CO on 13.10.2020.

Table 18: Comparison of OCEMS & Joint Monitoring data of the stack emission

Sl. No.	Parameters	OCEMS	Joint inspection results
1.	PM mg/Nm3	Not working	62.7-85.1
2.	HCL mg/Nm3	4.86-51.13	407
3.	NOx mg/Nm3	132.4-251.71	869-104.3
4.	SO2 mg/Nm3	5.79-98.25	BDL
5.	CO	11.35-105.61	Not monitored

j. Ambient Air quality monitoring results are given in **Table-15**. It is observed that PM2.5 & PM_{10} at Ghazipur Police station & Delhi Transco Ltd. (**127 µg/m³ & 215 ug/m³ and 273 ug/m³ & 404 ug/m³ respectively)** exceeded the standard of prescribed limit (PM2.5 : 60 µg/m³ & PM10 100 µg/m³). Concentration levels of the remaining parameters are within the stipulated norms.

k. Continuous Ambient Air Quality Monitoring Station (CAAQMS) was not operational during the inspection.

l. Lime, Powered Activated Carbon (PAC) and Urea are used as dosing agents in Flue gas. A graph has been plotted for Lime, Powered Activated Carbon (PAC) and Urea used on 13.10.2020 during 6.00AM to 6PM as shown in **Figure 8**. The quantity of Lime, activated carbon and urea doused is observed to be in the range of 140-168kg/h, 4-6 kg/h and 20-28.32 Kg/hr respectively.

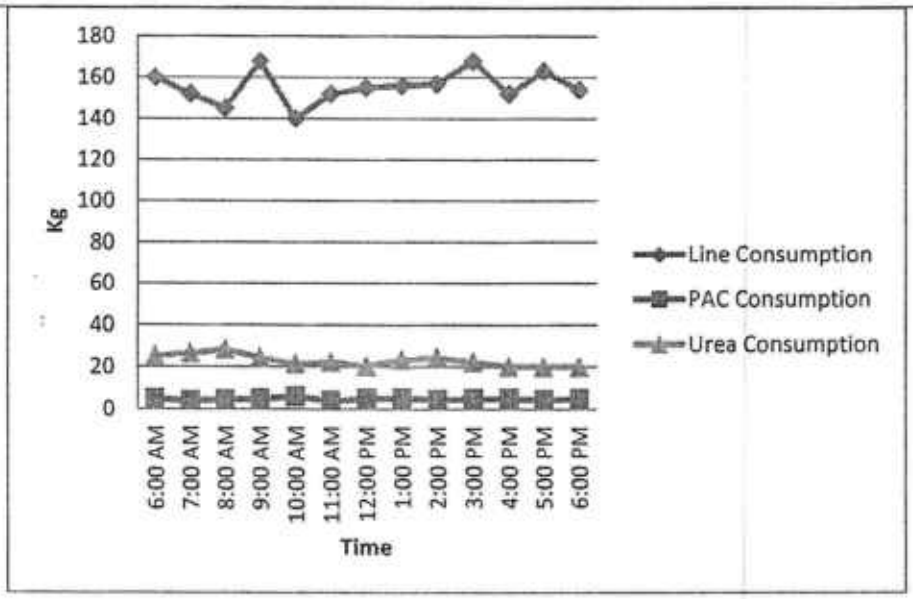


Figure-8: Amount of Lime, Activated Carbon and urea used as dosing on 13.10.2020.

m. Analysis reports of loss of ignition (LOI) and heavy metals in fly ash and bottom ash are given in **Table-16.** It is observed that monitored levels of all the parameters are within the specified limit.

n. The plant is dumping Bottom Ash, Fly Ash & inerts at Ghazipur Dumpsite. WtE plant Ghazipur is not utilizing Fly ash for beneficial purposes like bricks manufacturing etc.

o. Leachate Treatment plant has been installed and treated leachate is being used for gardening, road waste etc.

p. During inspection, Treated Leachate Treatment plant was found operational. Treated leachate analysis report is tabulated in **Table-19.** It has been observed that the value of TDS of treated leachate exceeded the standard limit on Land disposal.

Table 19: Analysis report of treated leachate

S. No	Parameter	Land disposal (Standards)	Treated Leachate analysis report
	Suspended solids, mg/l, max	200	47
	Dissolved solids (inorganic) mg/l, max.	2100	**2532**
	pH value	5.5 to 9.0	-
	Ammonical nitrogen (as N), mg/l, max.	-	3.0
	Total Kjeldahl nitrogen (as N), mg/l, max.	-	-
	Biochemical oxygen demand (3 days at 270 C) max.(mg/l)	100	18.2
	Chemical oxygen demand, mg/l, max.	-	92
	Arsenic (as As), mg/l, max	0.2	BDL
	Mercury (as Hg), mg/l, max	-	-
	Lead (as Pb), mg/l, max	-	BDL
	Cadmium (as Cd), mg/l, max	-	BDL
	Total Chromium (as Cr), mg/l, max.	-	BDL
	Copper (as Cu), mg/l, max.	-	0.03
	Zinc (as Zn), mg/l, max.	-	1.25
	Nickel (as Ni), mg/l, max	-	BDL
	Cyanide (as CN), mg/l, max.	0.2	-
	Chloride (as Cl), mg/l, max.	600	-
	Fluoride (as F), mg/l, max	-	-
	Phenolic compounds (as C6H5OH) mg/l, max.	-	BDL

q. Unit has not fixed radioactive sensors on the way of MSW loaded truck.

r. During inspection all drains within the premises were found chocked & MSW found scattered on roads inside the plant.

s. Plant has not maintained considerable greenery inside the premises.

15. Recommendations

i. The plant has to upgrade its production process and emission control measures to ensure that the emission levels of all parameters including (PM, HCL, NOx, Dioxin & Furans) are within the stipulated limits.
ii. Plant should implement necessary measures to improve air quality (PM2.5 & PM10) in and around the plant.
iii. OCEMS installed in the plant to be calibrated to ensure that OCEMS data matches with the actual monitoring results.
iv. The plant has to ensure that CAAQMS installed in their premises is operational at all times and the display board for the same should be made functional.
v. The plant should upgrade leachate treatment procedure so as to improve the treated leachate quality before spreading over land.
vi. The plant has to provide facility for treatment of wet waste.
vii. The segregation process of MSW of the plant has to be made operational to improve efficiency of the plant.
viii. The plant has to be obtained valid consent to operate from DPCC.
ix. The plant has to ensure that it is operational at full capacity when the joint inspection of the unit is carried out so that the monitoring results are conclusive.
x. Time bound Action Plan to be submitted for utilization of fly ash and inert material.
xi. Green Belt has to be developed around the plant as per Buffer zone Guidelines for waste processing processing facilities issued by CPCB.
xii. Unit has to fix radioactive sensors at suitable places to effectively monitor the entering in the plant.
xiii. House Keeping needs to be improved.

Name & designation of inspecting officer(s)	**(Ratnesh Kumar), Sc.'B', CPCB Delhi**	**(Ramesh Chandra) EE, DPCC Delhi**	**Atanu Dey, RA-I, CPCB**
Signature			

**BEFORE THE NATIONAL GREEN TRIBUNAL,
PRINCIPAL BENCH, NEW DELHI**

**M.A. No. 1168 of 2017
In
Original Application No. 22 of 2013 THC**

**Sukhdev Vihar Residents Welfare Association & Ors.
Vs.
State of NCT of Delhi & Ors.**

CORAM : **HON'BLE MR. JUSTICE SWATANTER KUMAR, CHAIRPERSON
HON'BLE DR. JUSTICE JAWAD RAHIM, JUDICIAL MEMBER
HON'BLE MR. JUSTICE RAGHUVENDRA S. RATHORE, JUDICIAL MEMBER
HON'BLE MR. BIKRAM SINGH SAJWAN, EXPERT MEMBER**

Present: **Applicant:** **Ms. Alpana Podder, Adv. with Mr. Bhupender Kumar, LA, Central Pollution Control Board , Applicant in M.A.**

Respondent. : **Mr. Tarunvir Singh and Ms. Guneet Khehar, Advs.**
Ms. Sakshi Popli, Adv. for Delhi Jal Board
Mr. Krishna Kumar Singh, Adv. for Ministry of Environment, Forest and Climate Change
Ms. Priyanka Swami, Adv. for Nagar Nigam Ghaziabad
Mr. Biraja Mahopatra, Adv. and Mr. Dinesh Jindal, LO for Delhi Pollution Control Committee

	Date and Remarks	Orders of the Tribunal
	Item No. 12 **October 09, 2017** SS & SN	**M.A. No. 1168 of 2017** It is contended that keeping in view of the expenses involved, the fact is that the Central Pollution Control Board does not have in-house mechanism in their laboratories to analyse Dioxin and Ferrons. The prayer is that instead of monthly it may be made once in four months. We allow this prayer. The Central Pollution Control Board is permitted to collect and analyse the samples of ambient air quality once in four months, they shall also conduct at lease two surprise inspections and analysis be made in a year. With the above directions M.A. No. 1168 of 2017 stands disposed of. No order as to cost. .....,CP (Swatanter Kumar)

	Item No. 12 **October 09, 2017** SS & SN	.....,JM (Dr. Jawad Rahim) .....,JM (Raghuvendra S. Rathore) .....,EM (Bikram Singh Sajwan)

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 640/2018
(Earlier O.A. No. 22/2013)

Sukhdev Vihar Resident's Welfare Association
Vs.
State of Delhi & Ors.

CORAM : HON'BLE MR. JUSTICE ADARSH KUMAR GOEL,CHAIRPERSON
HON'BLE MR. JUSTICE S.P. WANGDI, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

Present: Respondent: **Mr. Nilava Bandyopadhyay, Adv. for Project Proponent, Okhla Project**

	Date and Remarks	Orders of the Tribunal
	Item No. 6 **September 27, 2018** **R**	1. In pursuance of earlier order of this Tribunal dated 18.04.2018, joint inspection has been conducted by the Central Pollution Control Board and the Delhi Pollution Control Committee. Findings in the report are that the Waste-to-Energy Plants at Okhla, Ghazipur and Bawana are non-compliant with respect to the standards of the particulate matter. Following recommendations have been made: **"Recommendations:** 1. *To ensure better efficiency of the Plant and Power generation the unit should feed segregated wastes.* 2. *Plant should adopt technologies to reduce Moisture Content in RDF.* 3. *Fly ash utilization should be done rather than dumping it on landfill site.* 4. *Unit shall install Fly ash bricks manufacturing unit.* 5. *Flow meters shall be installed at inlet and outlet of Leachete treatment plant.* 6. *Plant should adopt technologies to improve calorific value of RDF.* 7. *Plant shall be designed for 30-35 years."* 2. The Central Pollution Control Board may send a copy of its report to the project proponents of Okhla, Ghazipur and Bawana Waste-to-Energy Plant for compliance and conduct another inspection within one

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL,
Principal Bench, New Delhi
In
Original Application No. 640/2018
(Earlier O.A. No. 22/2013)

In the Matter of: -

Sukhdev Vihar Resident's Welfare Association — **Applicant(s)**

Vs.

State of Delhi & Ors. — **Respondent(s)**

Index

Sr. No.	Particulars	Page No.
1.	**Compliance Report of Waste to Energy Plants in Delhi (Period: February-March, 2020)** in compliance to Hon'ble NGT, PB order dated 09.10.2017 and 27.09.2018 in the matter of O.A. No. 640/2018 (Earlier O.A. No. 22/2013) titled as Sukhdev Vihar Resident's Welfare Association. Vs. State of Delhi & Ors.	
2.	**Annexure-I:** A copy of Hon'ble NGT order dated 09.10.2017.	
3.	**Annexure-II:** A copy of Hon'ble NGT order dated 27.09.2018.	

(Divya Sinha)
Scientist 'E'
Central Pollution Control Board
Parivesh Bhawan, East Arjun Nagar
Delhi-110032

Place: Delhi
Date: 24th September, 2020

Compliance Report of Waste to Energy Plants in Delhi

(Period: February-March, 2020)

As per Hon'ble NGT Vide its Order dated 09/10/2017, in OA No. 22 of 2013 T_{HC} & dated September, 27, 2018 in OA No. 640/2018 (Earlier OA No. 22/2013)

CENTRAL POLLUTION CONTROL BOARD
(Ministry of Environment, Forest &Climate Change, Govt. of India)
'Parivesh Bhawan' C.B.D. Cum-Office Complex,
East Arjun Nagar, Shahdara, Delhi-110032
E-mail:divsinha@yahoo.com, Website- www.cpcb.nic.in

September, 2020

1. Background

1.1. Hon'ble NGT in its order dated 09/10/2017 in OA No. 22 of 2013 T_{HC}, directed Central Pollution Control Board to collect and analyse the samples of the ambient air quality once in four months, they should also conduct at least two surprise inspections and analysis be made in a year" .

1.2. Further Hon'ble NGT vide its order dated September 27, 2018 in OA No. 640/2018 (Earlier OA No. 22/2013), issued the following directions

i. *In pursuance of earlier order of this Tribunal dated 18.04.2018, joint inspection of Waste to Energy Plants at Delhi has been conducted by the CPCB and the DPCC. Findings of reports are that WtE plants at Okhla, Ghazipur and Bawana are non-compliant with respect to the standards of Particulate matter.*

ii. *"Directed CPCB to send a copy of its report to the project proponents of Okhla, Ghazipur and Bawana Waste to Energy Plant for compliance and conduct another inspection within one month in view of the fact that the earlier inspection was in February, 2018 and requirement of carrying out inspection is in every 4 months We do not find any ground to accept the prayer for reliving CPCB of its requirement in four monthly monitoring. If there is a manpower constraint, it is for the CPCB to make any other appropriate arrangement for discharging its functions. This cannot be the ground to avoid responsibility under the binding directions of this Tribunal"*

iii. "*It is made clear that if the project proponents fail to maintain the standards, even after carrying out the deficiencies noticed in the joint inspection Report, CPCB may recommend the amount of environmental damage required to be paid by them".*

In view of above directions, monitoring was planned during January, 2020.However, due to Delhi Assembly Election it could not be carried out. The Three Waste to Energy Plants were subsequently monitored by CPCB & DPCC joint inspection team during February-March 2020. The members of joint committee i.e. representatives fromMoEF&CC, expert from IIT Delhi and

representative of Sukhdev Vihar RWA (For Okhla Waste to Energy Plant) were informed vide email dated February 19 & March 09, 2020 regarding inspection schedule. Expert from IIT Delhi was present during inspection of Waste to Energy Plant Okhla. RWA representative did not join the inspection. The details of the monitoring have been covered in the following sections.

Waste to Energy Plant Bawana

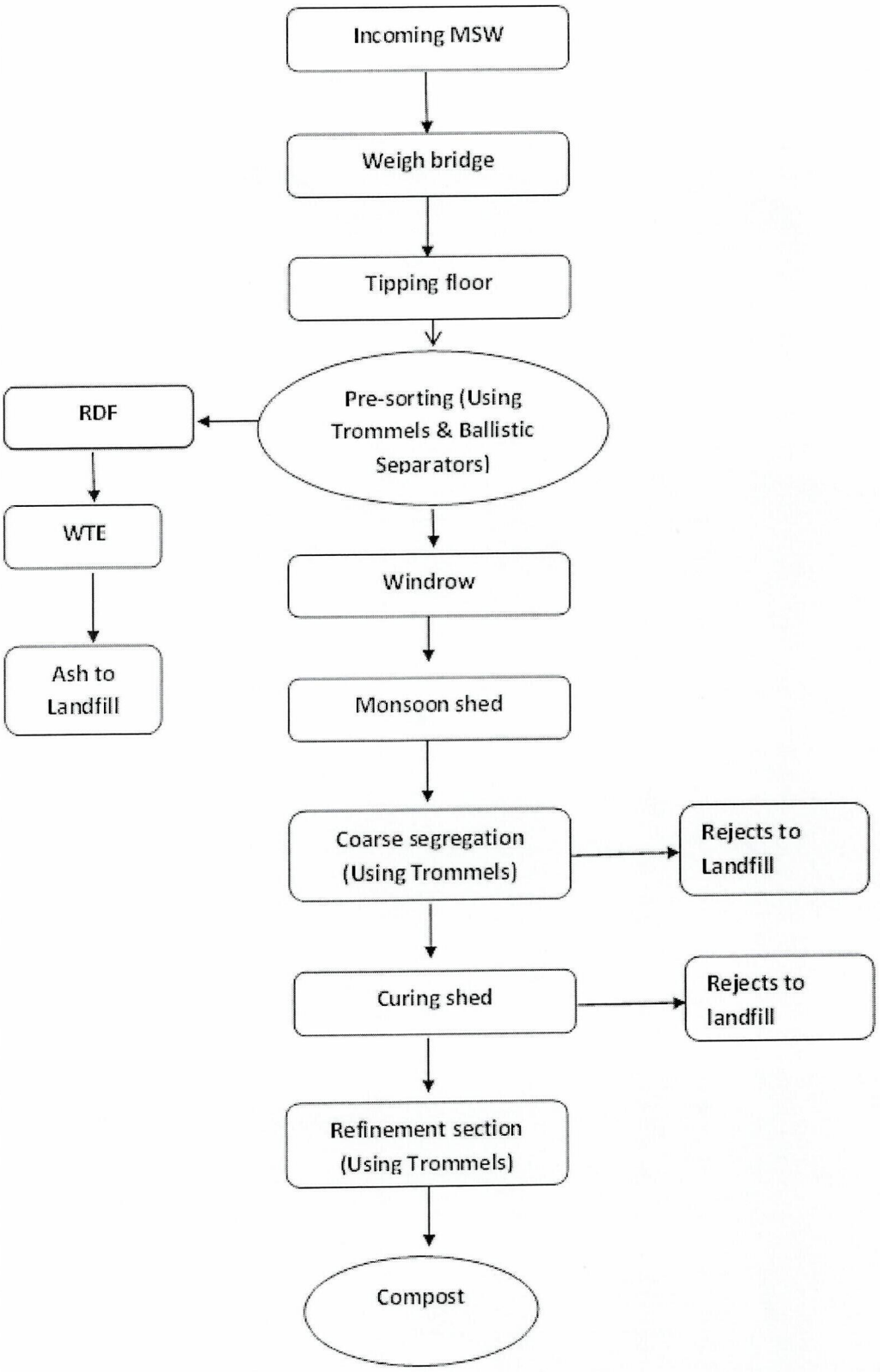
CENTRAL POLLUTION CONTROL BOARD, DELHI

1	Name and address of the industry Coordinates (Longitude & Latitude)	M/s Delhi MSW Solutions Ltd. Pocket N-1, Sector-5, Bawana Industrial area, Behind Pragati Power Plant Delhi-110039 Latitude Extension: 28°47'58.36"N Longitudinal Extension: 77° 04'11.79"E
2.	Name of the occupier/contact person with Telephone Fax E-mail	K Vijay Kumar Reddy Mob. 9821124350 laboratorynarela@ramky.com
3.	Date of inspection and monitoring	February 25-26, 2020
4.	Installed processing Capacity	2000 TPD Processing and Disposal facility with 24 MW Waste to Energy Plant
5.	Production status (on date of inspection)	Operational
6	Actual Power Generation	Details of power generation ranges during the said inspection

Date	Power Generation range (MW) 6 AM- 6 PM
25.02.2020	18.3-20.9
26.02.2020	19.1-20.1

7. Process Flow Diagram:

DMSWSL PLANT PROCESS FLOW SHEET



8. Air Pollution – Emission Sources & Control			
Sources of air pollution	**Chimney Details**	**APC Equipment**	**Emission Quality**
Stack of the Waste to Energy plant	60mtrs	Reaction Tower (lime Spray reactor), Activated Carbon Injection followed by Bag filters.	Stack Monitoring Conducted by CPCB team & Dioxin & Furans by M/s SIIR, Delhi. Results are given in **Table-1**

9.	OCEMS Status	Installed with stack & was found operational during the inspection.
10	Ambient Air Quality Conducted at two locations	Ambient Air Quality Status given in **Table - 2.**
11.	Continuous Ambient Air Quality Station	CAAQMS installed & was working
12.	Bottom Ash & Fly Ash	Analysis results of LOI and heavy metals in Bottom ash and Fly ashare given in **Table-3**

13. Status of validity & compliance of consent and authorization

	Consent/Authorization	Validity
I	Under Water Act (Copy to be enclosed)	Valid till 05-05-2021
II	Under Air Act (Copy to be enclosed)	Valid till 05-05-2021

14. **OBSERVATIONS**

During the inspection on 25-26, February,2020 following observations were made.

a) The plant has obtained consent to operate dated 22.02.2017 for processing of 2000 Tons per day of solid waste and power generation of 24 MW. Consent of the plant is valid upto 05.05.2021.

b) The plant operated at full capacity during inspection.The plant processed 2430 MT and 2487 MT of Municipal Solid Waste on 25.02.2020 & 26.02.2020 respectively.

c) The rated capacity of the plant is 24MW, however the power generation at the time of inspection was in the range of 18.3- 20.1 MW; thus although the plant was operated at full capacity of waste feed, i.e., in terms of processing of waste, the corresponding power generation was not up to the installed capacity.

d) Both the boilers along with pollution control devices of the waste to energy plant were found operating at the time of inspection.

e) Radioactive sensors, installed at entrance of the facility were operational during inspection

f) The segregation sections of the plant were found operational during inspection. It was observed that the waste being fed into the boiler is segregated.

g) Ferrous waste is segregated manually as well as through magnetic separator installed at conveyor belt of ballistic separators.

h) The facility is collecting solid waste since 2009 and legacy waste of about 0.8 Million MT is being stored in an open area of about 9 Acres. This waste is also being processed in the plant

i) Since commencement of trial operation of boilers in June 2016, approximately 400-450 tons/day waste from the said stored waste is being used in the boilers. Project Proponent informed that legacy waste will be consumed in next one year.

j) Online Continuous Emission Monitoring System (CEMS) for PM,SO_2,NOx and HCL in the stack emission has been installed and the same was found working at the time of inspection.

k) Continuous Ambient air quality monitoring station (CAAQMS) has been installed & the same was found working, at the time of inspection.

l) Segregated rejects, bottom ash and fly ash are disposed into the sanitary landfill site existing within the facility premise at Bawana.

m) As per the monitoring results of stack emission, all parameters are complying with the stipulated norms

n) $PM_{2.5}$ and PM_{10} values of ambient air quality monitoring at both the locations were exceeded the permissible limits. Concentration levels of the remaining parameters are within the stipulated norms

o) Concentration value of Cadmium in the fly ash exceeds the permissible limit.

15.Recommendations

a) To ensure better efficiency of the Plant and optimum power generation the unit should further improve further waste segregation.

b) The plant should take necessary measures to reduce fugitive emissions specifically during material handling, soas to reduce PM_{10}& $PM_{2.5}$ value concentrations in ambient air

c) Required efforts to reuse the Bottom ash, Fly ash utilization should be made instead of dumping it on landfill site.

d) The plant should identify the source of cadmium and minimize the same so as bring the Cadmium concentration levels in fly ash within the stipulated limits. (1 mg/l[#])

Name & designation of inspecting officer(s)	**(Ratnesh Kumar), Sc.'B', CPCB Delhi**	**(Ramesh Chandra) EE, DPCC Delhi**
Signature		

Table 1. Analysis results of the stack emission monitoring of the WTE plant Bawana.

S. No.	Parameters	Monitored & Analysed by	Standards as per Consent to Operate issued by DPCC	Standards as per Solid Waste Management Rules, 2016,	Date of Sampling	Measured values in mg/Nm^3
1.	Particulate Matter	CPCB	30 mg/Nm^3	50 mg/Nm^3	25-26 Feb, 2020	29.4, 27.3
2.	Hydrogen Chloride	CPCB	50 mg/Nm^3	50 mg/Nm^3		1.3
3.	SO_2	CPCB	100 mg/Nm^3	200 mg/Nm^3		35.2, 32.8
4.	NO_X	CPCB	350 mg/Nm^3	400 mg/Nm^3		64.3, 144.2
5.	Carbon Monoxide	CPCB	100 mg/Nm^3	100 mg/Nm^3		0
6.	Hydrogen Fluoride	CPCB	0.5 mg/Nm^3	4 mg/Nm^3		BDL
7.	Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V+their compounds	CPCB	0.5mg/Nm^3	0.5mg/Nm^3		0.005
8.	Cd + Th + their compounds	CPCB	0.05mg/Nm^3	0.05mg/Nm^3		BDL
9.	Pb	CPCB	0.1mg/Nm^3	Not prescribed		0.002
10.	Hg	CPCB	0.02mg/Nm^3	0.05mg/Nm^3		BDL
11.	Dioxin & Furans	M/s SIIR, Delhi	0.1ngTEq/Nm^3	0.1ngTEq/Nm^3	26.02.2020	0.0199 ng TEQ/Nm^3
12.	Total Organic Compounds (as C) at 11% O_2		20 mg/Nm^3	20 mg/Nm^3		3.4

* BDL for SO_2 is <1.0 mg/Nm^3, BDL for HF is <1.0 mg/Nm^3, BDL for Hg < 1.0 $\mu g/Nm^3$

Table 2: 24 hourly average ambient air quality monitoring conducted by CPCB at WtE Plant Bawana

Parameters	Date of sampling	Monitored by	Prescribed Standard* (in µg/m^3)	Measured values	
				Fire Station Bawana Location-I	Near main gate Location-II
PM_{10}	25-26 February, 2020	CPCB	100	**309.33**	**268.33**
$PM_{2.5}$			60	**216**	**203**
NO_2			80	55.5	43.88
SO_2			80	28.00	19.66

**National ambient air quality standards as notified on dated 16.11.2009 under the Environment Protection Act, 1986.*

Table 3:Analysis results of LOI and heavy metals in Bottom Ash and Fly Ash

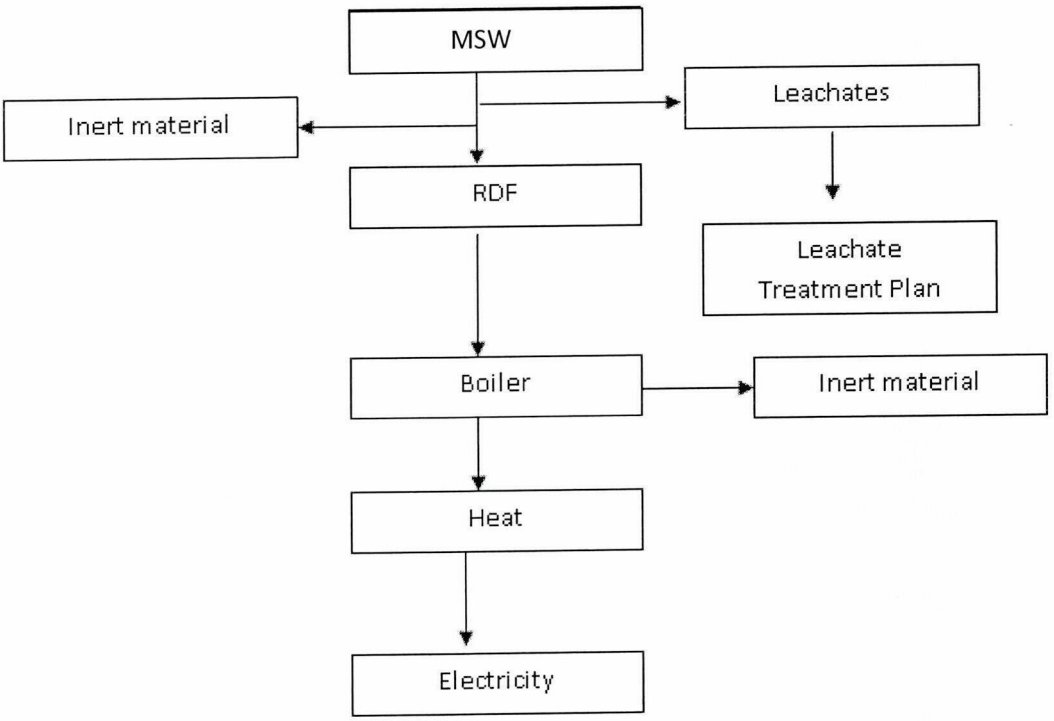
Date of sampling	Parameters	Limit	Measured Values	
25 Feb, 2020	Loss on Ignition (for bottom ash only)	<5%*	1.51%	
			Bottom Ash	Fly Ash
	Arsenic	5 mg/l#	0.01	0.01
	Cadmium	1 mg/l#	0.01	**5.12**
	Chromium	5 mg/l#	0.01	0.20
	Manganese	10 mg/l#	0.95	1.23
	Lead	5 mg/l#	0.01	0.15
	Selenium	1 mg/l#	BDL	BDL
	Copper	25 mg/l#	0.22	0.17
	Nickel	20 mg/l#	BDL	BDL
	Zinc	250mg/l#	BDL	BDL
	Cobalt	80 mg/l#	BDL	BDL
	Vanadium	24 mg/l#	0.07	BDL
	Antimony	15 mg/l#	BDL	0.12

BDL: for Lead <0.013 ug/l, Selenium < 0.019ug/l, for Copper < 0.003 ug/l, for Nickel < 0.003 ug/l, for Cobalt < 0.002 ug/l and Vanadium < 0.16 ug/l.
#Concentration Limit to categorize as hazardous waste as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, notified under the Environment (Protection) Act, 1986.

Waste to Energy Plant Ghazipur

CENTRAL POLLUTION CONTROL BOARD, DELHI		
1	Name and address of the industry Coordinates (Longitude & Latitude)	M/s East Delhi Waste Processing Company Ltd. Adjacent to Veterinary Hospital Behind Ghazipur DDA Flats Ghazipur, Delhi- 110096 Lat. 28.622653, Long. 77.323398
2.	Name of the occupier/contact person with Telephone Fax E-mail	Mr. Iype George 8448692608 Iype.George@ilfsindia.com
3.	Date of inspection and monitoring	March 5-6, 2020
4.	Installed processing Capacity	1300MT of Municipal Solid Waste (MSW) per day for the generation of 12MW electricity.
5.	Production status (on date of inspection)	Plant was operating on 3.22 MW power generation capacity on 06.03.2020.
6a.	Power Generation Authorized	12MW
6b	Actual Power Generation	**Details of power generation ranges during the said inspection** Date: 05.03.2020 — Power Generation range (MW) 6 AM- 6 PM: 3.43 - 7.94 Date: 06.03.2020 — Power Generation range (MW) 6 AM- 6 PM: 0.01 - 6.69

7.	Process Flow Diagram



8. Air Pollution – Emission Sources & Control

Sources of air pollution	Chimney Details	APC Equipment	Emission Quality
Two boilers connected with one stack of the waste to energy plant	60 meters	Scrubbing system	Given in **Table -4**

9.	OCEMS Status	Installed with stack & was found operational during the inspection.
10	Ambient Air Quality Conducted at two locations	Ambient Air Quality results are given in **Table – 5**
11.	Continuous Ambient Air Quality Station	CAAQMS installed but was not working
12.	Bottom Ash & Fly Ash	Analysis results of LOI and heavy metals in Bottom ash and Fly ash are given in **Table - 6**

13. Status of validity & compliance of consent and authorization

	Consent/Authorization	Validity
I	Under Water Act (Copy to be enclosed)	Expired on 08.12.2018, applied for renewal of the same
II	Under Air Act (Copy to be enclosed)	Expired on 08.12.2018, applied for renewal of the same.

14.0 Observations

I. The plant has been given Consent-to-Operate for processing of 1300 TPD of solid waste and subsequent generation of power. Consent to operate was valid upto 08.12.2018. The unit has applied for renewal of Consent.
II. The plant is not operational at full capacity. The plant received 301.13 T & 228.32 T of mixed municipal solid (MSW) waste on 05.03.2020 & 06.03.2020 respectively which was much less than the installed processing capacity of 1300 TPD.
III. The power generation is in the range of 0.01 – 7.94 MW which is much less than the rated power generation capacity of 12 MW. Captive power utilization of the plant is about 2 to 2.5 MW.
IV. PM, NO_X and Pb concentrations in stack emissions are exceeding the permissible limits.
V. All values monitored in ambient air are within the stipulated norms.
VI. Continuous Ambient Air Quality Monitoring Station (CAAQMS) was not operational during the inspection.
VII. Unit has not fixed radioactive sensors on the way of MSW loaded truck.
VIII. The plant is dumping Bottom Ash, Fly Ash &inerts in Ghazipur Dumpsite WtE plant Ghazipur is not utilizing 100% Fly ash for beneficial purposes like bricks manufacturing etc.
IX. Concentration value of Cadmium in the fly ash exceeds the permissible limit.
X. On 06.03.2020 the plant was suddenly shut down at 2.58 PM due to wet RDF & hence Dioxin & Furan Monitoring could not be carried out. The plant remain shut for more than a week and after that due to lock down the Dioxin & Furan monitoring was not carried out at Waste to Energy Plant Ghazipur.

Recommendations

i. The plant has to obtain valid consent to operate from DPCC.
ii. The plant has to ensure that it is operational at full capacity when the joint inspection of the unit is carried out so that the monitoring results are conclusive.
iii. The plant has to take necessary measures to ensure that the concentration levels of all monitored parameters in stack emission are within the stipulated limits.
iv. Theplant has to ensure that CAAQMS installed in their premises is operational at all times and the display board for the same should be made functional.
v. Unit has to fix radioactive sensors at some other suitable places from where all the trucks loaded with MSW should pass.
vi. WtE plant Ghazipur should utilize 100% Fly ash for beneficial purposes like bricks manufacturing etc.
vii. The plant should identify the source of cadmium and minimize the same so as bring the Cadmium concentration levels in fly ash within the stipulated limits. (1 mg/l[#])The plant should use the technology to bring PM, NOx and Pb values of stack emission to well within limit.

Name & designation of inspecting officer(s)	**(Ratnesh Kumar), Sc.'B', CPCB Delhi**	**(Ramesh Chandra) EE, DPCC Delhi**
Signature		

Table 4. Analysis results of the stack emission monitoring of the WTE plant, Ghazipur monitored and analysed by CPCB.

S. No	Parameters	Monitored by	Standards as per consent to operate issued by DPCC	Standard as per Solid waste Management rules,2016,	Date of Sampling	Measured Values Stack-1 (Average)
1	Particulate Matter	CPCB	30 mg/Nm³	50 mg/Nm³	5-6 March, 2020	**48.4, 53.7**
2	HCL	CPCB	50 mg/Nm³	50 mg/Nm³		3.5
3	SO_2	CPCB	100 mg/Nm³	200 mg/Nm³		16.1, 51.6
4	NOx (NO and NO_2 expressed as NO_2)	CPCB	350 mg/Nm³	400 mg/Nm³		105.9, **872.6**
5	Carbon Monoxide	CPCB	100 mg/Nm³	100 mg/Nm³		-
6	Hydrogen Fluoride	CPCB	0.5 mg/Nm³	4 mg/Nm³		BDL
7	Sb+As+Pb+Cr+Co+Cu+Mn+Ni+ V+their compounds	CPCB	0.5 mg/Nm³	0.5 mg/Nm³		0.347
8	Cd+Th+their compounds	CPCB	0.05 mg/Nm³	0.05 mg/Nm³		.007
9	Pb	CPCB	0.1 mg/Nm³	Not prescribed		**0.112**
10	Hg	CPCB	0.02mg/Nm³	0.05mg/Nm³		BDL

Table 5: 24 hourly ambient air quality monitoring conducted by CPCB.

Parameters	Date of Sampling	Monitored by	Prescribed Standard*	Measured values	
				Ghazipur Police station location-1	Delhi Transco Limited Ghazipur Location-2
$PM_{2.5}$	March5-6, 2020	CPCB	60	33	35
PM_{10}			100	99.33	46
NO_2			80	28.33	37.5
SO_2			80	0.833	8.166

BDL for SO_2 is < 4ug/m^3
**National ambient air quality standards as notified under the air (prevention and control of pollution) Act 1981.*

Table 6: Analysis results of LOI and heavy metals in Bottom ash and Fly ash

Date of sampling	Parameters	Limit	Measured values	
05.03.2020	Loss on ignition (For bottom Ash only)	<5%*	3.60	
			Bottom ash	Fly Ash
	Arsenic	5 mg/l #	0.02	BDL
	Cadmium	1 mg/l #	0.02	**2.75**
	Chromium	5 mg/l #	BDL	0.08
	Manganese	10 mg/l #	0.36	1.48
	Lead	5 mg/l #	BDL	0.19
	Selenium	1 mg/l #	BDL	BDL
	Copper	25 mg/l #	0.21	0.03
	Nickel	20 mg/l #	BDL	BDL
	Zinc	250 mg/l #	0.11	0.24
	Cobalt	80mg/l #	BDL	BDL
	Vanadium	24mg/l #	0.24	0.08
	Antimony	15mg/l #	0.02	BDL

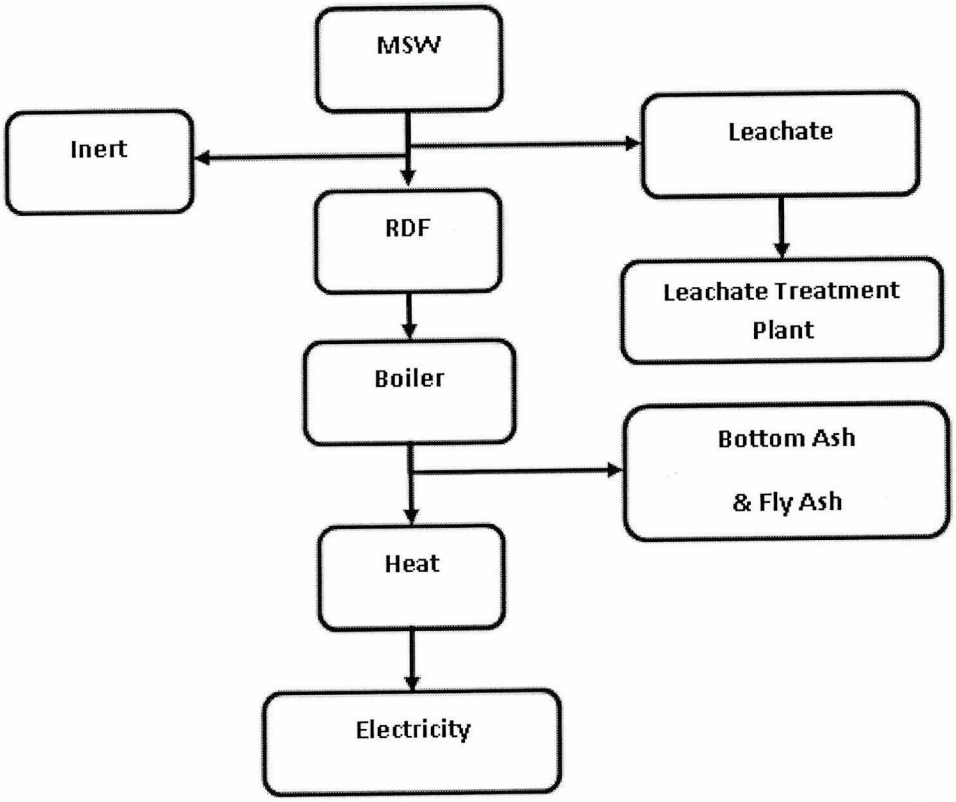
Note: BDL for Arsenic <0.022 mg/l BDL for Chromium<0.002 mg/l BDL for Manganese for Lead<0.013 BDL for Nickel BDL, 0.003 mg/l for Cobalt BDL< mg/l for Vanadium BDL<0.16 mg/l
#Concentration Limit of categorise as hazardous waste as per Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016, notified under Environment (Protection) Act, 1986. Facility for fly ash and inert material utilization are yet to be installed.

Waste to Energy Plant Okhla

CENTRAL POLLUTION CONTROL BOARD, DELHI

1	Name and address of the industry Coordinates (Longitude & Latitude)	M/s Timarpur Okhla Waste Management Company Limited, Old NDMC Compost Plant, Behind CRRI, Mathura Road, New Delhi-110025 Lat. 28.553672 & Long. 77.280838
2.	Name of the occupier/contact person with Telephone Fax E-mail	Mr. Sandeep Dutt Mob. 09958360016 Sandip.dutt@jindalcopolis.com
3.	Date of inspection / monitoring	March 12-13, 2020
4.	Installed processing Capacity	As per DPCC Authorization letter the unit has capacity to process 1950 TPD MSW for subsequent generation of 16 MW power. **Vide letter dated 15.01.2020, MoEF&CC has amended Environmental Clearance for increase in Power Generation from 16 MW to 23 MW**
5.	Production status (on date of inspection)	Operational
6	Actual Power Generation	Details of power generation ranges during the said inspection

Date	Power Generation (MW)		
	Time	Minimum	Maximum
12.03.2020	6 AM to 6 PM	17.68	21.20
13.03.2020	6 AM to 6 PM	17.84	21.63

7.	**Process Flow Diagram:** 

8. Air Pollution – Emission Sources & Control

Sources of air pollution	**Chimney Details**	**APC Equipment**	**Emission Quality**
Stack of the Waste to Energy plant	60mtrs	Scrubber followed by bag filters	Stack Monitoring Conducted by CPCB team & Dioxin & Furans by M/s SRIIR, Delhi Results are quoted at **Table – 7**

9.	OCEMS Status	Installed with stack & was found operational during the inspection.
10	Ambient Air Quality Conducted at two locations	Ambient Air Quality Status are quoted at **Table-8**
11.	Continuous Ambient Air Quality Station	**CAAQMS not yet installed**

R.L

12.	Bottom Ash & Fly Ash	Analysis results of LOI and heavy metals in Bottom ash and Fly ash are quoted at **Table-9**

13. Status of validity & compliance of consent and authorization

	Consent/Authorization	**Validity**
I	Under Water Act	Valid till 24.09.2024
II	Under Air Act	Valid till 24.09.2024

14. Observations

a) DPCC has renewed Consent-to-Operate of the plant vide consent order dated 21.05.2020 and it is valid upto 24.09.2024.
b) The plant received 1705 MT and 1630 MT, of mixed Municipal Solid Waste (MSW) on 12.03.2020 and 13.03.2020 respectively. The segregation system was working properly. However, complete segregation is not possible until MSW is segregated at source.
c) All the three boilers along with pollution control devices were found operational. The temperature of furnace was maintained between 950-1050°C.
d) The Dioxin & Furans value of stack emission monitoring exceeded the permissible limit.Concentration of remaining parameters are within limits.
e) The PM_{10} and $PM_{2.5}$values of ambient air quality monitoring at two locations were exceeded the permissible limit. Concentration of remaining parameters are within limits.
f) Continuous ambient air quality monitoring station is not yet installed at the unit
g) Online Continuous emission monitoring system (OCEMS) has been installed and found operational during the inspection.
h) Quenched Bottom Ash, Fly Ash and segregated inert are disposed of at Jaitpur site.
i) Radioactive sensors are installed at gate no. 2 of plant.
j) Plant has installed water sprinkling system for dust settlement.
k) Fly ash bricks manufacturing unit is installed but was not operational during the inspection. The plant operator informed that there is negligible market for fly ash bricks because of high manufacturing cost.
l) Analysis report of Fly ash & Bottom ash reveals that all parameters were well within the limit.
m) Plant has maintained considerable greenery inside the premises and along boundary wall.

15. Recommendations

i. The plant has to take necessary measures to ensure that the concentration levels of all monitored parameters in stack emissions are within the stipulated limits
ii. The plant should take necessary measures to reduce fugitive emissions specifically during material handling, so as to reduce PM_{10}& $PM_{2.5}$ value concentrations in ambient air.

iii. Continuous Ambient Air Quality monitoring station should be installed at the earliest. iv. Okhla plants should utilize 100% Fly ash for beneficial purposes like bricks manufacturing etc.		
Name & designation of inspecting officer(s)	**(Ratnesh Kumar),** **Sc.'B', CPCB Delhi**	**(Ramesh Chandra)** **EE, DPCC Delhi**
Signature		

Table :7 Analysis results of the stack emission monitoring of the WtE plant Okhla,

S. No.	Parameters	Monitor by	Standards as per Consent to Operate issued by DPCC	Standards as per Solid Waste Management Rules, 2016,	Date of Sampling	Measured values
					12-13 March, 2020	Stack
1.	PM	CPCB	30 mg/Nm^3	50 mg/Nm^3		9.2 / 8.5
2.	Hydrogen Chloride		50 mg/Nm^3	50 mg/Nm^3		3.8
3.	SO_2		100 mg/Nm^3	200 mg/Nm^3		19.9 / 30.4
4.	NO_X (NO and NO_2 expressed as NO_2)		350 mg/Nm^3	400 mg/Nm^3		51.6 / 63.7
5.	CO		100 mg/Nm^3	100 mg/Nm^3		2
6.	HF		0.5 mg/Nm^3	4 mg/Nm^3		BDL
7.	Sb + As + Pb +Cr+ Co+ Cu+ Mn + Ni+ V+ their compounds		0.5 mg/Nm^3	0.5 mg/Nm^3		0.028
8.	Cd + Th +their compounds		0.05 mg/Nm^3	0.05 mg/Nm^3		BDL
9.	Pb		0.1 mg/Nm^3	Not prescribed		0.005
10.	Hg		0.02 mg/Nm^3	0.05 mg/Nm^3		BDL
11.	Dixon & Furan	M/s SIIR, Delhi	0.1ngTEq/Nm^3	0.1ngTEq/Nm^3	13.03.2020	**0.3037**
12.	Total Organic Compounds (as C) at 11% O_2		20mg/Nm^3	20mg/Nm^3		5.7

Table-8.: 24 hourly average values of ambient air quality monitoring

Date of sampling	Monitored by	Parameters	Prescribed Standard* (in µg/m^3)	Measured values	
				Sukhdev Vihar Location-I	STP Okhla Location-II
12-13 March, 2020	CPCB	PM_{10}	100	**136**	**164.66**
		$PM_{2.5}$	60	**69**	**80**
		NO_2	80	35.33	37.833
		SO_2	80	1.33	0.833

Table 9: Analysis results of Bottom ash and Fly ash

Date of sampling	Parameters	Standard/Limit	Measured values	
12.03.2020	Loss on Ignition (for Bottom ash only)	<5%*	2.36%	
			Bottom Ash	Fly Ash
	Arsenic	5 mg/l#	BDL	0.01
	Cadmium	1 mg/l#	0.17	0.10
	Chromium	5 mg/l#	BDL	0.35
	Manganese	10 mg/l#	1.94	0.11
	Lead	5 mg/l#	BDL	BDL
	Selenium	1 mg/l#	BDL	BDL
	Copper	25 mg/l#	0.21	1.34
	Nickel	20 mg/l#	BDL	BDL
	Zinc	250 mg/l#	BDL	2.16
	Cobalt	80 mg/l#	BDL	BDL
	Vanadium	24 mg/l#	BDL	BDL
	Antimony	15 mg/l#	0.03	0.26

*Standards prescribed by DPCC in the Consent to Operate.
#Concentration Limit to categorise as hazardous waste as per the Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016, notified under the Environment (Protection) Act, 1986.

Annexure-I

**BEFORE THE NATIONAL GREEN TRIBUNAL,
PRINCIPAL BENCH, NEW DELHI**

**M.A. No. 1168 of 2017
In
Original Application No. 22 of 2013 T_{HC}**

**Sukhdev Vihar Residents Welfare Association & Ors.
Vs.
State of NCT of Delhi & Ors.**

CORAM : **HON'BLE MR. JUSTICE SWATANTER KUMAR, CHAIRPERSON
HON'BLE DR. JUSTICE JAWAD RAHIM, JUDICIAL MEMBER
HON'BLE MR. JUSTICE RAGHUVENDRA S. RATHORE, JUDICIAL MEMBER
HON'BLE MR. BIKRAM SINGH SAJWAN, EXPERT MEMBER**

Present: **Applicant:**

Ms. Alpana Podder, Adv. with Mr. Bhupender Kumar, LA, Central Pollution Control Board , Applicant in M.A.

Respondent. : **Mr. Tarunvir Singh and Ms. Guneet Khehar, Advs.**
Ms. Sakshi Popli, Adv. for Delhi Jal Board
Mr. Krishna Kumar Singh, Adv. for Ministry of Environment, Forest and Climate Change
Ms. Priyanka Swami, Adv. for Nagar Nigam Ghaziabad
Mr. Biraja Mahopatra, Adv. and Mr. Dinesh Jindal, LO for Delhi Pollution Control Committee

	Date and Remarks	Orders of the Tribunal
	Item No. 12 **October 09, 2017** **SS & SN**	**M.A. No. 1168 of 2017** It is contended that keeping in view of the expenses involved, the fact is that the Central Pollution Control Board does not have in-house mechanism in their laboratories to analyse Dioxin and Ferrons. The prayer is that instead of monthly it may be made once in four months. We allow this prayer. The Central Pollution Control Board is permitted to collect and analyse the samples of ambient air quality once in four months, they shall also conduct at lease two surprise inspections and analysis be made in a year. With the above directions M.A. No. 1168 of 2017 stands disposed of. No order as to cost. .....,CP (Swatanter Kumar)

19

	Item No. 12 **October 09, 2017** **SS & SN**	.....,JM (Dr. Jawad Rahim) .....,JM (Raghuvendra S. Rathore) .....,EM (Bikram Singh Sajwan)

Annexure-II

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 640/2018
(Earlier O.A. No. 22/2013)

Sukhdev Vihar Resident's Welfare Association
Vs.
State of Delhi & Ors.

CORAM : HON'BLE MR. JUSTICE ADARSH KUMAR GOEL,CHAIRPERSON
HON'BLE MR. JUSTICE S.P. WANGDI, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

Present: Respondent: **Mr. Nilava Bandyopadhyay, Adv. for Project Proponent, Okhla Project**

	Date and Remarks	Orders of the Tribunal
	Item No. 6 **September 27, 2018** **R**	1. In pursuance of earlier order of this Tribunal dated 18.04.2018, joint inspection has been conducted by the Central Pollution Control Board and the Delhi Pollution Control Committee. Findings in the report are that the Waste-to-Energy Plants at Okhla, Ghazipur and Bawana are non-compliant with respect to the standards of the particulate matter. Following recommendations have been made: **"Recommendations:** 1. *To ensure better efficiency of the Plant and Power generation the unit should feed segregated wastes.* 2. *Plant should adopt technologies to reduce Moisture Content in RDF.* 3. *Fly ash utilization should be done rather than dumping it on landfill site.* 4. *Unit shall install Fly ash bricks manufacturing unit.* 5. *Flow meters shall be installed at inlet and outlet of Leachete treatment plant.* 6. *Plant should adopt technologies to improve calorific value of RDF.* 7. *Plant shall be designed for 30-35 years."* 2. The Central Pollution Control Board may send a copy of its report to the project proponents of Okhla, Ghazipur and Bawana Waste-to-Energy Plant for compliance and conduct another inspection within one

21

	Item No. 6 **September 27, 2018** **R**	month in view of the fact that the earlier inspection was in February, 2018 and requirement of carrying out inspection is in every 4 months. We do not find any ground to accept the prayer for relieving Central Pollution Control Board of its requirement in four monthly monitoring. If there is a manpower constraint, it is for the Central Pollution Control Board to make any other appropriate arrangement for discharging its functions. This cannot be a ground to avoid responsibility under the binding directions of this Tribunal. 3. It is made clear that if the project proponents fail to maintain the standards, even after carrying out the deficiencies noticed in the joint inspection Report, Central Pollution Control Board may recommend the amount of environmental damage required to be paid by them. The application is disposed of. ....., CP (Adarsh Kumar Goel) .....,JM (S.P. Wangdi) .....,EM (Dr. Nagin Nanda) 27.09.2018

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA

F. No. CM-13011/125/2024-LAW- HO-CPCB-HO **Date: 07.08.2024**

To,

The Members Secretary
SPCBs/PCCs (As per list)

Subject: Hon'ble NGT Suo Motu matter O.A. No. 536/2024, pertaining to the order dated 15.05.2024, regarding "Waste to Energy: Smokescreen or Solution?" as published in the Indian Development Review on 27.03.2024, information required-**reg**.

Sir,

This has reference to the Hon'ble NGT order dated 15.5.2024 in abovementioned subject. A copy of the order is enclosed as **Annexure-I.**

In this context, it is requested to provide the information related to Waste to Energy (WtE) plants in your State/UT including the monitoring details & compliance to the environmental norms in the enclosed format (**Annexure-II**). The information may please be provided through email to **SWM.CPCB@GOV.IN** latest by August 10, 2024.

Your Faithfully,

Dy.

(Divya Sinha)
Director & DH (UPC-II)

Copy to:

1. DH, Law Div.
2. PS to MS: For information of MS, please

o/c

Dy.

(Divya Sinha)

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, New Delhi - 110032
दूरभाष/Tel: 43102030, 22305792, वेबसाईट/Website : www.cpbc.nic.in

List of SPCBs/PCCs

SN	State/UT
1	Andhra Pradesh Pollution Control Board D.No. 33-26-14 D/2, Near Sunrise Hospital, Pushpa Hotel Centre, Chalamvari Street, Kasturibaipet, Vijayawada – 520 010
2	Arunachal Pradesh State Pollution Control Board Paryavaran Bhawan, Papu Hill, Yupia Road, Naharlagun- 791110
3	Assam Pollution Control Board Bamunimaidan, Guwahati, Assam - 781021
4	Bihar State Pollution Control Board Parivesh Bhawan, Plot No. NS-B/2, Paliputra Industrial Area, Patliputra, Patna (Bihar) - 800 023
5	Chhattisgarh State Environment Conservation Board Paryavas Bhavan, North Block Sector-19, Naya Raipur (C.G.) 492002
6	Goa State Pollution Control Board Nr. Pilerne Industrial Estate, Opp. Saligao Seminary, Saligao - Bardez, Goa - 403511
7	Gujarat Pollution Control Board Paryavan Bhavan, Sector 10-A, Gandhinagar – 382 043
8	Haryana State Pollution Control Board C-11, Sector-6. Panchkula-134109, Haryana - 134109
9	Himachal Pradesh Pollution Control Board Him Parivesh, Phase-III, New Shimla, Himachal Pradesh 171009
10	Jammu & Kashmir Pollution Control Committee Summer Office: May-October Sheikh-ul-AIaCampus, Behind Govt. Silk Factory, Rajbagh, Srinagar (J&K) 190008 Winter office: November-April Parivesh Bhawan, Gladni, Transport Nagar, Narwal - 180006
11	Jharkhand State Pollution Control Board T.A Building, HEC, P.O. Dhurwa, Ranchi – 834004
12	Karnataka State Pollution Control Board Parisara Bhavan, 4th & 5th Floor, # 49, Church St., Bangalore - 560 001
13	Kerala State Pollution Control Board Plamoodu Jn., Pattom Palace P.O. Thiruvananthapuram-695 004
14	Madhya Pradesh Pollution Control Board Parayavaran Parisar, E-5, Arera Colony Bhopal – 462 016, Madhya Pradesh

15	Maharashtra Pollution Control Board Kalpataru Point, 2nd – 4th Floor, Opp. Cine Planet Cinema, Nr. Sion Circle, Sion (E), Mumbai – 400 022
16	Manipur Pollution Control Board Lamphelpat, Near Imphal West D.C. Office, Imphal - 795004
17	Meghalaya State Pollution Control Board ARDEN, Lumbyngngad Shillong – 793 014, Meghalaya
18	Mizoram Pollution Control Board New Secretariat Complex, Khatla Thlanmual Peng, Khatla, Aizawl - 796001, Mizoram
19	Nagaland Pollution Control Board Signal Point, Dimapur - 797112, Nagaland
20	Odisha State Pollution Control Board A-118, Nilakanta Nagar, Unit –VIII, Bhubaneshwar – 751012
21	Punjab Pollution Control Board Vatavaran Bhawan, Nabha Road, Patiala – 147 001, Punjab
22	Rajasthan State Pollution Control Board A-4, Jalane Dungri Institutional Area, Jaipur – 302 004, Rajasthan
23	Sikkim State Pollution Control Board Department of Forest, Environment & Wildlife Management Government of Sikkim, Deorali, Gangtok -737102
24	Tamil Nadu Pollution Control Board 76, Mount Salai, Guindy, Chennai-600032
25	Tripura State Pollution Control Board Vigyan Bhawan Pandit Nehru Complex, Gorkhabasti, PO: Kunjaban, Agartala- 799006
26	Telangana State Pollution Control Board Paryavaran Bhawan, A-3, I.E. Sanath Nagar, Hyderabad-500 018
27	Uttar Pradesh Pollution Control Board Building.No. TC-12V Vibhuti Khand, Gomti Nagar, Lucknow-226 010
28	Uttarakhand Pollution Control Board Gaura Devi Paryavaran Bhawan, 46 B IT Park, Sehstradhara Road, Dehradun -248001
29	West Bengal Pollution Control Board Paribesh Bhavan, 10A, Block-L.A.,

	Sector III, Bidhan Nagar, Kolkata - 700 106
30	Andaman & Nicobar Pollution Control Committee Department of Science & Technology, Dolly Gunj Van Sadan, Haddo P.O., Port Blair – 744102
31	Chandigarh Pollution Control Committee Paryavaran Bhawan, Ground Floor, Sector19 B, Madhya Marg, Chandigarh - 160019
32	Daman & Diu and Dadra & Nagar Haveli Pollution Control Committee Office of the Deputy Conservator of Forests, Moti Daman, Daman – 396220
33	Delhi Pollution Control Committee 4th floor, ISBT Building, Kashmiri Gate, Delhi – 110006
34	Lakshadweep Pollution Control Committee Department of Science, Technology & Environment, Kavarati-682555
35	Puducherry Pollution Control Committee Housing Board Complex, III Floor, Anna Nagar, Puducherry – 600 005
36	Ladakh Pollution Control Committee Skara Yokma, Near KBR Airport, UT of Ladakh, Leh-194101

Annexure-I

Item No.06 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No.536/2024

News item titled "Waste to energy: Smokescreen or solution?" appearing in the Indian Development Review dated 27.03.2024

Date of hearing: 15.05.2024

CORAM: HON'BLE MR. JUSTICE PRAKASH SHRIVASTAVA, CHAIRPERSON
HON'BLE DR. AFROZ AHMAD, EXPERT MEMBER

ORDER

1. This original application is registered *suo-motu* on the basis of the news item titled "Waste to energy: Smokescreen or solution?" appearing in the Indian Development Review dated 27.03.2024.

2. The matter relates to the utility of the waste to energy plants (WtE) and questions their suitability with respect to India's waste problem. As per the article, Waste-to-energy (WLE) technologies allow for the recovery of energy by burning or incinerating waste that cannot be recycled or composted. Their benefits are considered twofold. One, they offer an alternative waste disposal mechanism, diverting solid waste from landfills. Two, through the generation of electricity or heat by burning waste, they provide a renewable energy source that limits reliance on fossil fuels, thereby reducing greenhouse gas emissions. However, the article alleges that though WtE plants have seen relative success in the European Union, environmentalists and scientists have warned that they

a. The quality of waste in India: As per the article, the potential of a WtE operation to meet its energy production target depends on the quality of its waste feedstock. Waste with low moisture content and high calorific value would be ideal for incineration. This includes materials such as non- recyclable plastics (multilayered packaging, plastic bags, styrofoam), contaminated non-usable household textile waste, and non-recyclable domestic hazardous waste, such as soiled paper, soiled cloth, pieces of leather, rubber, tyre, and non-usable wood.

However. Domestic waste in India typically contains high moisture content and has low calorific value, making it unsuitable for efficient combustion in WtE plants, The news item alleges that the WtE plants in India often receive mixed waste, which includes organic, recyclable material. It alleges that mixed waste has high moisture content and needs supplementary energy to incinerate or it won't burn well. This energy is typically fossil-fuel-based, which undermines the claim that electricity produced by WtE plants is altogether clean.

b. Health and Environmental implications: As per the article, incineration of mixed waste produces toxic particles, including carbon monoxide, nitrogen oxides, and sulphur dioxide due to inefficient burning. These particles can cause respiratory ailments and also lead to chronic lung diseases, such as asthma among people who live near WtE sites.

4. The news item raise the question that if India doesn't have suitable waste for WtE plants and these plants are harmful to both human and environmental health, why are more of these facilities being built?

5. It states that In India, an estimated 55 million tonnes of municipal solid waste is generated annually by 377 million citizens residing in urban areas. With an urban population that's expected to grow to 600 million by 2030 and to 814 million by 2050, India is set to generate 165 million tonnes of waste by 2030 and 436 million tonnes by 2050. The waste composition and its characteristics are also subject to change drastically, with a rise in dry waste quantities, a trend observed in major cities. Therefore, there is an urgent need to adopt sustainable waste management practices, with incineration and land filling relegated to the back of the queue.

6. The above matter indicates violation of Solid Waste Management Rules, 2016 and the Environment Protection Act, 1986.

7. The news item raises substantial issue relating to compliance of the environmental norms and implementation of the provisions of scheduled enactment.

8. Power of the Tribunal to take up the matter *suo-motu* has been recognized by the Hon'ble Supreme Court in the matter of *"Municipal Corporation of Greater Mumbai vs. Ankita Sinha & Ors." reported in 2021 SCC Online SC 897.*

(ii). Ministry of Forest Environment and Climate Change, through its Secretary, Indira Paryavaran Bhawan, Jorbagh Road, New Delhi- 110003.

(iii). National Environmental Engineering Research Institute, through its Director, Nehru Marg, Nagpur – 4400020.

(iv). Indian Institute of Technology, New Delhi, through its Director, Hauz Khas, New Delhi – 110016.

(v). Indian Institute of Technology, Mumbai, through its director, IIT Bombay, Powai, Mumbai – 400076.

10. Let notice be issued to the above respondents for filing their response at least one week before the next date of hearing.

11. List on 01.08.2024

Prakash Shrivastava, CP

Dr. Afroz Ahmad, EM

May 15, 2024
OA No.536/2024
HB

Annexure: II

Information related to WtE plants									
Name of SPCB/PCC:									
S.No.	**Name of WtE Plant with address**	**CTE/CTO /Authorization Validity**	**Capacity of WtE (TPD) & Technology used & product formation (gas/ power / heat)**	**Average Calorific value of waste received at WtE facility (Kcal/kg)**	**Average bottom ash/fly ash generation (%) & Handling & disposal methods**	**Whether WtE plant monitored in last 5 years (Yes/No) If yes, please provide date of monitoring**	**Parameters monitored as specified in schedule-II of SWM Rules, 2016**	**Parameters found non complying the norms**	**Details of actions taken (EC imposed, Show cause/Closure issued, non-renewal of authorization or any other action taken for non-compliance)**
1									
2									
3									
4									
5									

Annexure-IV

Summary of Information provided by 5 SPCBs having operational WtE plants based on RDF (MSW based)

State	No. of operational based on RDF (MSW based) WtE plant	Whether monitored in last 5 Years	Parameters monitored as specified in schedule -II of SWM Rules, 2016	Non complying parameters	Details of Action taken
Gujarat	1	No	NA	NA	NA
Haryana	1	Yes, monitored on 15.03.2024	Stack Emission PM, HCl, SO2, CO, TOC, HF NOx, Cd+ Th + Their compound Hg, Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V + their Compounds, Total dioxins and furans Treated Leachate TSS, TDS, pH value Ammonical nitrogen Nitrogen, TKN, BOD, COD, Aresenic, Hg, Lead, Cd, Cr, Cu, Zinc, Nickel, Cyanide, Chloride, Fluoride, Phenolic Compound	NA	NA
Madhaya Pradesh	2	i. Not monitored ii. Monitored on 16.05.2024	i. NA ii. PM, CO, Nox, SO2	i. NA ii. Complying	i. NA ii. NA

State	No. of operational based on RDF (MSW based) WtE plant	Whether monitored in last 5 Years	Parameters monitored as specified in schedule -II of SWM Rules, 2016	Non complying parameters	Details of Action taken
Maharashtra	2	i. Monitoring through CEMS Stack Monitoring is carried out on 16.05.2024 and 28.06.2024. ii. Monitored on, 28/09/2021, 19/10/2021, 14/11/2021, 26/12/2022, 06/02/2023, 11/03/2023, 04/05/2023, 28/11/2023, 22/02/2024, 08/04/2024, 03/05/2024, 25/06/2024, 09/07/2024	i. HCL, PM, CO, NOX, SO2 ii. SO2, Nox, TPM	ii. NA iii. TPM	i. NA ii. Warnig Notice, Interim Direction, Forefetting Bank Guarantee
Telengana	1	Not provided	NA	Nil	NA
Andhra Pradesh	2	i. 20.09.2024 ii. 8.01.2024	i. PM, NOx, SOx ii. PM, NOx, SOx	i.Nil ii.Nil	i.NA ii. NA

Note: (*NA: Not applicable*)

Central Pollution Control Board

UPC-II

Date: 15-04-2019

OFFICE MEMORANDUM

SUBJECT: - " *Clarification on Buffer Zone* Guidelines " issued by CPCB.

CPCB issued guidelines on Buffer Zone around waste processing and disposal facilities in April, 2017.

Subsequently, Central Monitoring Committee constituted under Solid Waste Management Rules, 2016 suggested MOEF & CC to revisit the buffer zone in respect of distance. The Central Pollution Control Board in its 182nd meeting agreed for revisiting of Guidelines.

It is decided that following changes have been made as mentioned at page no.13 of aforesaid Guidelines;

1. **Land of 200-500 m from the boundary of the processing unit is excluded for setting up the facilities but it is mandatory outside the project site as "No development area" for 30 years.**
2. **"No development area" can be utilized for agriculture purpose.**

(A. Sudhakar)
Member Secretary

To,
(As per list attached)
All SPCBs/PCCs

AMENDED GUIDELINES ON THE PROVISION OF BUFFER ZONE AROUND WASTE PROCESSING AND DISPOSAL FACILITIES

Central Pollution Control Board
March, 2019

Contents

1. Introduction

Indian cities are expanding with the increase in population, economic activities and the resulting urbanization. Whereas population residing in urban areas was 11.4% of total population in 1901, it increased to 28.53% in the 2001 census and crossed 30% as per 2011 census, standing at 31.16%. There are 53 urban agglomerations in India with a population of 1 million or more as of 2011 against 35 in 2001. About 43 percent of the urban population of India lives in these cities. The unprecedented growth of these cities has posed several challenges for municipal authorities. Identification of suitable sites for waste management infrastructure in cities is one of the toughest challenges municipal authorities are facing at present. Lack of proper/ updated land use plan with urban authorities is a stumbling block in implementing solid waste management projects.

Most of the existing solid waste management facilities are practicing crude dumping of solid waste. In some cases where solid waste is processed, the situation is still alarming due to use of conventional treatment technologies coupled with poor operation and maintenance by the fund starved ULB. This situataion is giving rise to numerous environmental and public health concerns in and around urban areas. "Not in My Back Yard (NIMBY) syndrome" and litigations are common as public at large do not trust ULBs in providing credible waste management services. Majority of existing solid waste treatment plants and dumping sites, though initially away from habitation but now have no adequate buffer zone from these habitations. Buffer even where available have come under illegal encroachment in many cities and settling societies demand shifting the waste treatment facility itself. Thus there is a general public resistance to the location of waste management facility in any area. Lack of identified sites for municipal solid waste management in master plan compounds the problem.

Disposal of waste in landfills/ dumpsites without any treatment is still practiced even as it impacts on the surrounding environment. Waste management sites encompass waste processing/disposal facilities, which become sources of pollution in terms of air, water, land and noise besides emitting foul smell. Therefore, provision of buffer zone around these facilities is essentially required to protect people living in the surroundings from

exposure/impacts of such pollutants but also to ensure continued safe operations in the waste management facility by maintaining its "island character". Buffer zone also acts as barrier, absorber and to some extent as remedial measure against the fugitive emissions. Fugitive emissions of pollutants emitted during handling of waste, storage, transportation and movements of traffics.

Currently, no scientific basis is available for making provisions for buffer zone around waste processing/disposal facilities. The provisions recommended in the "Municipal Solid Waste Management Manual, 2016" were broadly drawn from the "Report of the Committee constituted by the Hon. Supreme Court of India in March 1999" on Solid Waste Management in Class 1 Cities in India.

In this context, the Government of India through CPCB has framed these guidelines on maintaining Buffer zone including green belt around waste management facilities. These guidelines will not only facilitate the ULBs in meeting the regulatory requirements, reduce the aforesaid nuisance value of the waste management facilities but also make an effort to enhance their aesthetic appeal. In addition to above, the siting criteria for setting up these facilities for waste processing/ landfill is adopted as mentioned in SWM Rules, 2016 at tailing part of these guidelines.

In some instances, the actual separation distance may vary from those recommended in these Guideline, due to site-specific constraints. In such cases, variations to the recommended separation distances may be acceptable, subject to detailed assessment by concerned authorities and to the satisfaction of the State Pollution Control Board/Committee.

2. Objective of the Guidelines

The purpose of this Guideline is to specify adequate separation distances between solid waste management facility and its surrounding area having different land usage characteristics.

To achieve the purpose, these Guidelines aim to:

- minimize the risk of adverse impacts on the environment (land, air, water, noise pollution) and the impacts on the Public Health
- inform and support strategic land use planning decisions and prevent encroachment of controlled areas
- Generate/ develop public acceptance for solid waste treatment and disposal infrastructure
- Encourage new technological innovations for processing facilities with minimal land requirement

3. Regulatory Framework

The buffer zone was first envisaged in 1982 after Indian task force developed the 'Core-Buffer-Multiple Use Zone' strategy. This strategy aimed at separating incompatible land uses, particularly in relation to wildlife. In this approach, the buffer zone would be under the wildlife park authorities' administration and controlled use of forest produce would be allowed. The multiple-use zone was located outside the park boundaries designated for rural development. With similar analogy, these buffer zone guidelines are framed for waste processing and disposal facilities. The existing regulatory provisions for these guidelines are given as under:

i. Provisions related to Buffer Zone specified in the **Solid Waste Management Rules**, 2016 mentioned as under;

- **Rule 11** Section (l)- **Duties of the Secretary–in-charge, Urban Development in the States and Union territories-** Notify buffer zone for the solid waste processing and disposal facilities of more than five tonnes per day in consultation with the State Pollution Control Board
- **Rule 12** Section (h)- **Duties of Central Pollution Control Board-** Publish guidelines for maintaining buffer zone restricting any residential, commercial or any other construction activity from the outer boundary of the waste processing and disposal facilities for different sizes of facilities handling more than five tonnes per day of solid waste;

- The **distance/siting criteria's for setting up waste management facilities as** specified in Solid Waste Management Rules, 2016 at **Schedule I (A)(vii)**
- **Schedule I (A) (viii)**-The sites for landfill and processing and disposal of solid waste shall be incorporated in the Town Planning Department's land-use plans.
- **Schedule I (A) (ix)**-A buffer zone of no development shall be maintained around solid waste processing and disposal facility, exceeding five tonnes per day of installed capacity. This will be maintained within the total area of the solid waste processing and disposal facility. **The buffer zone shall be prescribed on case to case basis by the local body in consultation with concerned State Pollution Control Board**.
- **Schedule I (F)**-Criteria for ambient air quality monitoring

ii. The **Coastal Zone Regulation** notified by Ministry of Environment Forest And Climate Change also prohibits setting up and expansion of units or mechanism for disposal of wastes in High Tide Line (hereinafter referred to as the HTL) to 500 mts on the landward side along the sea front. Also dumping of city or town wastes including construction debris, industrial solid wastes, fly ash for the purpose of land filling and the like with high tide line shall be regulated by the concerned authority, where shall implement schemes for phasing out any existing practice, if any.

iii. The buffer zone guidelines for setting up processing and disposal facility also come under the purview of The Water (Prevention and Control of Pollution) Act, 1974, The Air (Prevention and Control of Pollution) Act, 1981.

iv. For setting up solid waste processing and disposal facilities, The Environment (Protection) Act, 1986 also need to be adhered to particularly from the angle of Environmental Clearances. Authorities concerned need to deliberate on the number of issues and criteria when siting a buffer zone as broadly categorized below:

a) Environmental considerations

- Distance from the flood plains, coastal regulation, wetland, Critical habitat areas, sensitive eco-fragile areas, highways, habitations, public parks and water sources

- Topography- Hilly areas, land availability and also the slope's landslide potential.
- Wind Speed and Direction- Wind direction is one of the important consideration as to the area that can be affected due to dust and odour.

b) *Proximity and access considerations*

- Transportation Network
- Utilities and Services

c) *Land-use considerations*

- Land Usage and Activities on Adjacent Sites
- Allowable Land Uses and Zoning
- Proximity to Airports
- Proximity to Other Waste Management Facilities

4. Existing Norms for Buffer Zone in India and Abroad

A.) Buffer Zone

The buffer zone, particularly in context of NIMBY syndrome in India, is one of the limiting conditions for obtaining Environmental Clearance for setting up solid waste processing and disposal facilities. At present, there are no published norms for buffer zone for solid waste management facilities by MoEFCC/ CPCB.

However, the "Manual on Municipal Solid Waste Management, 2016" published by CPHEEO, Ministry of Urban Development recommends certain provisions for buffer zone particularly the one of maintaining 500 m buffer zone around the waste processing facilities. In the given pace of urbanization in the country, getting such large piece of land is becoming increasingly difficult and costly. ULBs in setting up waste processing and disposal facilities expeditiously.

The provisions made for Buffer zone for solid waste processing and disposal facilities in various countries are tabulated below:

i. Landfill

International Solid Waste Association	500 m should be provided depending on the size of landfill, height, wind direction
South Australia	500m buffer distance shall be maintained between areas dedicated for waste disposal and the nearest surface water
Ontario, Canada	Buffer area shall be at least 100 m wide at every point, if that does not apply to a buffer area, if the buffer area is at **least 30 metres** wide at every point and a written report confirms that; (a) the buffer area provides adequate space for vehicle entry, exit, turning, access to all areas of the site and parking; (b) the buffer area provides adequate space on the surface of the site for all anticipated structures, equipment and activities; and (c) the buffer area is sufficient to ensure that potential effects of the landfilling operation do not have any unacceptable impact outside the site.
Malaysia	500m
South Africa	Buffer zone min 200m to 500m
Bangladesh	250m from the habitat
Hong Kong	250 m away from the edge of the waste (landfill boundary)

ii. Waste processing facilities

Canada	minimum buffer strip between composting facility boundary and adjacent property. For in-vessel Composting distance between active area and the nearest residential or institutional building shall be min 500m, nearest commercial or industrial building 250 m and nearest property boundary will be **min 100m.**

CANADA-Nova Scotia	In case of in-vessel composting facilities, where it can be demonstrated that particular equipment will not release odours generated from the composting process into the surrounding environment, the distance between the equipment and the nearest property boundary shall be a minimum of **30 metres**
Malaysia	production of compost from organic waste- 500m
Devon city Council (UK)	buffer distance 500m
China	300m buffer zone between incineration plants and local residents

From above, it i s observed that the minimum buffer area varies from 100 m to 500 m in case of both waste processing and disposal facilities.

B.) Facility Siting Criteria

In addition to the suitable provisions of the buffer zone, the SWM Rules, 2016 provides norms for siting criteria for landfills. The same is reproduced below for adoption while setting up **landfill facilities.**

Table 1. Criteria specified for identifying Suitable Land for Sanitary Landfill Sites (Not a treatment facility)

S. No.	Place	Minimum Siting Distance
1.	Rivers	100 m away
2.	Ponds, Lakes, water bodies	200 m
3.	Highway, **Habitations, Public Parks and water supply wells**	200 m from center line
4.	Flood Plains as recorded for the **last 100 years**, zone of coastal regulation, wetland, Critical habitat areas, and sensitive eco-fragile	Sanitary landfill site not permitted

	areas	
5.	Airport/ Airbase	20 km**

In a special case, **landfill site** may be set up within a **distance of 10 and 20 km** away from the Airport/Airbase after obtaining no objection certificate from the civil aviation authority/ **Air force as the case may be.

However, there is no such siting criteria applicable for setting up waste processing facilities.

5. Recommended Provisions for Buffer Zone

The Solid Waste Management Rules, 2016 specified the terminology of **Buffer Zone**, *as "**no development zone to be maintained around solid waste processing and disposal facility, exceeding 5 TPD of installed capacity. This will be maintained within total land area allotted for the solid waste processing and disposal facility.**"*

Buffer Zone around the core waste processing area consists of utility area, open parks and green belts etc. Further, depending on feasibility of planning, the interface land use between the boundary of waste processing facility and sensetive receptors, can also be developed as an additional measure.The layout of buffer zone (utility area, open parks and green belts) including core waste processing area and optional interface land use is shown in the figure below:

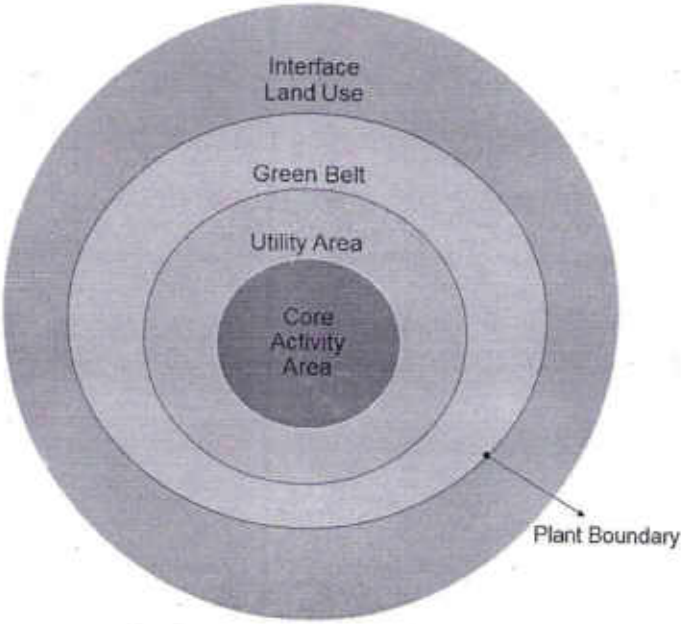


Figure 1 Depicts activity boundary, green belt and separation distance

For the purpose of these guidelines, the Buffer Zone, Separation Distance, Utility Area, Green belt and Interface Land use shall have the meanings set out below, unless otherwise provided, hereafter, for the exclusive interpretation of these Guidelines.

a) The **Buffer Zone** is generally defined as an area of restricted activities, depending on the activity in adjacent land uses. It also ensures long-term continuous availability of disposal sites by avoiding potential conflicts between waste disposal sites and adjacent lands with different users.

b) **Buffer Distance or Separation distance** is measured as the areal distance between the source of emission and sensitive receptors. For the purpose of these guidelines and addressing the required protection from adverse impacts, separation distance is measured from the tip of core SWM facility processing boundary, as the source of emission, to the nearest boundary of the property of sensitive receptors as shown in figure 1.

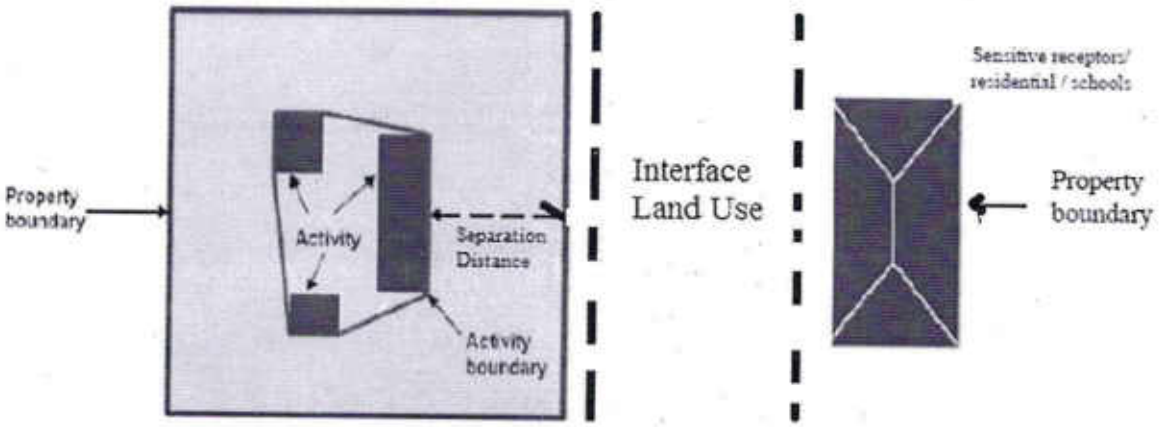


Figure 2. Core Plant activity area, buffer Zone and interface land use

c) **Core Waste Processing/Landfilling Area** typically requires space for receiving waste, storing waste, segregation of waste and treatment units within the facility. Similarly, for Landfilling it is the area of cell which is receiving the waste/inert.

d) **Utility Area** within the facility is designated area for the facility operations other that the core activities like. Weigh bridge, parking, vehicle cleaning, laboratory, emergency services etc.

e) **Green Belt** for the purpose of these guidelines shall refer to an area that is kept in reserve within the alloted land for setting up facility, around the core SWM processing area, for the purpose of plantation and landscaping to reduce the adverse effects from pollutants like air & noise, soil erosion control etc. It also works as a natural shield to protect people around the facility from these pollutants.

f) **Interface Land Use:** The buffer zone could be further augmented with interface land use area, where above beneficial and feasible as an additional optional measure, after due approval of the concerned authorities. The interface land use shall not generate significant emissions, nor warrants protection from them. The activities in the interface land use are **vehicle**

showrooms, service stations, warehouses, display homes, emergency services facilities, funeral, veterinary clinic and parks etc.

i. Separation Distances for Solid Waste Processing and Disposal Facilities

Ideally, a distance of 500 meter from the boundary of the Solid Waste Processing and Disposal Facility (sanitary landfill) should be maintained. However, on case to case basis a distance of minimum 200 meter from the Solid Waste Processing and Disposal Facility (sanitary landfill) can be considered subject to the condition that such facility meets the stipulated standards prescribed by State Pollution Control Board with respect to ambient air as well as for stack emissions.

The above provisions have been made keeping in view of high population density in urban areas, scarcity of land to set up such facilities and protest from local inhabitants in the area of processing/ disposal facility and is in line with those being adopted at international level. Besides, the following three conditions need to be ensured:

(a) the buffer area provides adequate space for vehicle entry, exit, turning, access to all areas of the site and parking;
(b) the buffer area provides adequate space on the surface of the site for all anticipated structures, equipment and activities; and
(c) the buffer area coupled with technological interventions is sufficient to ensure that potential effects of the processing/ landfilling operation do not have any unacceptable impact outside the site.

Note:

1. ***Land of 200-500 m from the boundary of the processing unit is excluded for setting up the facilities but it is mandatory outside the project site as " No development area" for 30 years.***
2. ***No Development area can be utilized for agriculture purpose.***

6. Green Belt

The buffer zone effectiveness is reinforced by the green belt within the solid waste processing and disposal boundaries. An important aspect of a green belt sometimes overlooked is that the plants constituting green belts are living organisms with limits to their tolerance towards air pollutants. For the purpose of these guidelines, the green belt shall refer to an area that is kept in reserve within and around the SWM facility for the plantation and landscaping to reduce the adverse effects from the activity area like air & noise pollution, soil erosion etc. The green belt is an effective pollution sink only within the tolerance limits of constituent plants. The philosophy is that when primary pollutants are taken care of, formation of secondary pollutants will not reach menacing proportions. Primary pollutants of concern are – SO_2, HF, NO_2, CO, CO_2, NH_3, H_2S, Cl, SPM and organics. **Annexure- 1** attached to these guidelines shows the selection criteria for plants near the processing facility.

These guidelines recommend minimum 10 metres green belt within and all around the facility along the boundary. Vegetation, shrubs, trees, and berms with high density greenery can be incorporated into green belt within facility limits to serve as visual barriers and to reduce noise levels. Depending on the monitoring of level of pollutants in ambient air after the boundary of facility, on case to case basis, suitable technological measures/ barriers to check pollutants need to be resorted. The important factors for developing green belt for agro-climatic conditions are stated below:

a) Criteria for Selection for Plant Species

- The plant species should be fast growing
- They should have thick canopy cover
- They should be perennial and evergreen
- They should have high carbon – CO_2 sink potential
- They should be effective in absorbing pollutants without significantly affecting their growth

b) Recommended plant species:

Keeping in view the nature of pollutants expected from the disposal site, a green belt of minimum 10 metre width is recommended and the following plant species can be selected for plantation:

- Acacia nilotica (Babul)
- Deldergia Sissoo (Shishum)
- Acacia auriculiformis (Australian Babul).
- Azadirachta Indica (Neem)
- Lagerstroemia speciosa (jamun)
- Prongamia pinnata (Karanji)

c) Recommended plant species Density around Processing & Disposal/ Landfill site:

These guidelines recommend the green belt width of minimum 10 meters within and all around processing and disposal facilities. The recommended minimum density of the green belt should be as discussed in the green belt model provided in the CPCB guidelines for developing green belts in 2000. These guidelines introduce the concept of a pollution attenuation coefficient for estimating the removal of pollutant while passing through the green belt. The formulation of pollution attenuation coefficient makes use of parameters such as leaf area, density of the tree plantation, deposition velocity of the pollutant on leaf surface and wind speed to the green belt. The model gives the dependence of the pollution attenuation factor of a green belt on various physical parameters of the green belt such as its height, width, distance from the pollution source and on atmospheric stability conditions and hence the model can be used to optimize the design of the green belt in obtaining the desired degree of attenuation of the pollution around an industry. The case to case basis CPCB guidelines for developing green belts (March, 2000) to be referred for optimal density applications.

7. Operationalization Framework

Solid Waste Management Rules, 2016 has empowered Central Pollution Control Board for maintaining buffer zones restricting any residential, commercial or any other construction activity from the outer boundary of the waste processing and disposal facilities for different sizes of facilities handling more than five tonnes per day of solid waste. The guidelines will be updated, from time to time, and address environmental aspects of processing and disposal of solid waste to enable local bodies to comply with the provisions of SWM Rules, 2016.

i. Role of State Pollution Control Board

a) The SPCB shall link the buffer zone achievement with grant of Consent to operate and establish under stipulated norms;
b) The SPCB shall conduct periodic environmental monitoring around buffer zone and assess the impact on the sensitive receptors;
c) The SPCB shall bi-annually review the Green Belt condition within the facility premises and give suggestions to the ULBs for further improvements. Stringent measures and penalties as per the stipulated norms to be imposed in case of default;
d) The SPCB shall extend all necessary support to local authority for the site selection for the newly proposed waste processing and disposal facility;

ii. Role of Local Body/ Facility Operator

a) The ULB shall be responsible for the selection of site in close coordination with SPCB;
b) The ULB/ operator shall be responsible for green belt development and maintenance in the buffer zone;
c) The ULB shall direct the operator concerned, in case it outsources facility to comply with these guidelines

iii. Role of Town and Country Planning Department

a) Town and Country Planning Department shall allocate adequate land for waste

management facilities in the Master Land Use Plan;

b) Town and Country Planning Department shall make all efforts to restrict/ prohibit peri-urban growth near such facility;

c) Town and Country Planning Department shall be responsible for making provisions of Green Area development around such existing/ exhausted facilities to the extent feasible to minimize the impact of pollution to sensetive receptors.

8. Annexure-1- Selection criteria for plants near the processing facility

Table 2.6 Compilation of research in India indicating sensitive and tolerant species, with reference to industrial pollutants

Name of Plant	Sensitive	Tolerant	Reference
Mangifera indica	Coal dust		
Citrus limon		Coal dust	Rao, 1971
Phaseolus aureus (Green gram)	Petro coke		Prasad and Rao (1981)
Zea mays	Cement dust		Sree Rangaswamy et al. (1973)
Syzygium cumini	Cement dust		Jafri et al. (1979)
Psidium guyava	Cement dust		Yunus and Ahmed (1980)
Triticum aestivum	Cement dust		Singh and Rao (1980 a)
Calotropis procera	Cement dust		Yusuf and Vyas (1982)
Cassia fistula	Cement dust		
Dalbergia sissoo	Cement dust		
Withania somnifera	Cement dust		
Glycine max	Cement dust		
Hordeum vulgare		5% fly ash	Singh and Rao (1979 a)
Portulaca sp			Bhatia (1976)
Triticum aestivum	Above 20% Fly ash		
Trifolium aestivum		6g/m²/day fly ash	Pawar and Dubey (1982)
		4g/m²/day fly ash	Dubey et al. (1980)
Dolichos biflab		4g/m²/day fly ash	
Abelmoschus esculentus Var Pusa sawani	Cement and Coal dust	fly - ash	Pawar et al. (mean) (1983)
Corchorus hengalensis	Air borne dust	fly - ash	Pawar et al. (1982)
Brassica oleraceae	Urban		Chapholer et al. (1980)
Chenopodium album	sil		Garg and Varshney (1980)
Cicer arietinum			
Dolichos biflab			
Sonchus asper			
Withania somnifera			
Tabernaemontana coronaria	Polluted environment		Srivastava et al. (1980)
Calotropis procera		Polluted conditions	Yunus and Ahmed(1981)

(Contd....)

12

Table 2.6 (*Contd...*)

Name of Plant	Sensitive	Tolerant	Reference
Calotropis gigantea	Polluted areas		Bhirava Murthy and Kumar (1983)
Boro paddy, Var. Ratna	Urban dust		Das and Pattanayak (1978)
Mangifera indica		Dust Collector	Shetye and
Thespesia populnea			Chaphekar (1980)
Erythrina indica	Poor dust Collector		
Polyalthia longifolia			
Ficus benghalensis		Dust Collector	Das 1981 and Das et al. (1981)
Ficus infectoria			
Ficus religiosa			
Mangifera indica			
Tectona grandis			
Polyalthia longifolia			
Shorea robusta			
Terminalia arjuna			
Cassia fistula	Poor dust Collector		Das (1981) and Das et al. (1981)
Poinciana regia			
Sesbania sp.			
Pithecolobium dulce		Better dust collector	Rao (1971)
Argyrea speciosa			
Leucaena leucocephala			
Melilotus alba	Polluted area		Ghouse and Khan (1983)
Banana Crop.	SO_2 and dust From brick Kiln		Bedi et al. (1982)
Lycopersicum esculentum	SO_2 and dust from brick Kiln		Bell and Bedi (1981)
Mangifera indica	SO_2		Rao 1972 Shetye 1979 Giridhar (an published data) Pawar and Dubey (1983)
Helianthus annus	To pollute areas		Chapheker et al. (1980 a)
Crotalaria juncea			
Commelina benghalensis			
Cyamopsis tetragonoloba			
Cicer arietinum	Fly ash SO_2		Dubey et al. (1982)

(*Contd.....*)

Table 2.6 (Contd....)

Name of Plant	Sensitive	Tolerant	Reference
Medicago sativa (Alfa-alfa)	SO_2		Singh and Rao (1975, 1980)
Sorghum vulgare var CSH - 1	SO_2		Boralkar and Chaphekar (1978)
Glycine max	SO_2		Pandey and Rao (1979), Prasad and Rao (1982)
Phaseolus aureus	SO_2		Singh and Rao (1980)
Arachis hypogea	SO_2		Mishra (1980)
Dolichos lablab	SO_2		Banerjee and Chaphekar (1979)
Phaseolus aureus Var. Vaishakhee	SO_2		Boralkar and Chaphekar (1980)
Trigonella foenum-graecum	SO_2		Boralkar and Chaphekar (1983)
Pisum sativum	SO_2		Varshney and Varshney (1978)
Crossandra undulaefolia	SO_2		Chaphekar and Kamthan (1974)
Mirabilis jalapa			
Amaranthus spinosus	SO_2		Boralkar and Chaphekar (1980)
Spinacea oleracea			
Raphanus sativus	SO_2		Banerjee and Chaphekar (1978)
Commelina benghalensis			
Erythrina indica			
Barley, Cotton, Wheat, Aster, Cosmos, Verbena Zinnia, Sweat Pea, Ipomoea purpurea, 4 o'clock plant, Bean, Beet, Carrot, Chilli, Pumpkin, Radish Bhendi, Sunflower etc.	SO_2		Pandey and Vaidya (1979)
Most trees		SO_2	Pandey and Vaidya (1979)
Mangifera indica	SO_2		Chaphekar (1972)
Terminalia catappa			
Malachra capitata Dahlia			
Croton, Plumeria		SO_2	Chaphekar (1972)
Opuntia, Nerium			
Dahlia, Petunia, Alfalfa, cotton	SO_2		Vashisavi (1976)
Barley			

(Contd....)

14

Table 2.6 (Contd...)

Name of Plant	Sensitive	Tolerant	Reference
Dalbergia sissoo Terminalia arjuna Cassia fistula Cedrela toona Syzygium cumini Oat, Pea, Brinjal, Potato Cucurbit	SO_2		Yunus and Ahmed (1979)
Azadirachta indica Ficus religiosa Pithecolobium dulce Calotropis procera Trees, Bushes, crops of those areas		SO_2	Yunus and Ahmed (1979)
Phaseolus aureus Cicer arietinum	SO_2, O_3, SO_2+O_3	SO_2, O_3, SO_2+O_3	Agrawal and Rao (1983)
Oryza sativa Panicum miliaceum	SO_2, O_3, SO_2+O_3	SO_2, O_3, SO_2+O_3	
Solanum melongena Vicia faba Abelmoschus esculentus Var. Pusa savani	SO_2, O_3, SO_2+O_3 SO_2, O_3, SO_2+O_3 SO_2, O_3, SO_2+O_3		
Abelmoschus esculentus	SO_2, O_3, SO_2+O_3,		Bolalkar and Shinde (1983)
Phaseolus aureus Triticum aestivum Brassica juncea	SO_2, HF, SO_2+HF		Sharma (1981)
Triticum aestivum	NO_2		Prasad and Rao (1979)
Triticum aestivum	NO_2+SO_2		Prasad (1980)
Dalbergia sissoo Madhuca indica	SO_2		Rao et al. (1983)
Pisum sativum var. Bonneville, Pisum sativum var. T163 Hordeum vulgare Zea mays	NaF		
Lycopersicum esculentum Terminalia tomentosa Buchanania lanzan	NaF HF		Arya (1971) Pandey (1979)
Zea mays	HF		Rao and Pal (1978 b)
Gladiolus sp.	HF		Pandey and Rao (1980 a)

(Contd....)

Table 2.6 (*Contd....*)

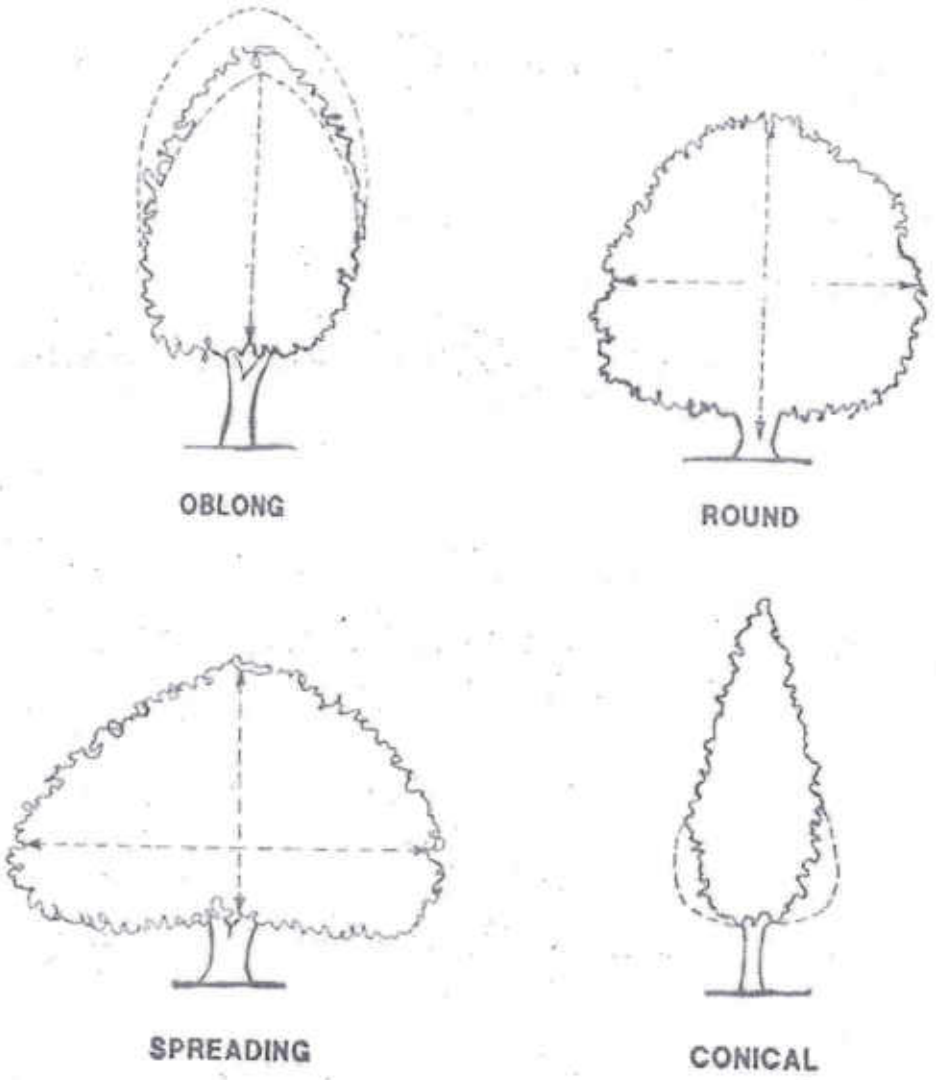
Name of Plant	Sensitive	Tolerant	Reference
Spinacia oleracea	Gasoline Vapour,		Prasad (1980)
Abelmoschus esculentus Cyamopsis tetragonoloba Crotalaria juncea Trigonella foenum-graecum	Ammonia		Chaphekar and Boralkar (1979)
Nerium indicum	SO_2		Varshney, (Unpublished)
Cynodon dactylon	HF		Meenakshy et al (1961)
Cicer arietinum Nasturtium indicum Petunia alba Tradescantia axillaris	SO_2		Varshney and Varshney (1981)
Madhuca indica	SO_2, fly-ash		Agrawal M (1989)
Cassia siamea Delonix regia Shorea robusta			
Acacia arabica		SO_2, fly-ash	
Acacia catechu Zizyphus sp			
Mangifera indica		Dust	Agrawal & Khanam (1989)
Ficus benghalensis L Ficus infectoria Roxb Holoptelia integrifolia Planch Ipomoea fistulosa Mart ex choisy Lagerstroemia sp Nyctanthes arbortristis L Peltophorum ptercocarpum (DC) K Heyne		Dust	Ahmad Yunus et al (1991)
Tectona grandis L Terminalia arjuna W & A Thevetia nerifolia Juss Acacia arabica Willd Bougainvillea spectabilis Willd Hibiscus rosa sinensis Willd Morus alba		Dust	Ahmad Yunus et al (1991)

(*Contd....*)

Table 2.6 (Contd...)

Name of Plant	Sensitive	Tolerant	Reference
Nerium indicum Mill Thevetia perifolia Juss Dalbergia sissoo Roxb		Cement dust	
Azadirachta indica A.Juss Brassica campestris L Citrus aurantium L Delonix regia Raffin Syzygium cumini (L.) skeel Mangifera indica L Pisum sativum L Tabernaemontana coronaria Willd Trifolium aestivum L Zizyphus mauritiana Lamk Helianthus annus L	Cement dust	fly ash	Pandey, Misra et al (1994)
Opuntia monacantha Opuntia dillenii Kalanchoe marmorata Crassula		SO_2	Raza S.H., Shylaja G. (1992)
Bryophyllum Aloe Bryophyllum tubiflorum Euphorbia cattamindoore	SO_2		
Caesalpinia pulcherima Eugnia jambolana Polyalthia longifolia Pongamia pinnata	SO_2	SO_2	Murthy M.S.R. et al (1990) Raza S.H. et al (1991)
Caesalpinia pulcherima Pithecolobium dulce Cassia fistula Pongamia glabra Polyalthia longifolia	Dust	Dust	
Pithecolobium dulce Caesalpinia pulcherima Polyalthia longifolia Pongamia pinnata	SO_2	SO_2	Raza S.H. et al (1998)

Fig.5.1 TREE CANOPY SHAPES



The shapes given here are for convenience only. Many crown shapes range between those identified following viz. Oblong-Round, Round-Spreading, Conical-Oblong, etc. Some shapes also change with age or environmental stresses.

FIG. 5.1 TREE CANOPY SHAPES

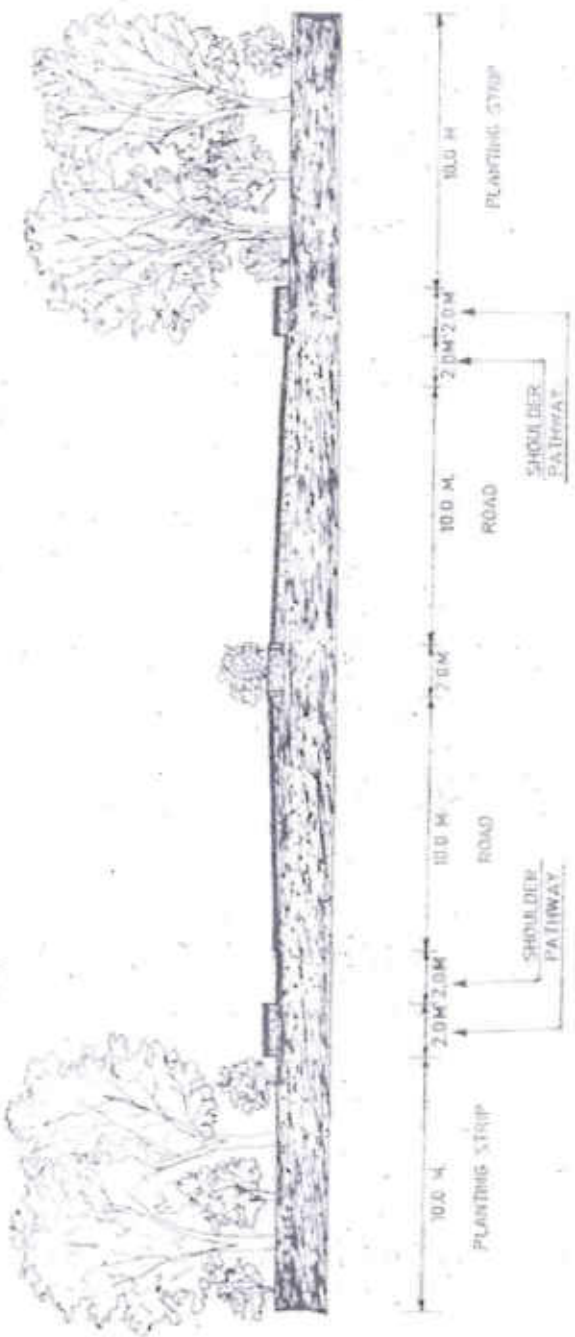


FIG. 5.2 TYPICAL ROAD-SIDE PLANTATION

FINAL

"Selection Criteria for Waste Processing Technologies"

[In compliance with Hon'ble National Green Tribunal Order Dated 25th May & 1st August, 2016 in the Matter of OA No. 199 of 2014, Almitra H. Patel &Anr. Vs Union of India &Ors.]

CENTRAL POLLUTION CONTROL BOARD

(Ministry of Environment, Forests and Climate Change)
PARIVESH BHAWAN, EAST ARJUN NAGAR, SHAHDARA

CONTENTS

SELECTION CRITERIA OF WASTE PROCESSING TECHNOLOGIES

1.0 Introduction:

Selection of appropriate technology is one of the key considerations for success of a waste management system for a particular town/city besides taking consideration of other aspects like resource recovery, environmental soundness, financial support, involvement of stakeholders/ public and institutional capability.

Many waste processing technologies are available and in practice world-wide. However, efficiency of a particular technology depends upon the criteria for which it is designed and planned. The major criteria considered for selection of technologies are the waste quantity, waste characteristics, physical properties and composition of wastes, availability of land, social factors, capital investment, duration of treatment, products market, etc.

A wrong selection of waste processing technology can cause failure of the entire waste management system leading to bad economics and environmental cost.

2.0 SelectIon of Best Available Technology for Waste Processing

The available waste processing technologies can be broadly divided into two categories-

(1) Biological treatment and
(2) Thermal treatment.

The Biological treatment process is accomplished by allowing to micro-organisms to degrade waste components by creating conducive environment for growth of microbial organisms. In the biological process, the biodegradable organic portion

of waste is broken down into gaseous products (CO_2, Methane gas, etc) and water molecules leaving behind carbon rich byproduct called compost. The biological activities depend upon several criteria- C/N ration, pH value, moisture content, supply of oxygen, etc. Biological processes for waste treatment can be further divided into two categories-

(a) Aerobic treatment (in presence of Oxygen) and
(b) Anaerobic treatment (absence of Oxygen).

The thermal process of treatment is applied to destroy the harmful potential of wastes together with energy recovery. In this process, the waste components are incinerated in controlled oxygen supply so that maximum heat energy can be recovered without causing the air pollution. During incineration, the waste undergoes chemical changes to release gaseous byproduct, water vapour along with heat energy. The heat energy can be utilized for generating electricity through boiler. The efficiency of heat recovery depends upon the calorific value of incinerated waste.

Details of the available technologies are discussed below;

2.1 Aerobic Composting

Composting is the process of aerobic decomposition of biodegradable organic matter in a warm, moist environment by the action of bacteria, yeasts, fungi and other organisms. MSW in India has an initial C/N ratio of around 30:1, ideal for decomposition. The organisms involved in stabilization of organic matter utilize about 30 parts of carbon for each part of nitrogen. Compositing requires approx 25 m^2 area per ton of MSW (only for windrow formation for 21 days composting and maturity yard for 30 days stabilization). The additional area required is for machinery, packing and storage. Facilities also required for recycling and treatment of effluent (leachate) and sanitary landfill for rejects (inert materials,

sludge from ETP). The compost products should comply with the standards prescribed in the SWM Rules, 2016.

2.2 Vermi -composting

Vermi compost is the end-product of the breakdown of organic matter by particular species of earthworm. Vermi compost is a nutrient-rich, natural fertilizer and soil conditioner, cultured on a specially made vermi-bed. The earthworm species most often used are Eudrillus eugineae, Eisenia foetida or Lumbricus rubellus. It can treat any organic waste, not appreciably oily, spicy, salty or hard and that do not have excessive acidity and alkalinity. The C/N ratio preferred is 30:1 where, carbon matter comes from brown matter (wood products, saw dust, paper etc) and nitrogen from green matter (food scraps, leaves etc). Overabundance of greens generates ammonia. The moisture content of 40-55% is preferable and maintained by covering the tank with wet sack and sprinkle water as required. Vermi-compositing can be done in tank with size of 4m x 1m x 0.5m for waste input of 10kg/day of semi decomposed waste.

2.3 Biomethanation /Bio-waste Derived Fuel

It is a process based on anaerobic digestion of organic matter in which microorganisms break down biodegradable material in the absence of oxygen. The process is widely used to treat wastewater sludge and organic wastes because it provides volume and mass reduction of the input material. It produces methane and carbon dioxide rich biogas suitable for energy production and hence, is a renewable energy source. The nutrient-rich solids left after digestion can be used as a fertilizer. It generally treats Sorted organic fraction only (highly putrescible) for better gas yield. Fibrous organic matter is undesirable as the anaerobic microorganisms do not easily break down woody molecules such as lignin, cellulose, hemicelluloses, etc.. Preferred C/N ratio is 25-30. Moisture content should be >50% which implies on feed, gas production, system type, system efficiency. Area requirement for bio-methanation is approximately 25 m^2

per tonne of MSW. Extra area required for machinery, gas containing and storage facilities.

2.4 Incineration

The incineration of MSW involves combustion of waste leading to volume reduction (90-95%) and recovery of heat to produce steam that in turn produces power through steam turbines (Bhide and Sunderesan 1983). Basically, it is a furnace for burning waste and converts MSW into ash, gaseous and particulate emissions and heat energy. The efficiency of the technology is linked to the waste characteristics and their properties such as moisture content and calorific values. It requires high temperature of the order of 800-1000^{o}C and sufficient air and mixing of gas stream. The minimum temperature for burning carbonaceous wastes to avoid release of smoke and prevent emissions of dioxin and furans is 850^{o}C. Depending on the nature of wastes and the operating characteristics of combustion reactor, the gaseous products derived from the combustion of MSW may include carbon dioxide (CO_2), water (H_2O, flue gas), oxygen (O_2), nitrogen oxides (NOx), sulphur dioxide (SO_2) and small. Minimum Moisture content should be <45%. Calorific value should be as high as possible; >1500 kcal/kg. Incineration of chlorinated plastic should be avoided as far as possible. The emission standards are prescribed in SWM Rules, 2016.

2.5 Plasma pyrolysis

Plasma pyrolysis or plasma gasification is a waste treatment technology that gasifies matter in an oxygen-starved environment to decompose waste material into its basic molecular structure. The process demands high electrical energy for creating high temperature by an electrical arc gasifier. It does not combust the waste as incinerators do. In a plasma converter, the arc breaks down waste primarily into elemental gas and solid waste (slag). The objective of the process is to generate net electricity, depending upon composition input wastes, and to

reduce the volumes of waste being sent to landfill sites. Relatively high voltage, high current electricity is passed between two electrodes, spaced apart, creating an electrical arc where temperatures as high as 13,871°C is reached. The temperature from one meter arc can reach up to ~4000°C. At these temperatures most types of waste are broken into basic elemental components in a gaseous form, and complex molecules are atomized - separated into individual atoms. Depending on the input waste (plastics tend to be high in hydrogen and carbon), gas from the plasma containment can be removed as Syngas, and may be refined into various fuels at a later stage. There has been issues of plasma systems regarding high temperatures requirement and short life of liners which are highly susceptible to both chlorine attack and to local variability in such high temperatures, not likely to last more than a year in service.

2.6 Pelletization /Production of Refuse Derived Fuel (RDF)

It is basically a processing method for mixed MSW, which can be very effective in preparing an enriched fuel feed for thermal processes like incineration or for use in industrial furnaces. It is a fuel produced by shredding municipal solid waste (MSW) and steam treatment for reducing moisture content. RDF consists largely of organic components of municipal waste such as plastics and biodegradable waste, which are compressed into pellets, bricks, or logs. Non-combustible materials such as glass and metals are removed during the treatment process with an air blow or other mechanical separation processing. The MSW collected for disposal is tested for its moisture content and when the moisture content is more than 35- 40%, it requires drying to produce fuel pellets with reasonable calorific/heating values. The reduction in moisture can be done artificially or by natural sun drying. The sun dried garbage is then uniformly fed into a rotary drying system i.e. Hot Air Generation burning oversize garbage or other fuel to further bring down the moisture level to about 10-12%. RDF is an alternative to WTE and is a potential waste management technology

3.0 Criteria for selection of Waste Processing Technology

For planning and designing of a waste management plan, some preliminary survey is required to be obtained from the city/town and accordingly selection of waste processing technologies can be done for the city/town. In case of waste quantity is found less than requirement, a regional plan may be prepared for clusters of towns to achieve the desired quantity of waste. In case of excessive generation of waste, the waste can be reduced by adopting decentralized treatment process (vermin-composting/Biogas) in pockets – within garden premises, large residential complex, etc. However, Integrated waste processing plants are capable of processing both organic and incinerable wastes.

The primary criteria for selection of waste processing technologies are as under;

1. Quantity of waste generation
2. Characteristics of waste (Physical and chemical property)
3. Based on land availability **(Annexure-I)**
4. Prevailing environmental conditions
5. Climatic condition and terrain
6. Social acceptance
7. Market for the products
8. Capital investment
9. Siting criteria
10. Environmental norms

The quantity of waste generation plays vital role in selection of waste processing technologies. Vermi-composting and Biogas plants are capable of handling effectively up to 30 Tonne/per day and suitable for small towns. Aerobic composting plants are found operational up to 500 Tonnes/day. The waste-to-Energy plants are found cost-effective for processing waste 500 Tonnes/day and above. The indicative land requirements for different composting technologies are given at **Annexure-I**.

Waste characteristics such as C/N ratio, moisture content, calorific value, etc. indicate the treatment technology to be adopted. The desirable C/N ratio for composting is 30:1 with moisture content 50-60%.; otherwise, the these parameters are maintained by addition of some selected wastes. The desirable calorific value of waste considered for incineration should not be less than 1500 Kcal/kg (SWM Rules, 2016). The desired calorific value of waste can be achieved practicing effective segregation of wastes. However, multiple technologies can be selected for a city for processing solid wastes in an integrated way depending upon the quantity and characteristics of wastes as under (Table-1);.

Table-1: Options for Integrated Technologies as per waste quantity generation

Sno.	Population range	Waste Gen.TPD	Composition	Technological options
1	Above 2 Million	>1100 TPD	Biodegradables 35 to 50 %	IWP comprising -BM +CC+ RDF. W to E plant for power, based on: gasification, pyrolysis, incineration and mass burning. RDF to cement industry Plastic to fuel oil
2	1 M to 2 Million	550 to 1100 TPD	Biodegradables 40 to 55 %	IWP comprising -BM +CC+ RDF. W to E plant for power, where wastes exceeds 500 TPD based on: gasification , pyrolysis, incineration and mass burning. RDF to cement industry Plastic to fuel oil
3	1 Lakh to 10 Lakh	30 to 550 TPD	Biodegradables 40 to 55 %	IWP-BM, CC + RDF as feed stock to power plant / cement industry. Plastic to fuel oil
4	50,000 to 1 Lakh	10 to 30 TPD	Biodegradables 45 to 60 %	BM, VC or CC RDF
5	Less than 50,000	Less than 10	Biodegradables 45 to 65 %	BM,VC / CC and RDF
6	Hill towns	State capitals	Biodegradables 30 to 50 %	BM, CC / RDF as feed stock. Plastic to fuel oil

*IWP- Integrated Waste Plant, BM- Biomethanation, VC- Vermi compositing,CC- Chemical Conversion, RDF- Refused Drive Fuel

From the above table, cities having population 1 lakh to above 2 million can adopt the most common technology to treat waste 500TPD to above 1100 TPD in an Integrated

way comprising waste treatment plants of Biomethanation, Chemical Conversion and Refused Drive Fuel. For treating the waste the composition of biodegradable waste should be varies from 30 to 60 % depending upon the generation of waste and the technologies those are in practice. For population less than 50,000 technologies like vermin-compositing and biomethanation can be used as they are more effective. The Hilly areas having land crisis, the technologies like biomethanation, vessel composting, static pile composting, RDF, etc. can be used. The desired characteristics of waste for various technologies are given at **Table-3 (Annexure-II).**

4.0 Key Criteria For Solid waste Incineration

MSW incineration projects are appropriate only if the following overall criteria are fulfilled:

- A mature and well-functioning waste management system has been in place for a number of years.
- Incineration is especially relevant for the dry bin content in a 2-bin system . For unsegregated waste, pre-treatment is necessary.
- The lower calorific value (LCV) of waste must be at least 1450 kcal/kg (6MJ/kg) throughout all seasons. The annual average LCV must not be less than 1700 kcal/kg (7 MJ/ kg) .
- The furnace must be designed in line with best available technologies to ensure stable and continuous operation and complete burn out of the waste and flue gases.
- The supply of combustible waste should be stable and amount to at least 500 tonnes/ day.
- Produced electricity and/ or stream can be sold at a sustainable basis (e.g. feeding into the general grid at adequate tariffs). It is possible to absorb the increased treatment cost through management charges, tipping fees
- Skilled staff can be recruited and maintained.

- Since the capital investment is very high, the planning framework of the community should be stable enough to allow a planning horizon of 25 years or more.
- Pre-feasibility study for the technology led to positive conclusions for the respective community.
- Strict monitoring systems are proposed and monitored.

5.0 Key Considerations for operation of Incinerators

Incineration of municipal solid waste should meet with the following criteria:

- Minimum gas phase combustion temperature of 850 °C and a minimum residence time of the flue-gases, of two seconds after the last incineration air supply.
- Optimum oxygen content (~lower than 6%) should be maintained in order to minimize corrosion and ensure complete combustion. The carbon monoxide content of the flue gas is a key indicator of the quality of combustion
- Fly ash acts as a catalyst for de-novo synthesis (at 200-450°C) of dioxins and furans. In order to reduce formation of dioxins and furans, it is imperative that maximum fly ash is removed before gases cool down to 200-450°C.
- The flue gases produced in the boilers should be treated by an elaborate flue gas treatment system.

6.0 Waste to Energy Initiatives:

The Ministry of New & Renewable Energy (MNRE) granted 5 waste to-Energy projects under their programme on energy recovery from municipal waste. Waste-to-Energy plants are intended to comply with international emission standards. Details of the 5 plants supported by MNRE are given below:

Delhi: Timarpur-Okhla Waste Management Co Pvt Ltd: an initiative of M/s Jindal ITF Ecopolis. The incineration plant was commissioned in January 2012 and is processing 2000 tons per day (TPD) for generating power of 16 MW.

Delhi, Ghazipur: out of the 2,000 TPD of waste received at the landfill site daily, the facility is processing 1,300 TPD to generate 750 TPD of RDF and 12 MW power. The project is under trial run with effect from March 2016. The operator is M/s ILFS on PPP mode.

Bangalore: BBMP has initiated installation of 8 MW power plant in Bangalore for processing 1000 TPD of waste. M/s Srinivasa Gayithri Resources Recovery Ltd is operator on PPP mode. The project is under installtion.

Pune: A 10 MW gasification plant is being set up in Pune with funds from MNRE. The plant will need 700 TPD of waste for production of 10 MW of electricity.

Hyderabad: 11 MW power plant, which will utilize 1,000 TPD of MSW, is being installed in the Nalagonda district. The plant will produce RDF for in-house incineration and power generation. The plant is currently under construction.

In general, three different designs can be distinguished. The nomenclature comes from the flow direction of the flue-gases in relation to the waste flow: unidirectional current; counter-current and medium current/centre flow furnace. The centre flow furnace is most ideal for mixed MSW which is highly variable in quality. A good mixture of all partial fluegas currents must be considered through mixture-promoting contours and/or secondary air injections.

References:

(i) Report of the Taskforce on Waste to Energy (Vol-I), Planning Commission , May, 2014
(ii) Manual on Solid Waste Management and Handling, Ministry of Urban Development (2000)
(iii) Solid Waste Management Rules, 2016

Annexure-I

Table-2: Indicative Land Requirements for Different Composting Technologies

Parameters	Windrow	Static	In-vessel	Vermicomposting
General	Simple Technology	Effective for farm and municipal use	Large- scale systems for Commercial applications	Suitable for quantities less than 50 TPD generation of mixed MSW
Amount of waste treated	1 ton-500 tons per Module	1 ton-500 tons per module	1 ton-300 tons per module	1 ton- 50 tons
Land Requirement	8 ha – 500 TPD	5 ha - 500 TPD (Less land required given faster rates and effective pile volumes)	4 ha - 500 TPD (Very limited land due to rapid rates and continuous operations)	2 ha: 50 TPD
Time	8 weeks	5 weeks	3 weeks (3-5 days in vessel; 3 weeks to mature)	8 weeks
Ambient Temperature	Not temperature sensitive	Not temperature sensitive	Not temperature sensitive	Temperature sensitive (30-40°C ideal range; 35-37°C specific to particular earthworm sp.)
Energy Input	Moderate	Moderate (2-3 hours aeration)	High	Low
Financial Implications	Moderate	Costly	Very Costly	Moderate. Purchase of exotic Earthworms suitable for MSW composting are expensive
Odour/ Aesthetic Issues	Odour is an issue if turning is inadequate	Moderate. Odour can occur but controls can be used such as pile insulation and filters on air system	Minimum. Odour can occur due to equipment failure or system design failure	None

(Source: Manual of MSW, May 2014)

Annexure-II

Table-3: SPECIFICATIONS FOR VARIOUS TYPE OF WASTE PROCESSING TECHNOLOGIES

S.No.	Method	MSW characteristics	C/N ratio	pH Control	Temperature required	Moisture Content
1	**Compositing**	Sorted organic fraction of MSW, preferable with same rate of decomposition	Between 25 – 50 initially. Release of ammonia and impeding of biological activity at lower ratios	7 – 7.5 (optimum). Not above 8.5 to minimize nitrogen loss in the form of ammonia gas	50-55°C for first few days and 55-60°C for the reminder composting period. Biological activity reduces significantly at higher temperature	55% (optimum)
2	**Incineration**	MSW with calorific value as high as possible; Volatile matter >40%; Fixed carbon <15%; Total inert <35%	Calorific Value-As high as possible; >1200 kcal/kg	_	850°C to 1400°C	As minimum as possible; <45%
4	**Pyrolysis**	_	_	6.5-8.5 (optimum)	elevated temperatures 700°C-900°C	_
5	**Gasification**	_	_	_	Temperature greater than 1000°C	_
6	**Biomethanation**	Sorted organic fraction only; Higher the putrescibility, better is the gas yield; Fibrous organic matter is undesirable as the anaerobic microorganisms do not break down woody molecules such as lignin	25-30 (preferable)	Acidogenic bacteria through the production of acids reduce the pH of the tank. Methanogenic bacteria operates in a stable pH range and temperature	Mesophilic bacteria act optimally around 37°-41°C or at ambient temperatures between 20°-45°C. Thermophilic bacteria act optimally around 50°-52° and at elevated temperatures up to 70°C. Mesophiles are more tolerant to changes in environmental conditions and hence more stable, but thermophiles act faster.	>50%; Implications on feed, gas production, system type, system efficiency

	Vermi composting	Any organic waste which are not appreciably oily, spicy, salty or hard and that do not have excessive acidity and alkalinity	30:1 (preferred). Brown matter (wood products, saw dust, paper etc) is rich in carbon and green matter (food scraps, leaves etc) in nitrogen.	Slightly alkaline state preferable. Correction by adding small dose of calcium carbonate	20 – 30oC	40-55% preferable; cover the tank with wet sack and sprinkle water as required