Council of Enviro Excellence

NATIONAL WASTE MANAGEMENT

SUMMIT AND AWARDS 2025

With a special emphasis on Fly Ash & Gypsum Utilization

DRIVING CIRCULAR SOLUTIONS FOR SUSTAINABLE POWER AND INFRASTRUCTURE

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Waste-to-Energy: Driving Circular Solutions for Sustainable Power and Infrastructure

Sustainability

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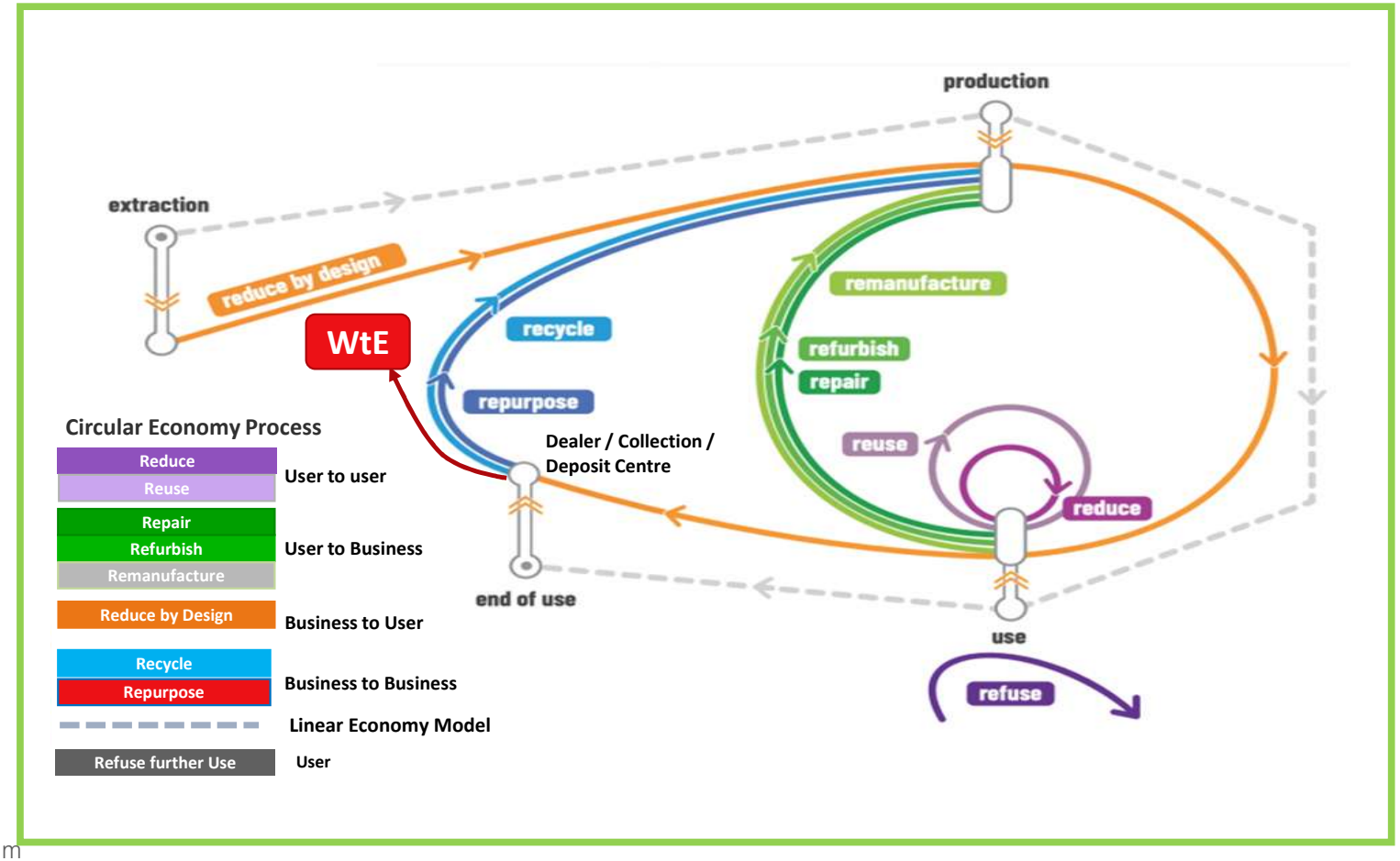
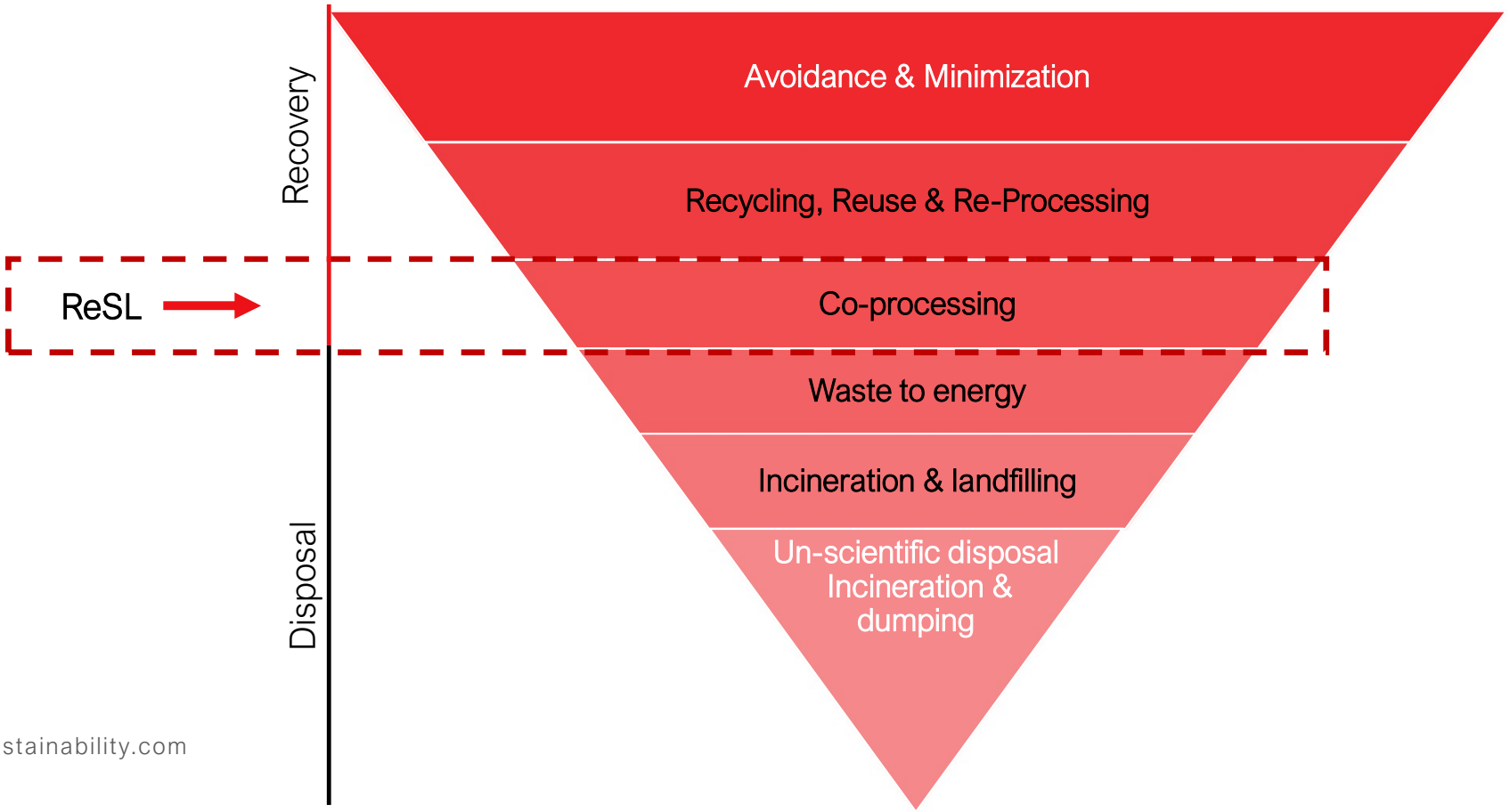
Circular Solutions & WtE



Hierarchy of Waste Management & WtE

Role of Re Sustainability Through Re-Ignite Business



Waste to Energy - Options

#	Type of Waste	Possible utilization Option
1	Segregated Combustible Material (SCM) of MSW – RDF WtE Grade	WtE Boiler
2	SCM of MSW after Processing into RDF	WtE Boiler ; Co-Processing in Cement Kiln (CK)
3	Bio-mass (agro-based)	Co-Processing in CK, WtE Boilers
4	Industrial Wastes - after pre-processing into AFR (Sludges/residues/spent solvents/paints/Tars/etc.)	Co-processing in CK
5	Waste Oils / Plastics/ Tyres after pre-processing	Co-processing in CK
6	Sinter from Iron & Steel	Co-processing in Blast Furnace
7	RDF after conversion into syngas gas	Co-Processing in Steel Plant; Power Plant
8	Carbon Residue (Petrochem, etc)	Carbon Black –> Tyres
9	Other	CPCB utilization SOPs

Sustainability

WtE through Alternate Fuels & Raw Material

Alternate Fuels for WtE

Alternative Fuels & Raw Material (AFR) are sustainable substitutes for fossil fuels - derived from non-conventional sources such as biomass and Municipal and Industrial waste

Purpose of AFs:. It is mainly used in industrial sectors like cement production for energy recovery (replacement of coal) – Supplementary Resource Material - safe waste disposal.

Ex: WtE Recovery in Cement Kilns – An Ideal Option

Benefits of using AFs in Cement Kilns:

- ✓ High temperatures (~1,400°C+) and high residence time ensure complete combustion.
- ✓ Alkaline environment safely neutralizes waste byproducts.
- ✓ The residue becomes part of cement as alternate material
- ✓ It reduces CO2 foot print

Alternate Fuels Benefits

Benefits of Alternate Fuels

1.

Environmental:

Reduced GHGs, SO2 and other emissions;

2.

Economic:

Supports waste management, local jobs; saves on emissions-related incentives; increases market appeal with sustainability.

3.

Sustainable:

Reduces fossil fuel dependence; supports rural economies and farmers; enhances energy security; facilitates transition to low-carbon energy.

Types of Alternate Fuels

Broad Categories of AFR

1

Non- Hazardous Solid AFR

1. Refuse-Derived Fuel (RDF) from MSW
2. Sewage Sludge – STP
3. Dolochar –from Sponge Iron Plant
4. Char –from gasification process
5. Biomass (Agricultural/Municipal Residues)

2

Hazardous Solid & Liquid

1. Tire-Derived Fuel (TDF)
2. Waste-Derived Fuels (WDFs)
3. Paint & Industrial Sludge
4. Processed Waste Oils/Solvents
5. Pharmaceutical Waste
6. FRP waste
7. Oil Sludge

Why Pre-Processing of Alternate Fuels Matters?

Sustainability

Fuel Consistency
Ensures uniform calorific value and composition for reliable combustion performance

Operational Safety
Removes hazardous contaminants and maintains safe handling standards

Environmental Compliance
Meets regulatory requirements and minimizes environmental impact during handling

Pre-processing transforms variable waste streams into qualified alternative fuels that meet technical and environmental specifications for industrial combustion applications.

Co-Processing Advantages

Co-processing delivers dual environmental benefits:
Energy recovery and **waste elimination**, while maintaining **product quality standards**.

Complete Waste Destruction
High-temperature combustion ensures total destruction of hazardous organic compounds, eliminating environmental risks.

Energy Recovery
Energy content directly replaces fossil fuels, reducing operational costs and carbon footprint.

Zero Waste to Landfill
Ash and mineral residues are incorporated into final cement products, eliminating disposal requirements.

RESL's Re Ignite alternate fuel quality parameters

#	Parameters	Alternate Fuel
1	NCV (dry basis)	>2,500 Kcal / kg
2	Chlorine	<2%
3	Sulphur	<1%
4	Flash Point	>60 degree C
5	Ash	<20%
6	Moisture	<40% (Monsoon); < 35% Non-Monsoon
7	Size	<80 mm (Shredded RDF)

Alternate Fuels Details

Segregation and Material For Solid

Effective segregation eliminates damage to equipment and improves fuel quality.
High priority given to Training and EHS aspects

1.

Skilled Hand-Picking
Manual removal of large contaminants and unsuitable materials from waste streams

2.

Screening Systems
Automated separation based on particle size using vibrating screens and air classifiers

3.

Magnetic Separation
Powerful magnets extract ferrous metals and other magnetic contaminants

Fuels Not Suitable For Kiln Firing

- X Electronic Wastes
- X Whole Batteries
- X Bio Active Medical Waste
- X Mineral Acids and Corrosives
- X Explosives
- X Asbestos
- X Radioactive waste
- X Unsorted Garbage

Alternate Fuels Details

Pre-processing Methods and Their Benefits

Physical Preprocessing Steps for Solid Matrix

Drying reduces moisture, improving calorific value and handling traits for combustion or conversion.

Shredding and grinding reduce particle size, enhancing process uniformity and feed consistency.

Separation:

Screening: Using disc screens to separate materials based on size, sending appropriate sizes for further processing.

Air Density Separation: Removing heavier contaminants like stones, glass, and metals using air classification.

Metal Separation: Utilizing magnetic and other separation techniques to remove ferrous and non-ferrous metals. .

Mixing/Blending: Different fuel components are homogenized and blended to create a consistent fuel with the desired characteristics.

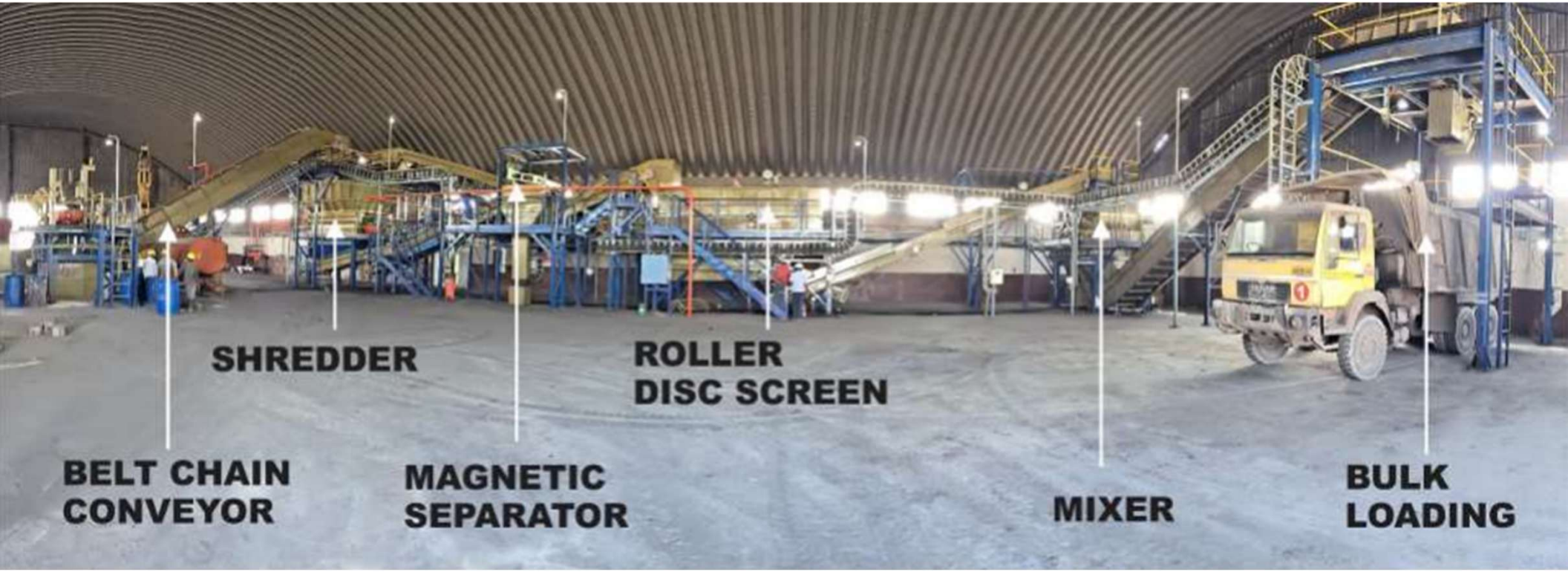
Storage: Stored in live-bottom floors or push-floor systems with controlled discharge before being conveyed to the processing or feeding system.

Feeding: The processed fuel is fed into the main industrial process using specialized equipment like flap dampers, rotary airlocks, and pneumatic shut-off gates.

Densification (pelletizing, briquetting) increases energy density and eases transport, especially for biomass fuels.

Alternate Fuels Details

Pre-Processing Along With Impregnation



Alternate Fuels Details

Liquid Fuel Pre-Processing and Handling Systems

Specialized Storage and Treatment

Liquid alternative fuels require dedicated handling protocols to maintain quality and safety standards.

→ Handling of Reactive Wastes

Comprehensive testing before processing

→ Sealed Tank Storage

Prevents contamination and vapor emissions

→ Chemical Quality Control

Continuous monitoring of composition and properties

→ Blending and Stabilization

Pre-processing adjustments before final use

Alternate Fuels Details

Conversion Technologies For Solid and Semi-Solid

Pyrolysis thermally decomposes feedstock into bio-oil, syngas, and char under low oxygen conditions produce **synthesis gas** (CO, H2) for further processing..

Fermentation utilizes **microbial activity** to produce ethanol and biogas from sugars and starches present in processed feedstock.

Fischer-Tropsch synthesis converts synthesis gas into **liquid hydrocarbons** (synthetic fuels) using metal catalysts.

Alternate Fuels Environmental and Regulatory Aspects

Sustainability

- AFR governed by guidelines of CPCB/SPCB and Waste Management Rules.

Regulations

- Continuous monitoring of stack emissions.

Emission Safeguards

- AFR in cement enables diversion of wastes from landfills and supports resource recovery for circular economy.

Waste to Energy/ Recovery

- Compliance/Certification: Mandatory permits, audits, and ISO 14001/OHSAS 18001 certification;
- only authorized AFR suppliers approved

Compliance/ Certification

Alternate Fuels - *Quality Assurance and Acceptance Criteria*

Sustainability

1.

Physical and chemical properties

- Calorific value
- Moisture content
- Ash
- Trace elements

are tested for suitability.

2.

Partner with Authorized Supplier

Traceability and contractual arrangements with suppliers are crucial for reliability and compliance.

3.

Regulations and R&D Update

Acceptance protocols require regular review and adaptation for new feed stocks and evolving production requirements.

Points To Ponder On AFR

1. AFR is different: AFR has mostly non-standard material properties. Specially designed equipment need to handle it.
2. Flexibility is key: Changing waste markets and AFR properties call for handling installations with high versatility.

Re Ignite Role of ReSL

We can partner with Cement to supply alternative fuel
(ReSL can provide O&M services and capex investment for the pre-processing facility)

ReSL's 3-pronged offering for Cement Kilns

1

Supply of Re-Ignite Alternate Fuel from ReSL sites

2

Operations & Maintenance of pre-processing facility (if required)

3

Capex investment for pre-processing facility (if required)

Sustainability

WtE through Municipal Solid Waste

MSW Generation and Management in India

2023

Quantity of MSW Generation	: 170, 000 MT/Day
Quantity of MSW Collected	: 156,500 MT/Day
Quantity of MSW processed	: 54 %
No of RDF Plants	: 11 (more in pipeline)
No of Compost Plants	: 313
No of WtE boilers	: 8 (3 in pipeline)

Processing and Disposal of MSW

MSW Incineration Based WtE Plants

S.No.	State /UT & No of WTEs	Name of WTE plant & Location	Capacity to Process MSW (TPD)	Power generation (MW)
1	Andhra Pradesh (02)	Jindal Urban Waste Management, Visakhapatnam, A.P	1372	15
2		Jindal Urban Waste Management, Limited Guntur , A.P	1620	20
3	Delhi (04)	East Delhi Waste Processing Company Ghazipur,Delhi	1300	12
4		Tehkhand Waste to Electricity Project Ltd. Delhi	2000	25
5		Timarpur Okhla, waste management Company Ltd. Delhi	1950	23
6		M/S Delhi MSW Solutions Ltd.Delhi	1300	24
7	Gujarat (02)	Goodwatts WtE Jamnagr Pvt Ltd., Gujarat	NA	7.5
8		Jindal WtE Pvt. Ltd ,Ahmedabad., Gujarat	NA	15
9	Haryana (01)	Integrated Solid Waste Management Facility , Murthal ,Sonipat , Haryana	NA	8
10	Karnataka (01)	Bidadi Waste to Energy Plant, Bidadi, Karnataka	600	11.5
11	Madhya Pradesh (02)	Rewa MSW Energy Solution Pvt Ltd ,M.P	500	6
12		Jabalpur MSW Pvt. Ltd Kathonda, Jabalpur , M.P	600	11.5
13	Maharashtra (02)	Anotny Lara Renewable Energy Private Limited, Waste to Energy, PimpriChinchwad, Mahararashtra	700	14
14		Bhumi Green Energy Pvt. Ltd., Sangli, Maharashtra	NA	10
15	Telangana (02)	Hyderabad MSW Energy Solution Ltd, Telangana	1200 (2x600)	19.8
16		Dundigal WtE Pvt. Ltd , Telangana	800	14.5
17	Uttarakhand (03)	Sidharth Papers Ltd., US Nagar, Uttarakhand	185	6
18		Siddheshwari Paper Udyog Pvt Ltd., Kashipur Uttarakhand	185	6
19		Bahl Paper Mills Ltd., Kashipur, Uttarakahnd	NA	NA
20	Uttar Pradesh (02)	Roitz India Waste Management Pvt. Ltd., Deenanathpur, Ghaziabad	75	NA
21		Roitz India Waste Management Pvt. Ltd., Bahadarpur, Ghaziabad	340	NA
Total			12727	248.8

Why Waste to Energy Plants…?

- **Waste Energy Plants are ideal for disposal of mixed and/or non-recyclable MSW in cities generating large quantities.**

- **Country has demonstrated that modern technologies will ensure reduction of harmful emissions to safe limits.**

- **Requirement of land for disposal of MSW can be reduced up to 85%.**

- **Incineration based WtE Boilers will ensure compete sterilization and stabilization of MSW**

WtE Plants - *Environmental and Regulatory Aspects*

Sustainability

Regulations

- Only Non-Recyclable combustible Fraction of the waste to be used WtE plants. >1500 KCal

Environmental Clearance

- EC with public Hearing required

Waste to Energy/ Recovery

- Comply with stringent Emission norms – w.r.t Heavy metals, TOC, HCl and Dioxins

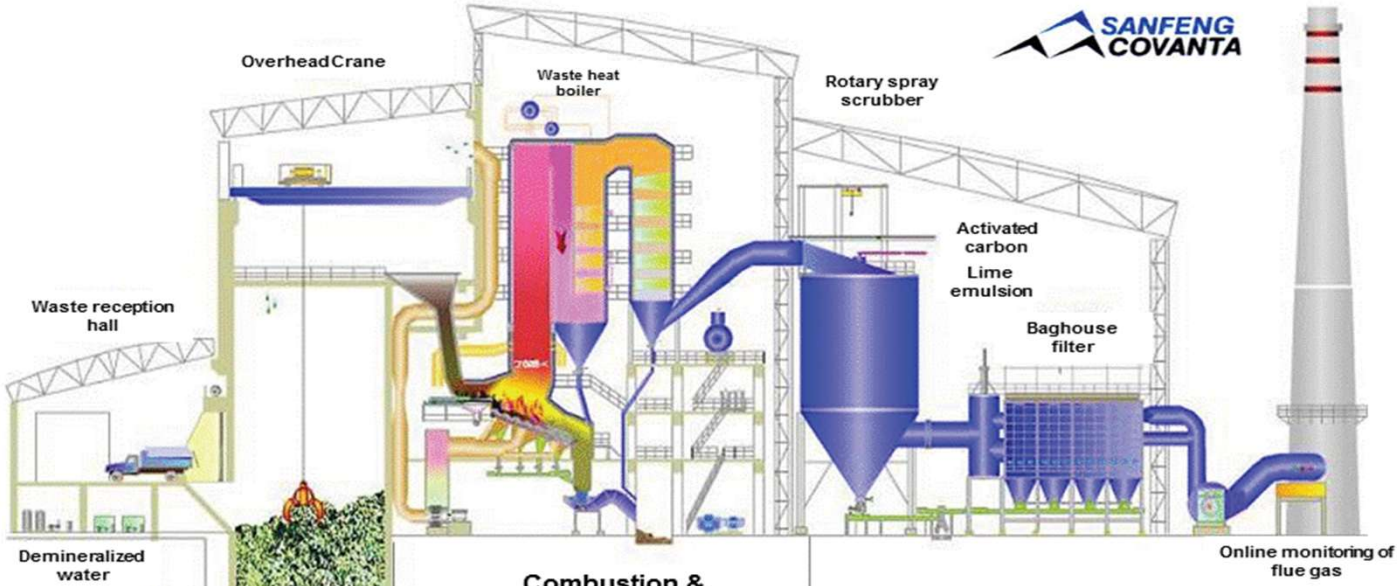
Residue Management

- Leachate management
- Bottom and flyash Management

Process operations of WtE Plants

- Waste reception
- Waste storage
- Pre-treatment of MSW (segregation / shredding / storing / drying)
- loading of waste into the furnace
- Thermal treatment (type of furnace etc.)
- Energy recovery
- Flue-gas cleaning
- flue-gas cleaning residue management
- Bottom ash management
- Emissions monitoring and control
- waste water collection and treatment

TYPICAL SECTIONAL VIEW



Waste Reception & Storage

- Waste reception area
- Waste storage trench
- Overhead waste grab crane
- Crane operator platform

Combustion & Power Generation

- Waste feed hopper
- Primary air
- SITY2000 Reverse Acting Reciprocating Grate
- Secondary air
- Secondary combustion chamber
- Waste heat boiler
- Steam drum
- Steam turbine
- Wet deslagger
- Slag discharger

Flue Gas Treatment & Handling

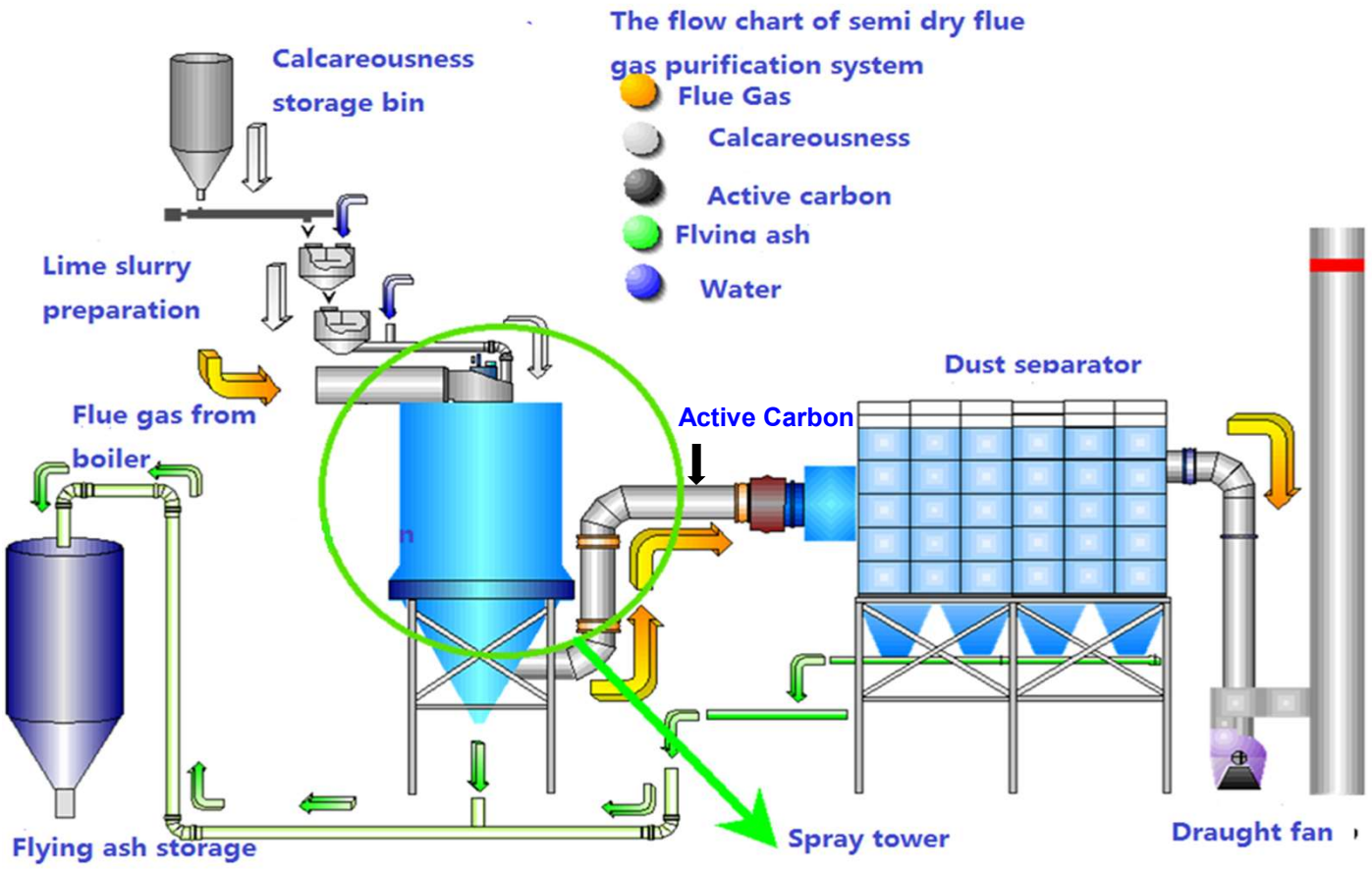
- Induced draft fan
- Gas-to-gas heat exchanger
- Electrostatic precipitator
- Baghouse filter
- Acid gas scrubber
- SOx gas scrubber
- Entrained-phase adsorption of PCDD/F gases
- Recirculation of flue gas to primary air to reduce NOx formation during combustion
- Selective Catalytic Reduction system to treat NOx gases
- Water cooling system
- Flue gas stack

Combustion Systems for MSW Incineration

Technique	Untreated Municipal waste	Pretreated MSW and RDF	Hazardous waste	Sewage sludge	Clinical waste
Grate - reciprocating	**Widely applied**	**Widely Applied**	Not normally applied	Not normally applied	Applied
Grate - travelling	Applied	Applied	Rarely applied	Not normally applied	Applied
Grate - rocking	Applied	Applied	Rarely applied	Not normally applied	Applied
Grate - roller	Applied	**Widely Applied**	Rarely applied	Not normally applied	Applied
Grate - water cooled	Applied	Applied	Rarely applied	Not normally applied	Applied
Grate plus rotary kiln	Applied	Not normally applied	Rarely applied	Not normally applied	Applied
Rotary kiln	Not normally applied	Applied	**Widely applied**	Applied	**Widely applied**
Rotary kiln - water cooled	Not normally applied	Applied	applied	Applied	applied
Static hearth	Not normally applied	Not normally applied	Applied	Not normally applied	**Widely applied**
Static furnace	Not normally applied	Not normally applied	**Widely applied**	Not normally applied	Applied
Fluid bed - bubbling	Rarely applied	Applied	Not normally applied	applied	Not normally applied
Fluid bed - circulating	Rarely applied	Applied	Not normally applied	**Widely applied**	Not normally applied
Fluid bed - rotating	Applied	Applied	Not normally applied	Applied	Applied
Pyrolysis	Rarely applied	Rarely applied	Rarely applied	Rarely applied	Rarely applied
Gasification	Rarely Applied	Rarely applied	Rarely applied	Rarely applied	Rarely applied

Burning of MSW on the Inclined Reciprocating Grate

Flue Gas Treatment System



Pollution Control Susyems

Particulate Mack atter (PM): Fine particles from combustion (need O2 correction)

Oxides of Nitrogen (NOx): Result from high-temperature combustion;

Sulphur Dioxide (SO_2): Emitted from sulphur-containing waste (plastics, rubber);

Carbon Monoxide (CO): Emitted under incomplete combustion.

Volatile Organic Compounds (VOCs): Evaporate during combustion of organic wastes.

Hydrogen Chloride (HCl) : halogenated plastics

Hydrogen Fluoride (HF): Fluorinated plastics/textiles/coating material

Dioxins & Furans: Toxic Persistent Organic Pollutants (POPs) from organic matter

Heavy Metals: Lead, mercury, cadmium, Tellurium, arsenic present in batteries, paints, and e-waste become airborne or entrapped in fly ash.

WtE - The Challenges

- Non-uniformity in MSW feed to boiler - Pre-treatment is required to homogenise the waste to achieve more consistent combustion characteristics (mixing, crushing or shredding)
- Inadequate Pre-segregation of MSW (problem of inerts/ moisture/ wet-waste / ind waste)
- Emissions – break downs, shut-down/start-up operations (seasonal influence)
- Public protest – proximity to residential areas.
- Compliance challenges - Dioxin & Furan & Heavy Metals.
- Flue-gas treatment systems (use and quality of reagent chemicals)

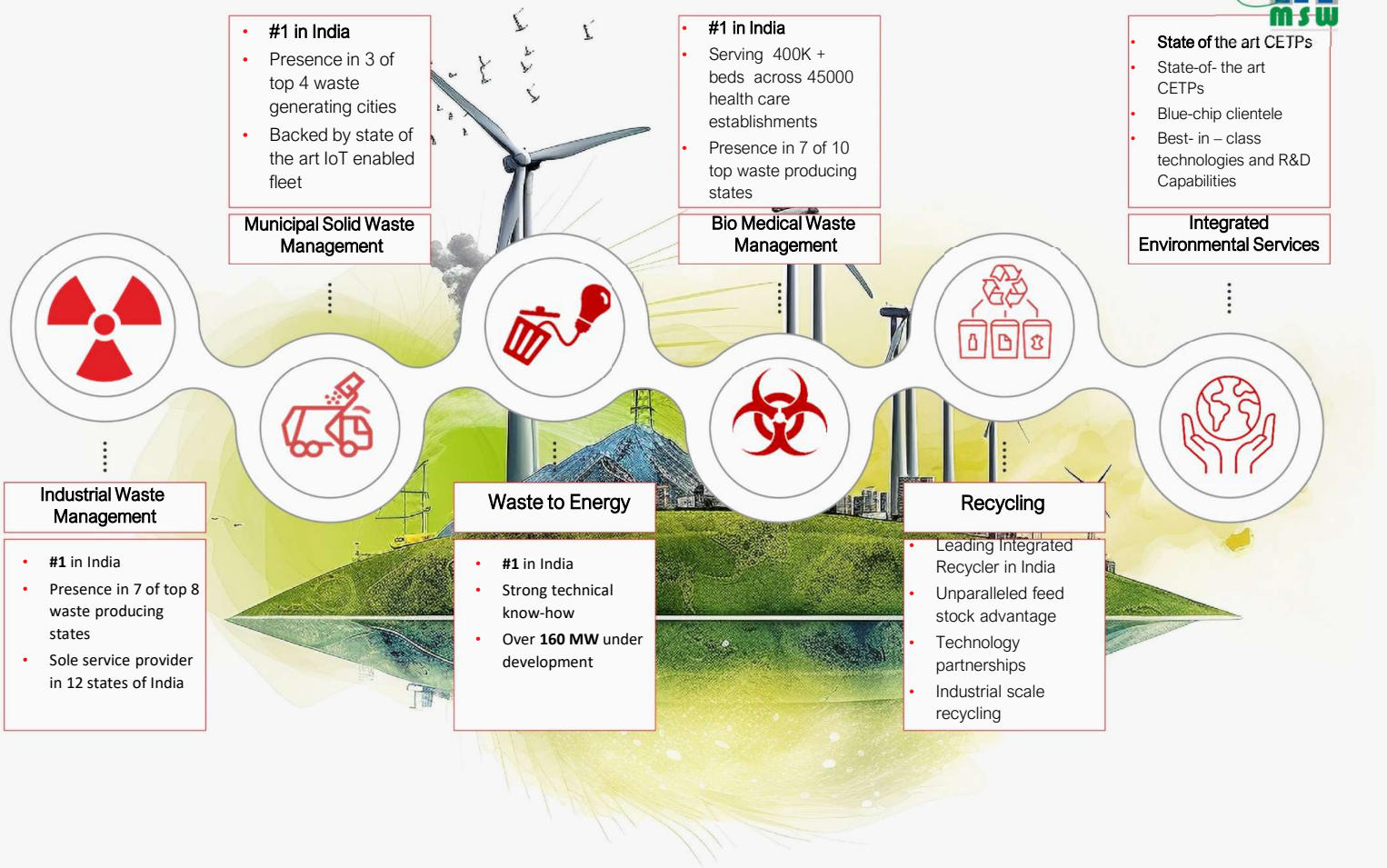
ONE OF ASIA'S LARGERST INTEGRATED SUSTAINABILITY SOLUTIONS PROVIDER

Deep domain experience backed by advanced technologies

Comprehensive, integrated capabilities across segments

Sustainability deeply rooted in the company's vision and operations

INTEGRATED SUSTAINABILITY SOLUTIONS



Municipal Solid Waste Management

- **#1 in India**
- Presence in 3 of top 4 waste generating cities
- Backed by state of the art IoT enabled fleet

Bio Medical Waste Management

- **#1 in India**
- Serving 400K + beds across 45000 health care establishments
- Presence in 7 of 10 top waste producing states

Integrated Environmental Services

- **State of the art CETPs**
- State-of- the art CETPs
- Blue-chip clientele
- Best- in – class technologies and R&D Capabilities

Industrial Waste Management

- **#1** in India
- Presence in 7 of top 8 waste producing states
- Sole service provider in 12 states of India

Waste to Energy

- **#1** in India
- Strong technical know-how
- Over **160 MW** under development

Recycling

- Leading Integrated Recycler in India
- Unparalleled feed stock advantage
- Technology partnerships
- Industrial scale recycling

Infrastructur Facilities @ RESL's WtE Plant Hyderabad

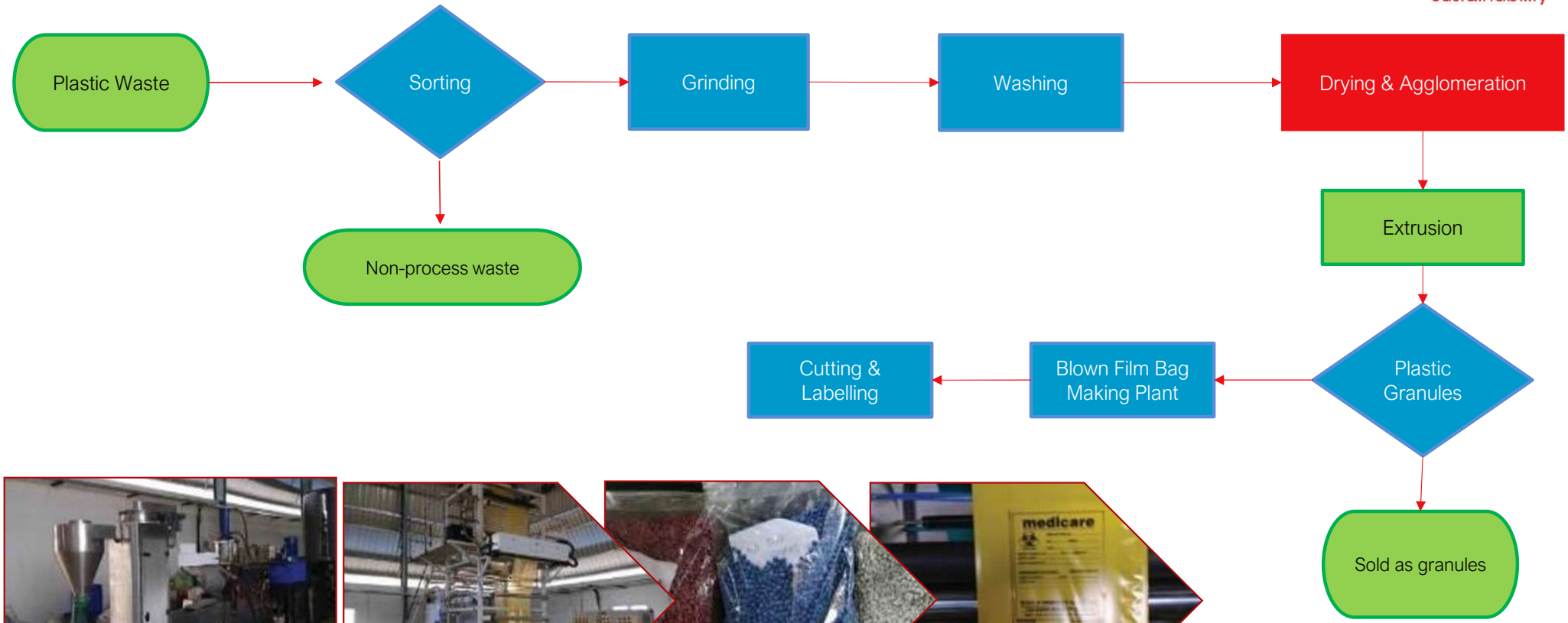
- Reception and Weighment
- Pre- Segregation / Sorting
- Composting (through MBT Process)
- RDF
- Plastic Recycling
- Biomethanation
- Waste to Energy
- Leachate Management
- Landfill (Disposal of Rejects / Process Inerts)
- Laboratory (Waste Characterization, Compost Quality etc.,)
- Environmental Monitoring

METHANE TO MOBILITY – CONVERTING LANDFILL GAS TO A CLEANER COMMUTE

The Compressed Bio-Gas (CBG) plant established at the Jawahar Nagar Processing & Disposal facility in Hyderabad is a unique and the largest project of its kind in India. With a capacity of 5 TPD , the plant extracts LFG from the landfill and capped dump site. The LFG converted to CBG is efficiently utilized as CNG, serving as an automotive fuel for vehicles.

PLASTICS RECYCLING

Sustainability



RDF Plant

WtE Plants in Hyderabad

Capacity of the Plant	2 * 600 TPD (24 MW)
No. of Boilers :	2
No. of Turbo Generators:	1
Steam temperature :	410 ± 5 deg. C
Steam pressure :	46 Kg/ sq.cm
Condenser :	Air Cooled Condenser
Flue Gas Treatment System	Semidry Flue Gas Treatment System with Lime and Activated Carbon injection followed by Bag filters

Capacity of the Plant	1* 800 TPD (14.5 MW)
No. of Boilers :	1
No. of Turbo Generators:	1
Steam temperature :	410 ± 5 deg. C
Steam pressure :	46 Kg/ sq.cm
Condenser :	Air Cooled Condenser
Flue Gas Treatment System	Semidry Flue Gas Treatment System with Lime and Activated Carbon injection followed by Bag filters

Capacity of the Plant	2 * 600 TPD (24 MW)
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Sustainability

Thank You

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