Introduction of Japan Highest Recycle Technology

REE-Box

No emission of odor

No emission of waste water

High speed processing

Only takes 2-4 hours / cycle

Eco-friendly microbial decomposition using indigenous microbes on-site

Compact design compared to other waste treatment plants (Compost plant, etc.)

BHARATJAPAN

BJBSI Bharat Japan Business Support Institute Co., Ltd.

on behalf of

GOOD FOOD JAPAN

Good Food Japan Co., Ltd

Proposed solution for waste problem in PNG

Problems to be solved

PLASTICS

- Various plastic bottles and bags exist in shore and in street around the market.
- There is no other waste control option than delivering them to the local dump site.

MIXED WASTE

- Mixed wastes (Plastics & Organic waste) are discarded in the market everyday.
- There is no other waste control option than delivering them to the local dump site.

SLUDGE

- Sludge is gradually piled up in a septic tank installed in the market everyday.
- There is no other sludge control option than delivering it to the local dump site.

Solutions brought by REE-Box

Plastics, Food waste, Sludge ⇒ Throw into REE-Box **all together!**

① RECYCLING of PLASTICS

- Plastics cleaned and dried by REE-Box processing can be used as **fuel** for a biomass boiler giving steam to REE-Box.

Putting output plastics into a biomass boiler connected to REE-Box (Indonesia)

② RECYCLING of ORGANIC WASTE and SLUDGE

- Organic output from REE-Box processing can be used as **fuel** for a biomass boiler giving steam to REE-Box.

  Fermented and dried through REE-Box processing, wet organic waste becomes non-perishable with 20~30% moisture which will **not generate dioxin** even if it is burned together with plastics in a boiler.

- The output organic matter can also be used as nutritious **fertilizer** and **feed** which local farmers can use for their farming and livestock feed.

Stuffing output organic matter into bags to sell as fertilizer (Philippines)

③ VOLUME REDUCTION of ORGANIC WASTE

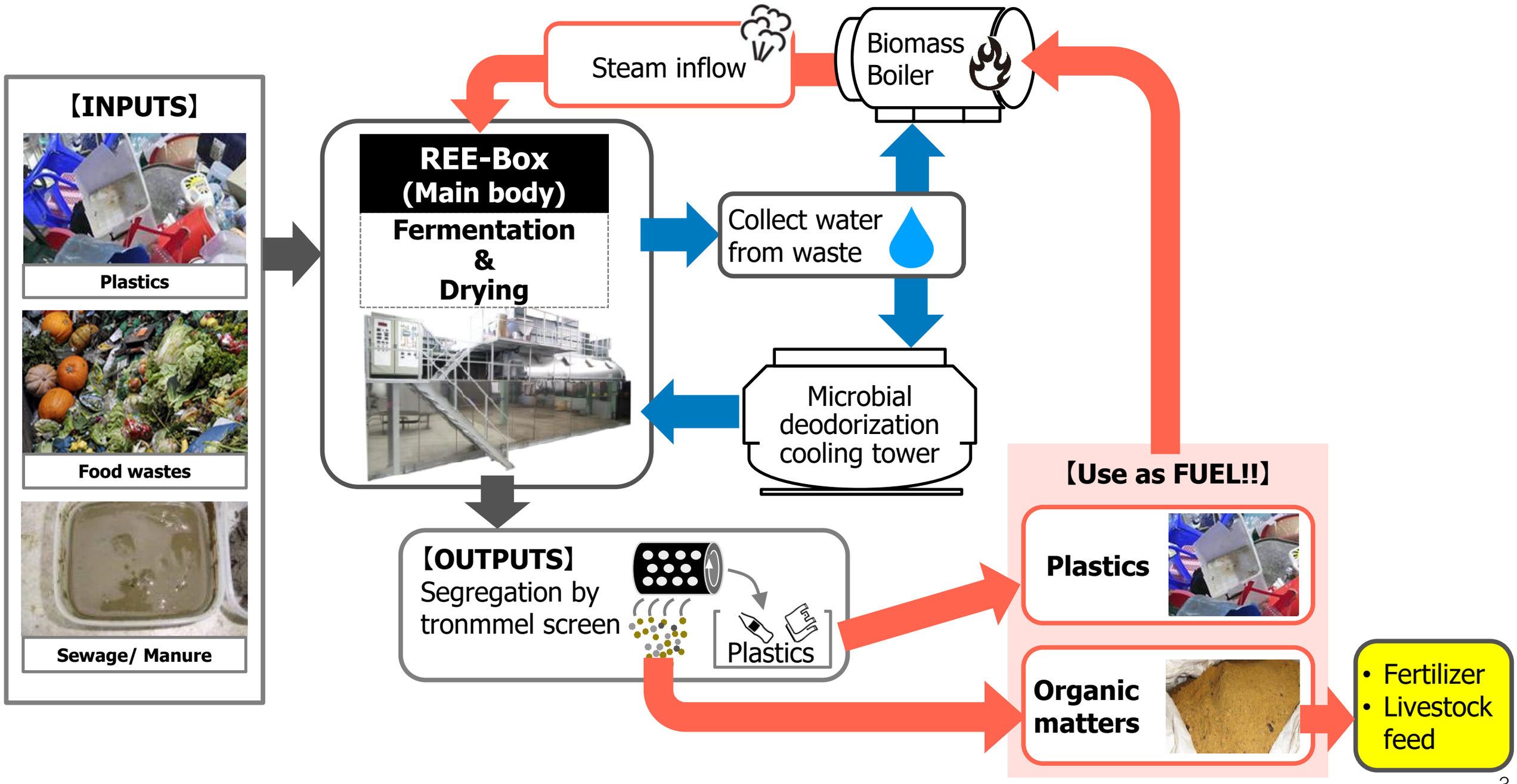
- Organic waste becomes 1/500 in weight by REE-Box system.

【Example】

Organic waste 1,000kg → REE-Box processing → Outputs 160kg → Burn in boiler as fuel → Burned ash 16kg → REE-Box processing → **Residue(Ash) 1.6kg**

REE-Box is an ideal RECYCLE Device.

- Able to recycle Plastics & Organic matters into FUEL for running REE-Box
- Able to recycle WATER from waste for running REE-Box (<u>No drain discharged outside</u>)
- NO need for Pre-segregation of wastes and input **all together** into REE-Box
- Eco-friendly microbial decomposition technology using indigenous microbes on-site (<u>No risk of bio-hazard</u>)
- High speed processing- <u>Only takes 2-4 hours per cycle</u>



Required steam & power for REE-Box operation

Steam and **Electric power** are required to operate REE-Box system.

■ Steam

Steam is generated by biomass boiler which uses water and fuel recycled from input waste through REE-Box processing. In case of processing common MSW, sufficient amount of steam can be generated by REE-Box processing of the input waste. If a once-through boiler is used instead of biomass boiler, heavy oil is required as fuel to the boiler.

■ Power

Model: REE-Box-0 to 3 (0.5t ～ 8t)

Power shall be supplied from industrial power source.

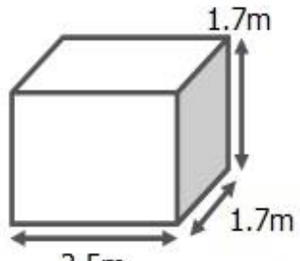
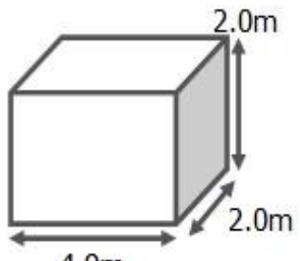
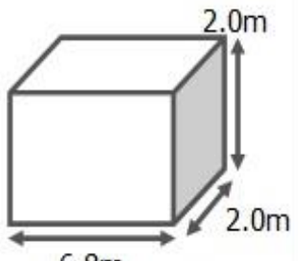
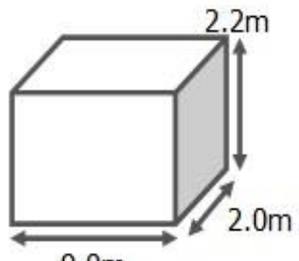
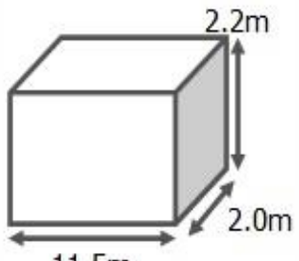
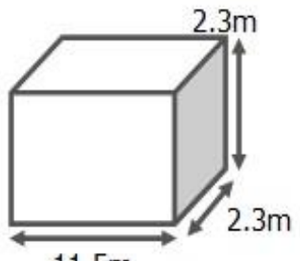
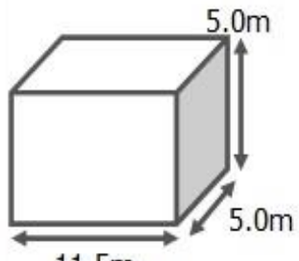
■REE-BOX-0 (0.5t): 0.079MW/day
■REE-BOX-1 (2t): 0.18MW/day
■REE-BOX-2 (4t): 0.262MW/day
■REE-BOX-3 (8t): 0.426MW/day

Note: The above figures are made by rough calculation for the case of processing common MSW. Actual figures shall be calculated based on on-site research.

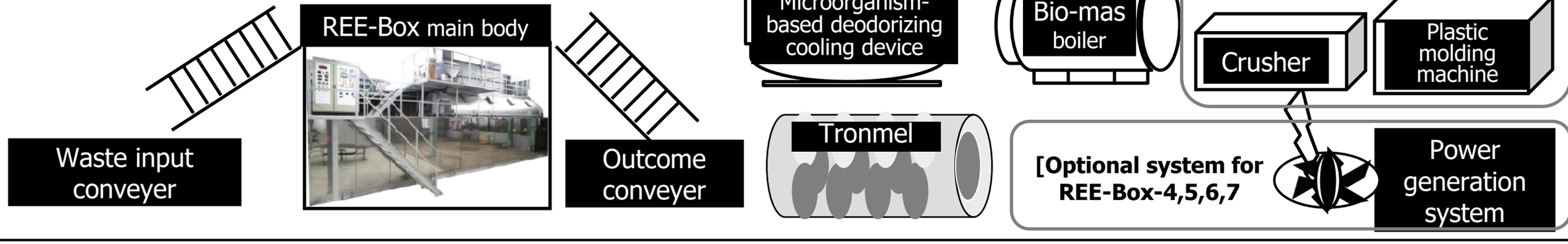
Model: REE-Box-4 to 7 (15t ～ 50t)

- In case of adding power generation equipment to REE-Box system, power supply from industrial power source is not required.
- Plastic and organic outputs from REE-Box processing can be used as fuel for biomass boiler generating and delivering steam into power generator to supply electric power to REE-Box system.
- In case of not adding such power generation equipment, power supply from industrial power source is required (the same as smaller models).

Machine size and set up space required

Model	REE-BOX-0	REE-BOX-1	REE-BOX-2	REE-BOX-3	REE-BOX-4	REE-BOX-5	REE-BOX-6/7
Process Capacity	0.5 t/ 24hrs	2t / 24hrs	4t / 24hrs	8t / 24hrs	15t / 24hrs	25t / 24hrs	50t / 24hrs
Size of Main Body	 Cubic capacity: **0.2m^3**	 **1.5m^3**	 **2.5m^3**	 **5.3m^3**	 **8.0m^3**	 **12m^3**	 **24m^3**
Space required	200 m^2	209 m^2	303 m^2	368 m^2	424 m^2	430 m^2	966 m^2

REE-Box system



Operation cost (Approximate estimation)

Machine type: **REE-Box-1 (Process capacity: 2 tons / day)**

Estimated cost	USD 82 / day	USD 41/ton x 2 tons/day = USD 82/day
	USD 2,460 / 30 days	USD 82/day x 30 days = 2,460/30 days
	USD 41 / ton	USD 29,900 ÷ 730 tons = USD 41/ton

No.	Description	Unit cost (JPY)	Amount	Cost (JPY)	Cost (USD)
1	Electricity (0.18 MWh/day x 365 days = 65,700 kWh/year)	JPY 20.4/kWh **(Source: PNG Power Limited)**	65,700 kWh/year	JPY 1,340,810	USD 12,100
2	Water (Groundwater use)	JPY 0/t	40 t/year	JPY 0	USD 0
3	Labor (3 operation workers)	JPY 657,000/head/year	3 heads	JPY 1,971,000	USD 17,000
		Total Yearly Cost		**JPY3,311,810**	**USD 29,900**

Prerequisites	
1	Total number of operation day per year : 365 days
2	Total amount of waste processed per year : 730 tons
3	JPY = approximately USD 0.009
4	The operation cost will change drastically depending on the input materials. The cost calculation will be given after the field study.

Calculation example of processing MSW

Machine type: **REE-Box-1 (Process capacity: 2 tons / day)**

Material	Amout		Moisture
Organic waste	1.094	t/day	70.40%
Paper, Cardboard	0.070		41.10%
Diaper	0.022		67.41%
Texture, fiber	0.076		49.65%
Wood, lumber	0.038		31.62%
Architectural materia	0.056		1.21%
Plastic, vinyl	0.278		4.80%

Material	Amount		Moisture
Rubber & leather	0.132	t/day	18.62%
Metal	0.038		2.03%
Inorganic(glass, ceramic)	0.070		1.16%
Sand & soil	0.110		49.36%
Toxic waste	0.016		0.00%
Total	2.000	t/day	47.3%

Condition					
Operation		Electrical generation		Operation day	
24	hrs/day	24	hes/day	365	day/year

Required power	0.008	MWh/hr
	0.180	MWh/day
Required steam flow	0.025	t/hr
	0.600	t/day

Outputs	
1.20	t/day
438.00	t/year
Moisture	15%

<Water evaporation>
0.87 t/day

Water from material

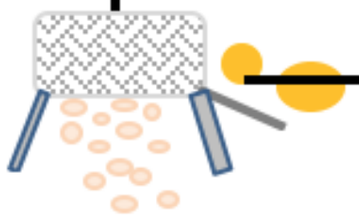
<Water supply>
0.11 t/day

Micobe deodorizing cooling tower

<Drain>
0 t/day

Plastic fuel	
0.44	t/day
159.81	t/year

Plastic fuel apparatus



Landfill	
0.21	t/day
76.49	t/year
Metal, glass, san, soil etc.	

Compost or fuel	
0.55	t/day
200.75	t/year

Steam flow	
0.025	t/hr
0.600	t/day

Biomass boil

※The operation cost will change drastically depending on the input of material. The cost calculation will be given after the field study.

Installation Records (From Year 1997 to present)

Country of customers
Japan, Singapore Indonesia, Philippines Malaysia, China

Model	Qty	Model	Qty	Model	Qty	Model	Qty
0.5t/day	1	4t / day	5	15 t/ day	6	50 t / day	2
2t / day	11	8t/ day	5	25 t / day	6		

MSW (Mixed waste)

Agri waste

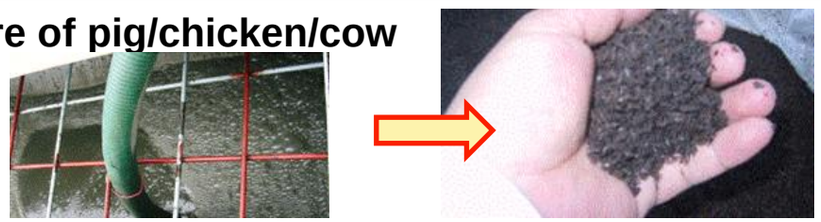
Palm residue (POME and EFB)

Vegetable residue

Sugar cane

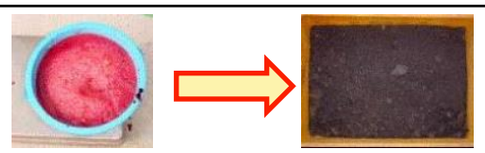
Livestock waste

Manure of pig/chicken/cow



Dead pig/chicken/ cow

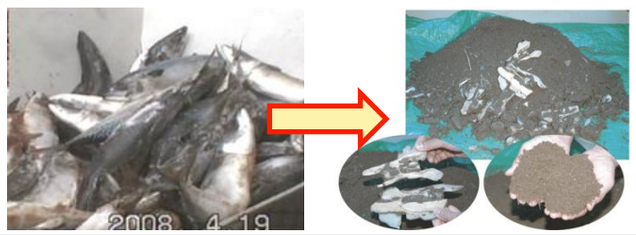
Slaughter waste (Pig blood)



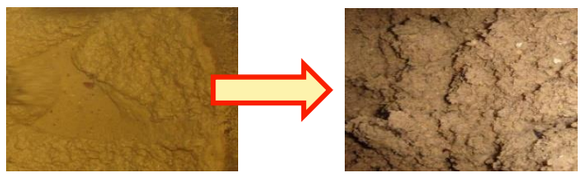
Industrial food waste

Coffee dregs & Tea dregs

Seafood process residue



Liquor lees



Bakery dough residue

Packed food from Retail shop

Sewage / Sedimen-tary sludge

Raw Human Excreta

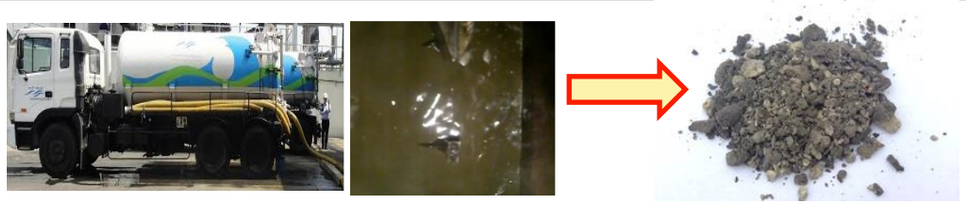
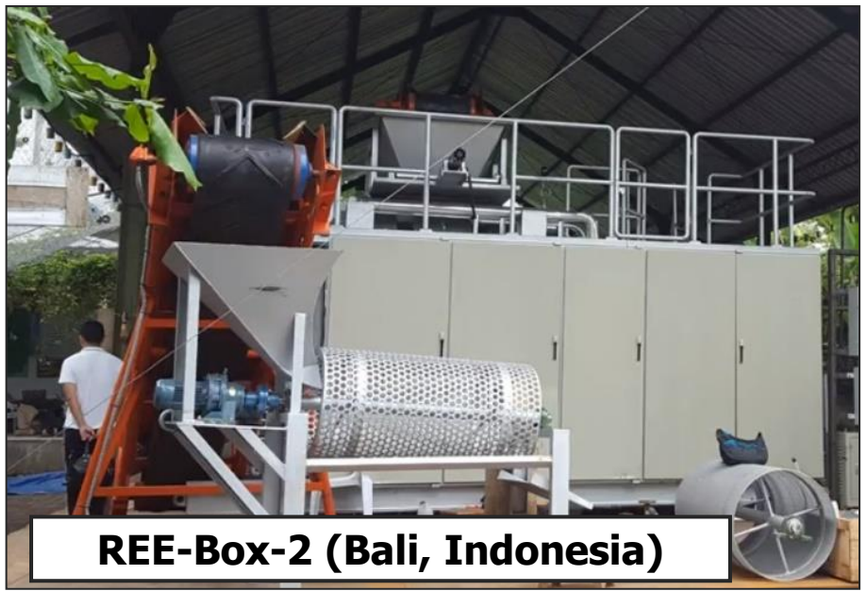


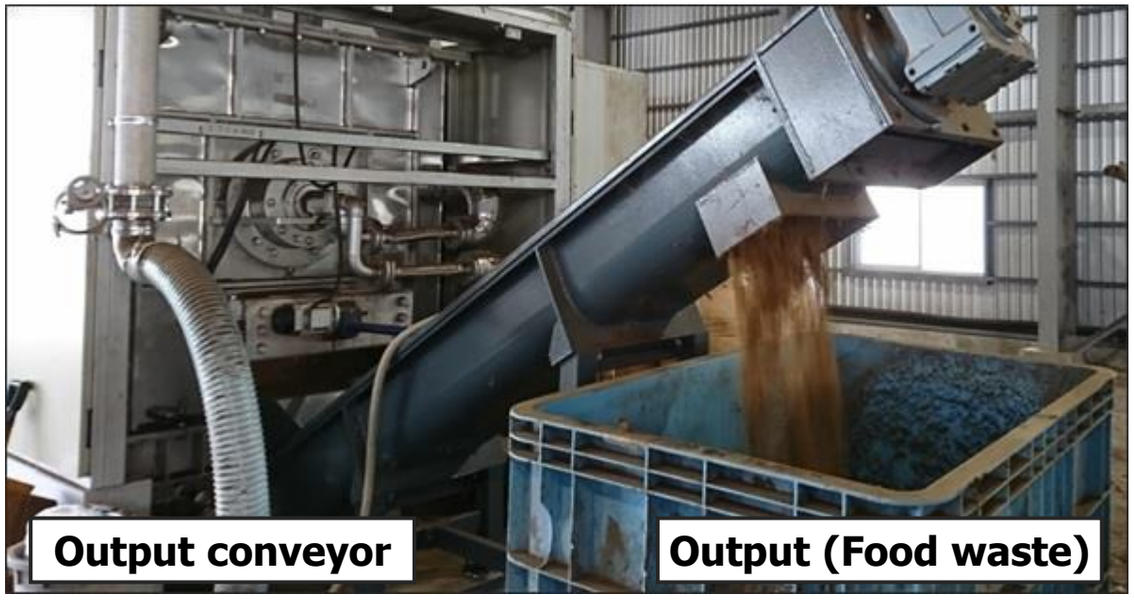
Photo Gallery


REE-Box-2 (Bali, Indonesia)


REE-Box-4 (Tochigi, Japan)


REE-Box-5 (Baguio, Philippines)


Input conveyor


Output conveyor

Output (Food waste)

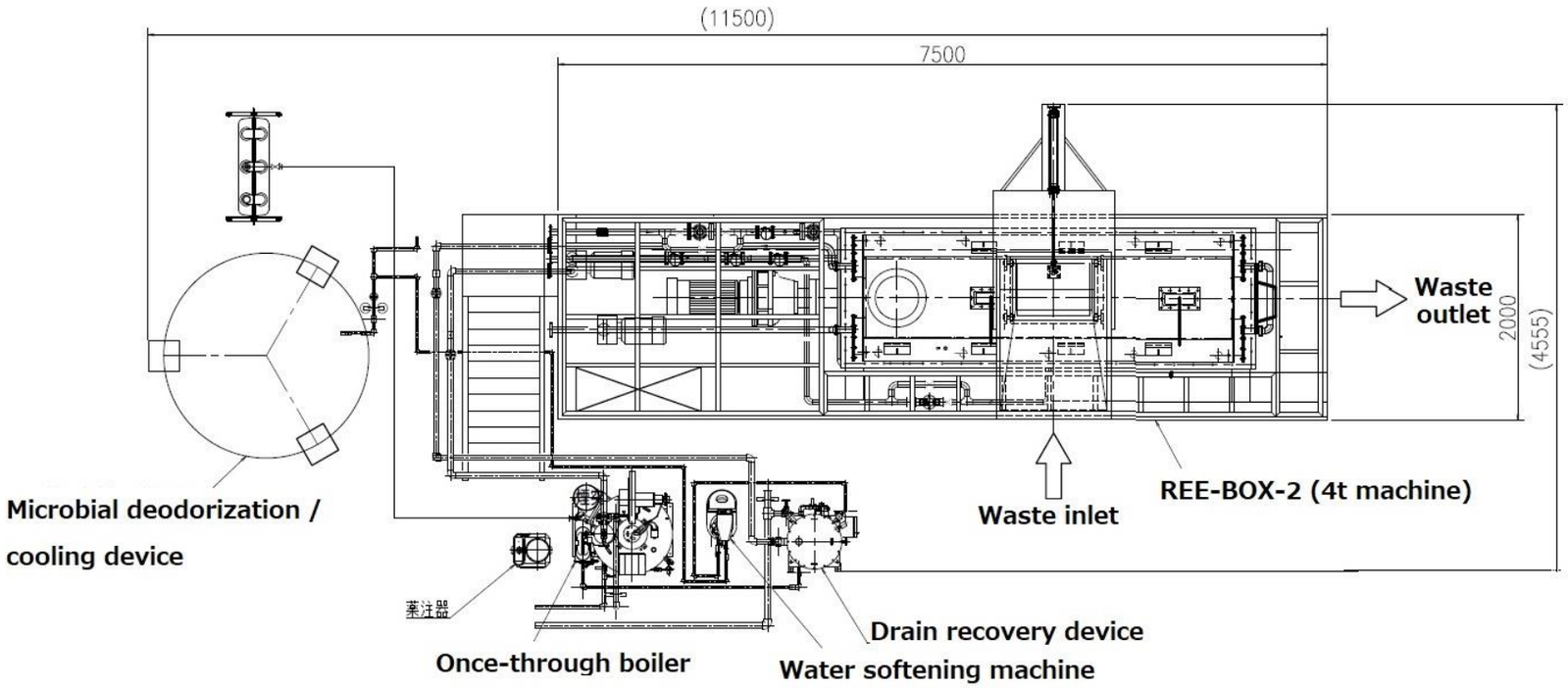

Inside of REE-Box

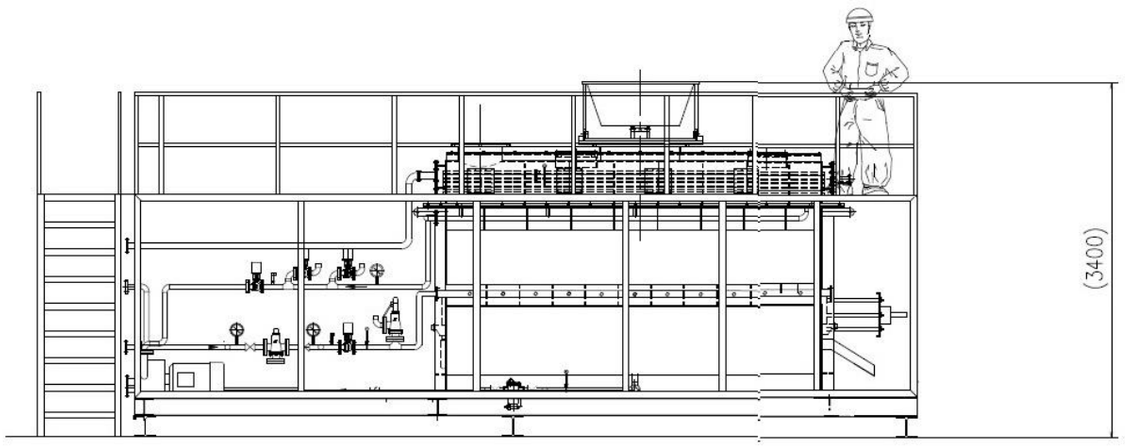

Trommel

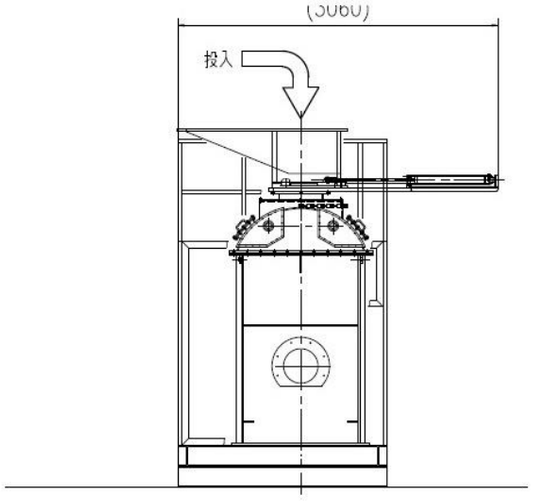

Output (Cow dung)


Output (Plastics)

Installation chart (in Okinawa, Japan)







品番 No.	部品名 NAME OF PARTS	材質 MATERIAL	個数 NO. REQ'D	単重量 WEIGHT(kg)	備考 REMARKS
納入先 CUSTOMER	グッドフードジャパン様				
名称 TITLE	REE-BOX-2型 LAYOUT				

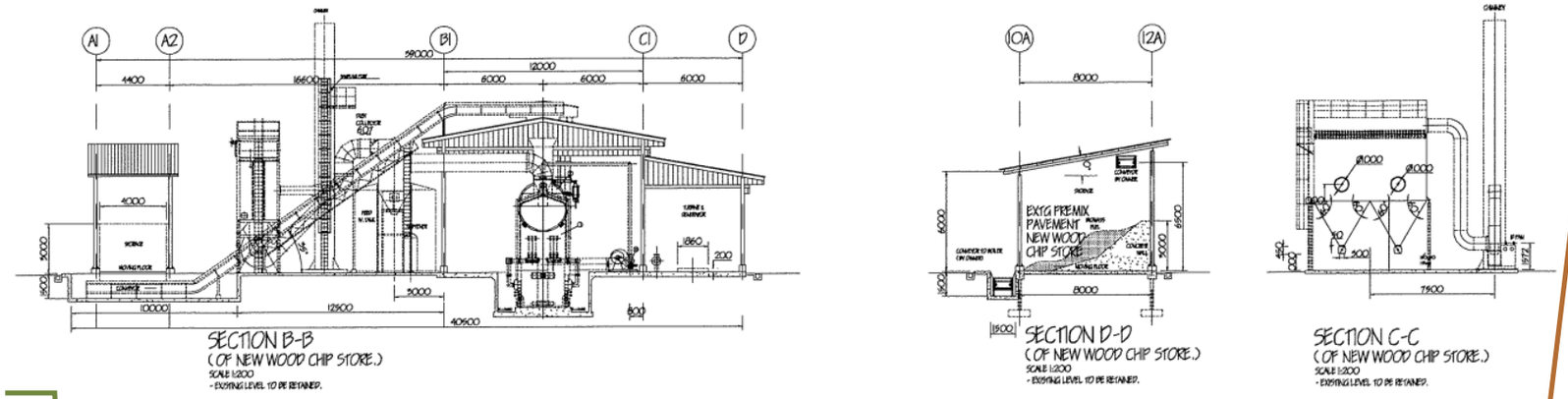
改訂 REV.	詳細 DESCRIPTION	日付 DATE	署名 SIGN

尺度 SCALE	1:30	工事番号 ORDER NO.	
設計 DESIGN	2019-08-06	検図 CH'D	
製図 DRAWN		承認 APP'D	

株式会社JET

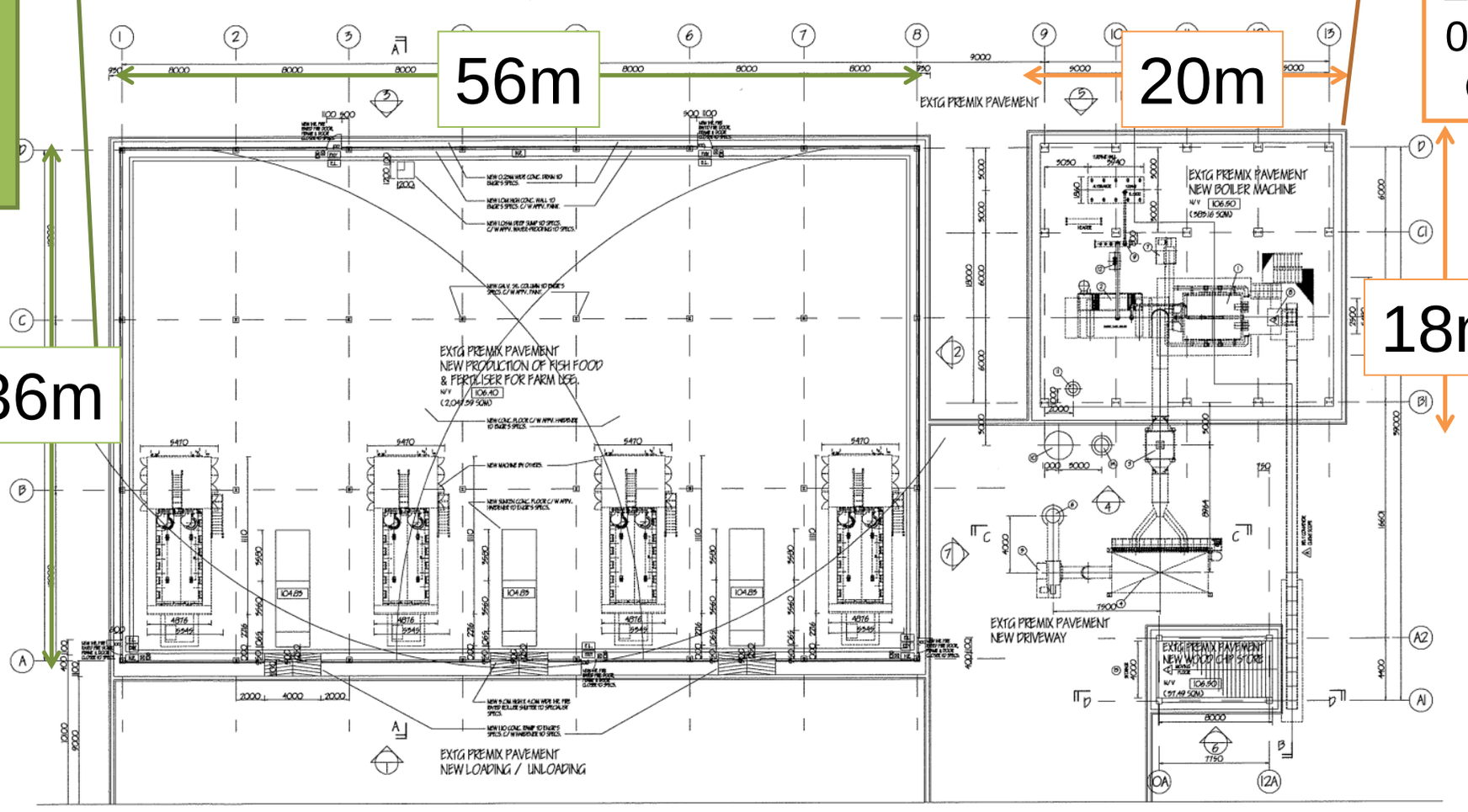
図番 DWG. NO. .

REE-BOX Plant with power generation in Singapore



REE-BOX Plant

Example of 200 Tons/day capacity



Power plant

Example of 0.54MW/Hr Capacity

Frequently Asked Questions

Q What is the technology of REE-Box system?

A It is a **high speed fermentation and drying technology** using indigenous microbes and mechanical depressurization.

- ✓ The microbes planted in REE-Box generate fermentation heat well under 50~60 ℃.
- ✓ Internal pressure of REE-Box is mechanically reduced to get the boiling temperature down to 50~70 ℃ in order to expedite the fermentation and evaporation of water content of the input waste.

Q What is the strong point of REE-Box compared to a composting plant?

A The difference between REE-Box process and common composting process is the **time length of processing to generate fermented matter**.

- ✓ REE-Box: 2 to 4 hours
- ✓ Composting: More than 1 month

Q How can REE-Box system control odor/bad smell during processing wastes?

A Microbes planted in REE-Box system carry out aerobic fermentation which can degrade ammonium content in the input organic waste and eliminate odor in the system.
The fermented matter taken out of the machine after being processed also does not have a bad smell.

Videos

The following videos are available.

The videos will be transferred to the customer as per their requirements.

REE-BOX treatment scenes
Municipal Solid Waste in Japan
Municipal solid waste in Philippines
Dam sludge
Construction waste (Concrete)
Restaurant residue in Bali Island
Dead frozen pig