

Food Resource Recovery Outline

What is Food Waste?

Refers to leftovers from the household or restaurants including waste made during cooking, before cooking as well as during all processes of distribution.

Quantity of Food Waste

The food wastes account for 22-28% of total domestic wastes

Year	2002	2003	2004	2005	2006
Domestic Waste (ton/day)	49,902	50,737	50,007	48,398	48,844
Food Waste (ton/day)	11,397	11,398	11,464	12,977	13,372
Food Waste Ratio (%)	22.8	22.5	22.9	26.8	27.5

Disposal State of Food Waste

From 2005, the direct reclamation of food waste was banned. It is separately collected to be reused in the method of foddering and composting. 94% of food wastes are being reused in this method.

Year	2000	2001	2002	2003	2004	2005	2006
Reclamation (%)	45.4	34.3	29.4	24.9	14.0	2.7	2.0
Incineration (%)	9.5	8.9	8.1	7.4	4.7	4.0	3.80
Recycling (%)	45.1	56.8	62.6	67.7	81.3	93.3	94.2

Resource Recovery Facility State of Food Waste

<Food Waste Resource Recovery Facility State>

Section	No. of Companies (Site)	Permitted Capacity (ton/day)	Actual Disposed Amount (ton/day)	Resource Recovery Rate (ton/day)
Public Facilities	95	5,346	4,751	930
Private Facilities	158	11,360	7,819	3,633
Total	253	16,709	12,570	4,563

<Facility Ratio by Food Waste Disposal Method>

Facility Type	Aerobic Composting	Wet Foddering	Dry Foddering	Dry Reduction	Crushing Dehydration	Sewage Integration	Anaerobic composting	Mushroom Cultivation
Facility Ration (%)	33	26	21	8	7	4	1	0.004
Public (%)	38	5	25	11	9	10	2	0
Private (%)	30	40	19	5	6	0	0	0.006

<Food Waste Resource Facility State (Compared to Disposed Amount)>

Section	Anaerobic Composting	Aerobic Composting	Dry Foddering	Wet Foddering	Dry Reduction	Crushing Dehydration	Sewage Integration	Mushroom Cultivation
Foreign Substance Occurrence Rate	15.4	5.2	4.3	5.5	3.7	2.2	5.2	16.7
Waste Water Occurrence Rate	126.9	81.4	77.8	60.2	75.6	70.6	160.4	
Product Production Amount	28.4	25.3	14.2	35.7	26.0	27.8		83.3

- Incineration and reclamation amount of food waste has decreased dramatically and resource recovery of 94% of food waste has occurred due to foddering and composting

- With the reduction of food waste and recycling perception bringing change, resource saving minds has led to improvements

- Imported crops can be replaced by foddering

- It brings increase of resource recovery technology equipment manufacturing ability and is now trying to expand abroad (China)

- Increases life expectancy of reclamation land and reduces causes of incineration plant dioxin

- Although infrastructure is weak at the moment, alternate energy technology development using biomass is being actively conducted

※ Food wastes contain 80-85% of waste, thus is easily decomposed. Odor and pollutant water is emitted to make cycling and moving difficult. When reclaiming, a lot of leachate flows out and induces secondary environmental pollution such as underground pollution. It takes a lot of cost to process leachate and when incinerating, the heat amount is small and moisture large. Thus there is a problem of additional use of additional fuel due to reduction of incinerating temperature.

Therefore, food waste must be reused as compost, fodder or fuel.

In the case of foddering, although there is difference according to decomposition in the transportation process, excessive salt (3%) and nutrient imbalance, utility value as a fodder and construction method, there are many realistic limitations such as odor occurrence during compost disposal, salt and moisture adjustment by sawdust or chuff, supply and demand of subsidiary materials such as livestock waste and economic feasibility.

Types of Food Resource Recovery

Types of Food Waste Disposal Facility

- Foddering (dry, wet, fermentation etc.) Facility
- Compost Facility
- Anaerobic Decomposition Facility (Liquefied, Gas Fueling, Sewage Integration Disposal etc.)
- Reduction Facility
- Appurtenant Land (land improvement agent or reclamation facility curing agent) Production Facility
- Worm Casting Production Facility
- Other Facilities (Pure Lime Disposal)
- Other Facilities (Mushroom Cultivation)

Foddering (Dry, Wet, Fermentation etc.) Facility

Foddering construction method classification and advantages and disadvantages

Type	Disposal Technology	Advantage	Disadvantage
Dry Foddering	A technology that disposes moisture to 20% or below by drying	<ul style="list-style-type: none">· Long distance movement· Easy to store for a long time· Reduced by 80%	<ul style="list-style-type: none">· High maintenance costs· Odor occurrence· Chlorine enriched
Liquefied Foddering	Self-selection of food waste. Technology that disposes in the sterilized liquefied form	<ul style="list-style-type: none">· A lot of reused fodder (inserted and emitted amount almost the same)· Cheap facility cost	<ul style="list-style-type: none">· Odor due to liquid· Long storage impossible· Long distance movement impossible· Cannot be used apart from hog fodder
Wet Fermentation Foddering	Self-selection of food waste. After dehydrating in the form of sterilization, water content percentage is low. It is mixed with a lot of excipients and microorganisms. Product is produced through agitation fermentation	<ul style="list-style-type: none">· Cheap facility cost· Reduced by 60-70%· Possible on many livestock (duck, dog, chicken etc.)· Long preservation possible· Long distance movement possible	<ul style="list-style-type: none">· Personnel needed per repair· Leachate consigned disposal

Composting Facilities

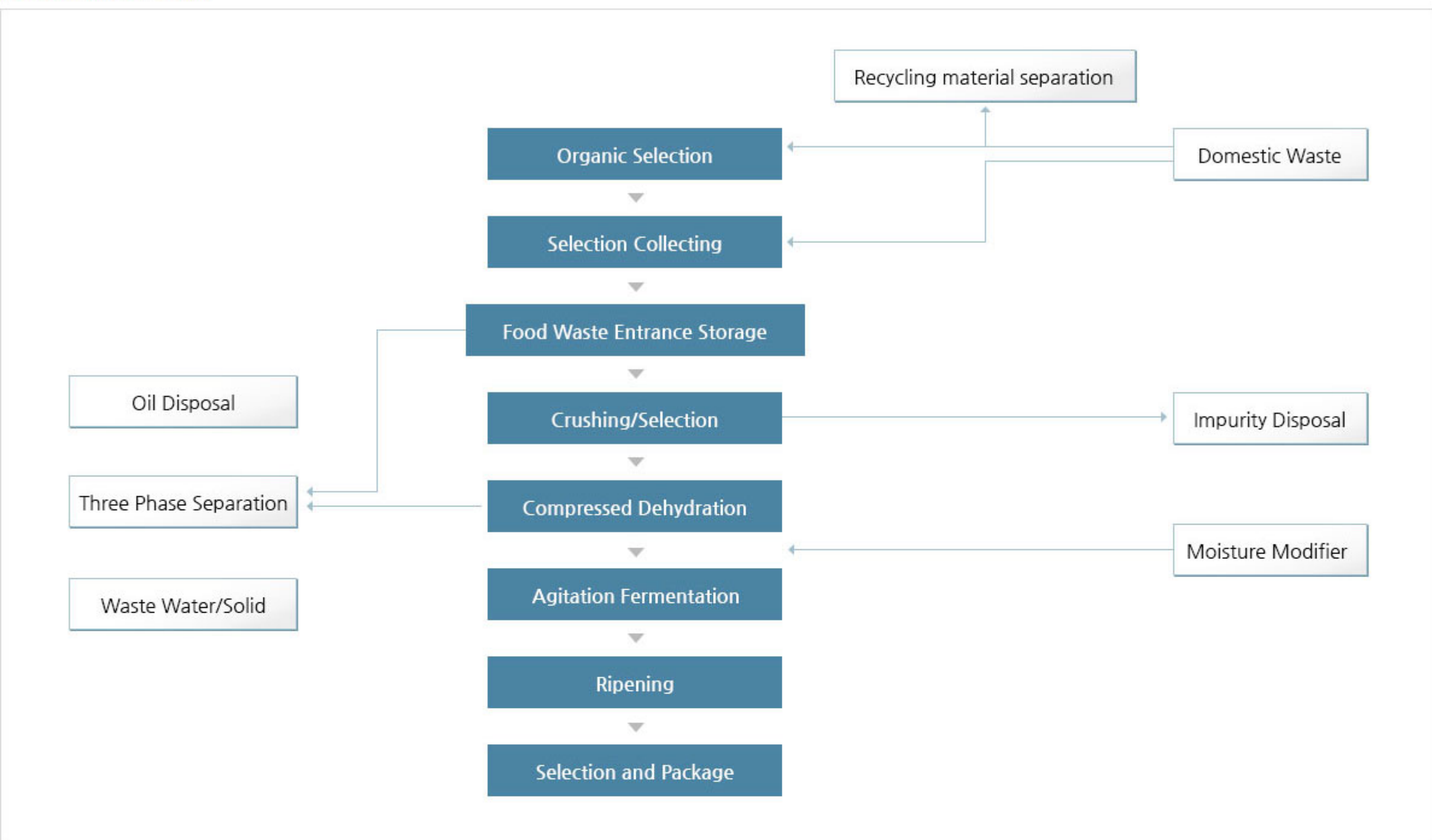
Propriety

- The mounding and organic layers existing in the upper part are greatly related to the growth of plants in the soil
- Of the organics, the organisms of animal and plants are decomposed by microorganisms and the humic made by integration is important (The optimum humic in a general forest region is 3-5%, but domestic soil humic is lacking of about 1%)
- Soil is acidized by consumption of chemical fertilizers (3 substance fertilizers: nitrogen, phosphate, kali) (Korea Fertilizer Manufacturing Association, 1997)
- » To prevent such shortage of organic substances and acidization of soil, supply of organic substances is required

Influence Factor

- Temperature: the fermentatio heat (55-66%) due to microorganism activity annihilates pathogens
- Air: aerobic metabolism, temperature control, moisture removal, gas removal
- PH: appropriate microorganism growth and development atmosphere = PH 5.5~5.8
- Moisture: content is 50~60% (decomposition rate, odor prevention, main factor of composting efficiency)
- Carbon/nitrogen rate: the appropriate initial coal quality rate is 26-35 (increase of microorganisms and compost speed factor)

Process Flow Chart



Fueling Facility

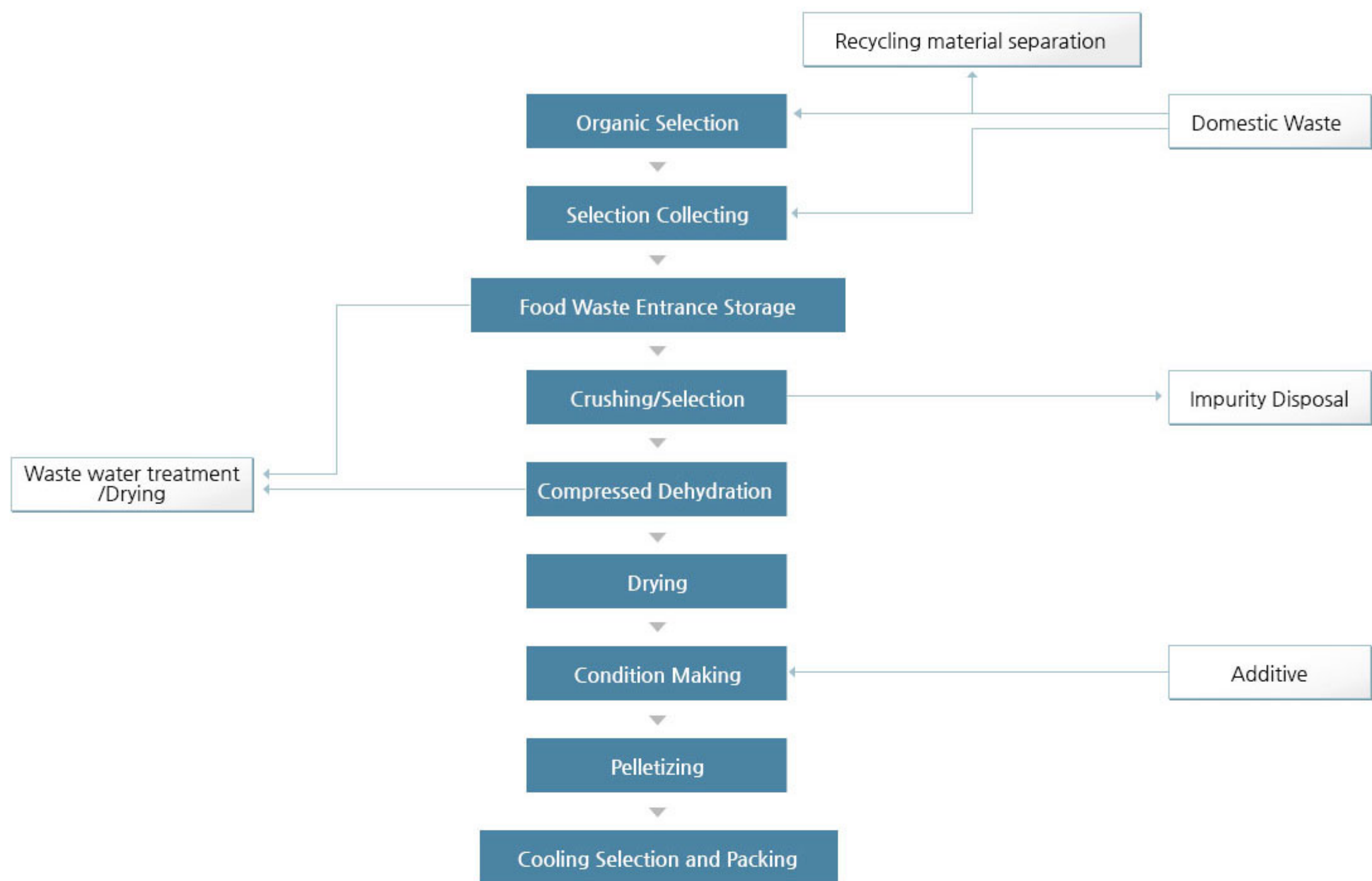
Propriety

- Increase of food waste disposal costs
- Disposal at sea of leachate banned
- Most ideal food waste disposal (recycling) - economic feasibility, easy, practical
- High heat secured (excellent compared to wooden pellet)

Influence Factor

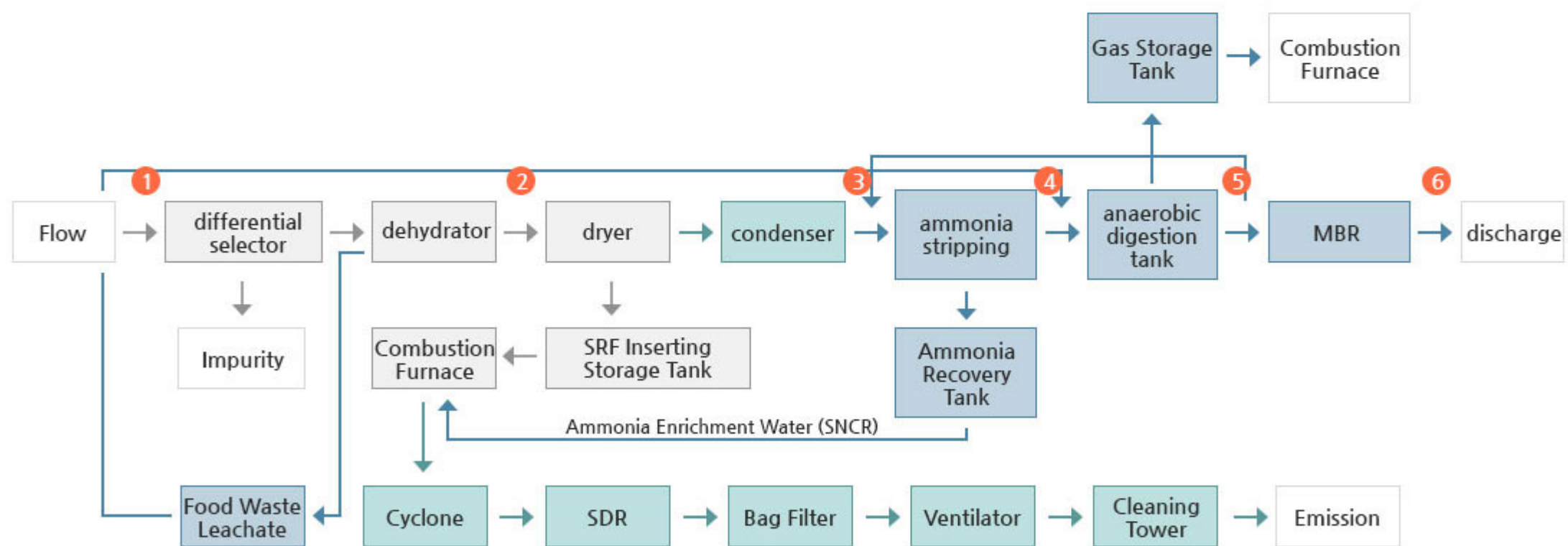
- Water percentage: need to dry from 90% to 10%
- Pelletizing
- Pile up disposal or harmless exhaust gas when combusting
- Law regarding recycling

Process Flow Chart



Energization Facility

Material Resin



① Food Waste

Item	Concentration (mg/ℓ)
Q	100ton/day
Water Percentage	82%
TS	180,000
SS	153,000
BOD	130,000
T-N	5,000
T-P	800

② Dryer Insertion

Item	Concentration (mg/ℓ)
Q	65ton/day
Water Percentage	74.6%
TS	253,846
SS	199,615
BOD	130,000
T-N	5,000
T-P	800

③ Condenser

Item	Concentration (mg/ℓ)
Q	35.2ton/day
Water Percentage	-
TS	-
SS	200
BOD	10,400
T-N	700
T-P	10

④ Digestion Tank Influent

Item	Concentration (mg/ℓ)
Q	65.2ton/day
Water Percentage	-
TS	-
SS	13,909
BOD	28,617
T-N	1,171
T-P	189

⑤ MBR Influent

Item	Concentration (mg/ℓ)
Q	65.2ton/day
Water Percentage	-
TS	-
SS	300
BOD	2,862
T-N	937
T-P	152

⑥ Discharge Water

Item	Concentration (mg/ℓ)
Q	65.2ton/day
Water Percentage	-
TS	-
SS	10
BOD	65
T-N	48
T-P	10