

Food Waste Management in South Korea

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Food Waste Reduction Policy in S. Korea

Year	Policies and Actions
1995	Introduced volume-based waste charging under "pay-as-you-throw" system
1996	Food Waste Reduction Masterplan
1998	 Established recycling program (demanding the collection of food waste in residential areas and from restaurants) Revamped in 2004 Started construction and operation of 5 public food treatment facilities and also private facilities
2005	Banned landfilling of food waste
2013	Banned sea dumping of food waste water
2013	 Implemented a specific quantity-based charging scheme for food waste Four charging means: paid standard plastic bags, attaching paid stickers to food-waste bins, chip-based waste bins, RFID system

Food Waste Treatment Policy in S. Korea

Flow Chart of Food Waste Collection and Disposal

Separate Disposal			Collection & Transportation		Disposal & Recycling		
Original Producers 3,070ton (100%)	Household 1,920ton (62%)	Multi-unit Building 690ton (22%)	Collection Method	Collecting from a Designated Point	Facility to Turn Waste into Resources (100%)	Compost 997ton (33%)	Supplied to Farmers with/ without Charge
				Door-to-door Collection		Animal Feed 1,480ton (48%)	
		Single-family House 1,230ton (40%)	Collecting Agent	DistrictPersonnel (0%)		Energy 29ton (1%)	
				Agency (100%)		Original Form Used 564ton (18%)	
	Business 1,150ton (38%)	Small-size Restaurant Large Wasteprsoducing Business Sites 1,150ton (38%)	Se	lf-disposal	Disposing	Public Disposal Facility 1,055ton (38%)	Public Treatment
			Contractor		(100%)	Private Disposal Facility 2,015ton (64%)	Water (1,454ton)

	Seoul	Hong Kong
Population	10.5 million	7.3 million
Food waste	3,070 T/d (2013) (0.29kg/d/pax)	3,382 T/d (2015) (0.46kg/d/pax)
Food waste treatment plant	5 (3 <i>,</i> 070 T/d)	1 (200 T/d)

RFID System for Food Waste Collecting and Weighing

- Measures the food waste from individual household of multi-unit buildings
- 3 main features: RFID user identification system, weighing system and wireless telecommunication system
- Swipe a card equipped with a RFID chip before gaining access to residential trash cans
- Charges disposal fee based on the weight of food waste disposed
- The authorities could monitor entire process of food waste collection and transportation.



RFID System for Food Waste Collecting and Weighing

- Location: Songpa Habio Prugio Apartment house complex
- Number of households: 10 buildings
- 55 units for 3,000 commercial offices and 1000 households
- Households dispose food waste once per 2-3 days
- > 80kg per bin, collect 1 bin food waste per 2 days
- ➢ Hk\$15,000 per unit
- ➢ RFID system now occupies 50% market share in S. Korea
- Charge by weight: HK\$1.2/kg



OHSystem – Automatic Food Waste Collecting System

- Siksa residential complex has adapted Automatic Refuse Collecting System (ARCS) covering entire residential area
- Throw food waste into food waste inlets installed inside or outside the buildings
- Food waste vacuumed through a sealed food waste pipe network to a storage tank and later discharged out by vehicles
- > The collection system is sealed from inlets to the storage
- The air used to transport food waste is purified by the filtering system











OHSystem – Automatic Food Waste Collecting System

Comments:

- Eliminates the trouble to take food waste to collection bins
- More hygienic, convenient
- Difficult to install in existing residential complex
- High setup cost
- More suitable to sophisticated high-class residential developments









Food Waste Treatment Facility

• Songpa-gu Resource Recycling Center

- One of the 5 food waste treatment facilities in Seoul
- Capacity : 450 T/day
- Land area: 6,407 m²
- Convert food waste into dried animal feed
- Food waste water to generate biogas, oil and fertilizer





Food Waste Treatment Facility

- Food waste shredded and pressed to separate solid and liquid contents
- Solid contents dried through vacuum cooker, dish dryer and cooling dryer. Impurities separated, and then the solid shredded again to produce animal feed
- Wastewater locally treated. Oil separated from the wastewater and then anaerobic process to produce biogas



Food Waste Treatment Facility

Comments:

- > Merits of converting food waste into animal feed instead of compost:
 - Much higher market value (>HK\$10,000/T Vs <HK\$1,000/T)
 - Much higher market demand
 - Very compact for a 450T/d plant (6,407 m² Vs 20,000 m² of ORRC1)
- Drawbacks:
 - Concerns about impurities in animal feed products
 - Low biogas yield (31Nm³/T food waste) and methane content not high (60.5%)
 - Biogas production meet 90% of the plant's energy use. No surplus energy



Food Waste Water Treatment Facility

- Banned landfilling of food waste in 2005
- Banned sea dumping of food waste water in 2013
- \geq 89% of 1,454 m³/d food waste water from food waste treatment facilities is treated by public waste water treatment facilities

Food waste water treatment facility in SUDOKWON Landfill

- Capacity : 500 m³/day
- Land area: 27,000 m²
- Started operation in 2013
- Generate biogas: 25,000 Nm³
- Contents of biogas: Methane(>60%)



Food Waste Water Treatment Facility



Findings from S. Korea's Food Waste Management

- Started food waste management in 1995 and the whole infrastructure basically completed by 2013
- Comprehensive food waste collection from households and business
- Developed innovative methods to collect food waste from households (e.g. RFID system)
- Trying more sophisticated system (ARCS) to ease food waste disposal in residential
- > 100% food waste treated and recycled
- A combination of food waste treatment facilities (produce dried animal feed and compost) and food waste water treatment facilities (produce biogas)
- 33% of food waste is converted to compost, 48% is converted to dried animal feed
- Concerns about the impurities in the animal feed

Recycling of Food Waste to Valuable Resources



3-step Zero Effluent Discharge Process

(Patented)



Auto Food Waste Separator



Food Waste



Recycle Water

Award-Winning Technology

- 2017 Geneva International Innovations Gold Medal with Congratulations of the Jury
- Winner in the "Power" category and a "Certificate of Highly Commended" in the "Sustainability" category of IET Innovation Awards 2017
- Champion prize of the 2017 HKIE Environmental Paper Award
- 2016 Hong Kong Awards for Industries Equipment and Machinery Design Certificate of Merit



Demonstration Plant in ZhuHai



A Technical Seminar co-organized by Engineers Australia Hong Kong Chapter (EA) and Hong Kong Institute of Qualified Environmental Professionals HKIQEP)

Title:	A Novel Process of Recycling Food Waste into High Market Value Products
Date:	20 July 2018 (Friday)
Time:	6:30pm (Networking), 7:00pm (Start of Seminar)
Venue:	Room HJ305 , Hong Kong Polytechnic University, Hung Hom, Kowloon
Speaker:	Ir Dr Anthony MA The Principal Consultant of the Hong Kong Productivity Council (HKPC)

Thank you !