Dear Cyd Ho, **8th July 2013**

Organic Waste Treatment Facility Hong Kong Tender doc Indicative moisture content of Hong Kong food waste

4.1.2 Waste Quality

4.1.2.1 The characteristics of Organic Waste in Hong Kong have been investigated in a number of surveys as described in the following. The Contractor shall note that the information provided under Clauses 4.1.2.2 to 4.1.2.4 of the Specification Part A is for Contractor's reference only and will not form part of the Contract. The Employer is not responsible for the accuracy of the data.

4.1.2.2 In 2005, the quality and quantity of food waste produced by a selected group of generators had been investigated. The characteristics of the food waste from the selected generators are shown below.

Composition of Food Waste in Hong Kong

Parameter	Public markets	Hotels	Food factories	Shopping malls
Moisture (%)	74.8	70.2	60	70.4
Total Organic Matter (%TM)	87.7	95	92	88.1
Total Organic carbon (%TM)	49.4	55.6	50.0	49.6
Kjehldal Nitrogen (%TM)	2.6	2.9	5.6	5.0
C/N ratio average (-)	25.5	21.1	9.6	16.7
C/N ratio range (-)	9.7-39.0	15.7-17.7	7.5-13.9	12.2-22.2
Arsenic (As, mg/kg)	< 0.10	< 0,10	< 0,10	< 0,10
Cadmium (Cd, mg/kg)	1.83– 5.08	0.78- 2.09	0.86- 1.83	1.17- 4.71
Chromium (Cr, mg/kg)	1.73- 23.1	2.34- 5.41	0.98- 1.92	1.25- 33.0
Copper (Cu, mg/kg)	3.07- 15.9	2.73- 5.20	2.68-3.14	2.12- 11.0
Mercury (Hg, mg/kg)	<0.010	< 0.010	< 0.010	<0.010
Nickel (Ni, mg/kg)	2.87- 20.0	4.20- 5.41	1.44-2.51	2.09- 13.5
Lead (Pb, mg/kg)	2.1- 12.6	1.27– 6.69	0.99- 1.92	1.27- 8.72
Selenium (Se, mg/kg)	0.58- 1.19	0.41- 0.93	0.30- 0.52	0.30- 1.96
Zinc (Zn, mg/kg)	8.98- 45.8	9.41- 15.5	9.03- 15.5	23.2- 64.7

4.1.2.3 In 2008, an investigation was conducted to study the nature of the organic material and the form and type of Inert Materials presented in the Organic Waste. The investigation revealed that there existed 5-20% of inert material among the waste during waste generation stage. Plastics were the major component of Inert Materials in combination with some glass or broken pottery.

4.1.2.4 In 2009, a study on Organic Waste composting conducted revealed that the results of heavy metal content were consistent with the data presented in Clause 4.1.2.2 of the Specification Part A. Other important characteristics of the Organic Waste in Hong Kong such as moisture content, volatile solids concentration and nitrogen content had also been investigated and the findings are summarized below.

Main Constituents of Organic Waste in Hong Kong

Parameter	Public Markets from FEHD	Public Markets from The Link	Food Industries / Hotels / Shopping Malls	Street-level Eateries
Moisture (%)	78	90	63	79
Total Organic Matter (VS as %TM)	88	86	94	93
Kjehldal Nitrogen (%TM)	4.1	4.6	3.6	4.9

http://www.massbalance.org/downloads/projectfiles/1826-00237.pdf

Putrescible food waste has a very low Calorific Value (CV) - since it is so wet

Component	Moisture, %	Volatiles, %	Fixed carbon, %	Ash, %	Calorific value, kJ/g
Paper and card	5–10	76–81	8–12	2–5	15.7–18.6
Waxed cartons	3.4	90.9	4.5	1.2	26.4
Vegetable (food) waste	78.3	17.1	3.5	1.1	4.2
Fried fats	0.0	97.6	2.4	0.0	38.3
Grass	75.2	18.7	4.5	1.6	4.8
Plants and shrubs	50–69	25–42	5–8	1–2	4.8–8.6
Wood	20	67.9	11.3	0.8	19.6
Rubber	1.2	84.0	4.9	9.9	25.9
Upholstery	6.9	76.0	14.5	2.6	16.1
Polystyrene	0.2	98.7	0.7	0.4	38.0
PVC	0.2	86.9	10.8	2.1	22.6
Vacuum cleaner dirt	5.5	55.7	8.5	30.3	14.8

http://www.waste-management-world.com/articles/2013/07/is-waste-to-energy-to-answer-for-india.html

IS WASTE TO ENERGY TO ANSWER FOR INDIA?

4 July 2013

During a recent visit to India as part of a UK trade mission [DL1] on the built environment, the question that kept raising its head in discussion with national and state officials, private developers and NGOs was whether waste to energy (WtE) is an appropriate technology to address India's growing solid waste crisis.

The answer, as ever, is complicated. WtE is an attractive option. It has the potential to divert waste from landfill, it significantly reduces the volume of waste which needs to be disposed of, and can generate power - a key factor in a country where energy demands are rising day by day. But, when faced with the dizzying array of waste technologies available, what is the best option? Conventional incineration, pyrolysis, plasma arc gasification? And do you need waste treatment and mechanical separation to prepare a refused derived fuel prior to combustion? To understand the issue properly, we need to consider a number of factors. Firstly, understanding the system as a whole is very important. What effects are the upstream elements of the waste management system having on the waste in terms of the quantity and its composition? Is a waste to energy facility likely to get enough waste to make it viable, or is much of it being diverted for composting or recycling?

Secondly, what is the waste composition? This is critical for a WtE facility. If the calorific value (CV) drops below roughly 6 MJ/kg then the waste will require some supplementary fuel to combust. I know from personal experience that the waste stream has a substantial proportion of inert material which can seriously affect the viability of a conventional WtE solution.

Is it economically viable? WtE is not a cheap disposal method. Yes, it generates energy which is a source of revenue and it can also potentially attract a gate fee, but these need to balance the relatively high levels of operational and maintenance costs, plus the payback on the substantial investment needed to build a facility. Typically a facility that recovers energy from waste will generate half of its revenue from a tipping fee and half from energy sales, but will these be sufficient to maintain the operation and maintenance of the plant, and generate the necessary revenues for the operator? ***David Lerpiniere*** *is Knowledge Leader for Waste Procurement within Ricardo-AEA's Resource Efficiency and Waste Management Practice and also co-ordinates the Practice's international activities. He is a Chartered Environmentalist and Waste Manager with over fifteen years of experience.*

ClearTheAir 爭氣行動 comment:

48% of Hong Kong's daily MSW is putrescible waste of which 42.3% in 2011 was high moisture content wet food waste. The calorific value (CV) of such waste hovers at or below 4 MJ/kg or at least 33% less than the value which is required to effectively combust. This means additional fuel mix will be required with a higher (CV) to co-combust the putrescibles if using moving grate incineration. In addition the burn temperature and time will have to be increased to handle what is effectively the major portion of our daily waste and there will be little excess energy for the grid from this feedstock, assuming grid inter-connection is finally confirmed. If burn temperatures are not consistently increased, dioxins and furans can form. Adding higher (CV) MSW to the food waste burn mix is therefore a mandatory requirement; however mandatory RRR measures, waste charging and increased recycling efforts will lessen the availability of such carbonaceous materials for the fuel mix which would then require even higher energy input to combust the feedstock.

Would it not be more sensible to have a large anaerobic digestion plant handling this massive quantity of putrescible waste instead of burying or burning it ? The (CV) of our major MSW (food waste) component must have been well known to ENB so why are they so adamant on using outdated technology which only thermally converts 70% of the MSW waste and leaves 30% residues by weight as ash which requires landfilling, ad infinitum in landfills that will soon be full ? As for a gasification plant instead of incineration there would be no ash, no landfilling and no new expensive tax payer funded ash lagoon islands to be built in the sea – gasification vendors would finance-design-build-operate the plant on Govt provided land instead of the current scenario of throwing good money at a terrible outdated policy idea that is bound to fail and kill children in the vicinity.

Kind regards, James Middleton

Chairman

Monitoring of Solid Waste in Hong Kong - Waste Statistics for 2011

Hong Kong 2011 stats for putrescibles – 48% of HKG's MSW are putrescibles

42.3% food waste/1.4% yard waste / 4.3% diapers etc

Composition	Domestic waste (a)	Commercial waste (b)
Glass	189 (3.2%)	78 (3.3%)
Metals	129 (2.2%)	36 (1.5%)
Paper	1,259 (21.1%)	569 (24.1%)
Plastics	1,107 (18.5%)	464 (19.7%)
Putrescibles	2,868 (48.0%)	1,014 (43.0%)

Putrescibles			
~ Food waste	2,528	(42.3%)	1,056
~ Yard waste	82	(1.4%)	15
~ Others[3]	258	(4.3%)	56
(Putrescibles) Sub-total	2,868	(48.0%)	1,126

Remark: Figures denote quantities and percentages by wet weight.

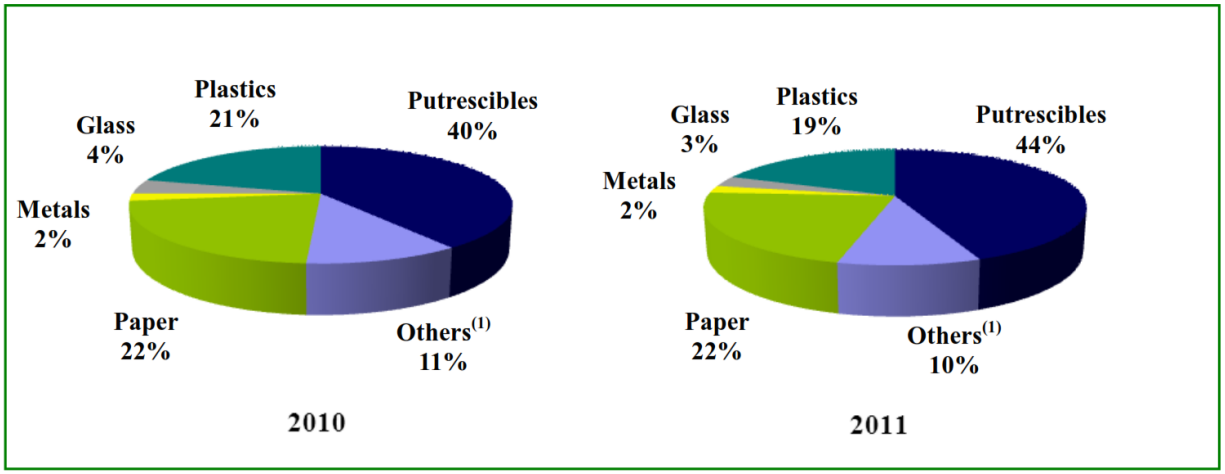
Notes:

(1) Other paper waste includes drink packs (e.g. tetrapaks), tissue paper, etc.

(2) Other plastics waste includes household utensils, packaging materials, toys, off-cuts, scrap, etc

(3) Other putrescible waste includes personal care cotton products, such as diapers.

https://www.wastereduction.gov.hk/en/assistancewizard/waste_red_sat.htm



Note:
(1) Others include textile, wood/rattan, household hazardous wastes and miscellaneous waste.

Hong Kong Food waste recycled locally in 2011 = 0.6%

http://www.edie.net/news/5/UK-anaerobic-digestion-industry-surpasses-100-plant-milestone-/

UK anaerobic digestion industry surpasses 100 plant 'milestone'

18 March 2013, source **edie newsroom**

The number of anaerobic digestion (AD) plants in the UK outside of the water industry has nearly doubled since September 2011, exceeding the 100 mark for the first time, according to figures released today.

http://www.waste-management-world.com/articles/2013/06/tamar-outlines-plans-for-first-of-40-anaerobic-digestion-biogas-.html

TAMAR OUTLINES PLANS FOR FIRST OF 40 ANAEROBIC DIGESTION BIOGAS PLANTS

3 June 2013
By Ben Messenger
Managing Editor

London based renewable energy company, Tamar Energy, which was formed in 2012 with the aim of developing some 40 anaerobic digestion biogas plants across the UK, has laid out its programme to construct its first four plants.

According to the company facilities will be the first step its vision to create a 'critical mass' network of around 40 plants by 2018, generating some 100 MW of electricity.


Together, Tamar said that the initial the four sites will have a combined capacity of 8 MW, but that it also has a further 14 sites in various stages of development.

The four sites are:

Farleigh, Hampshire
With the digester tanks currently being constructed, Tamar Energy's first facility will process 40,000 tonnes of food waste. Commissioning is expected to commence in autumn 2013 and the plant will be generating 1.5 MW of electricity by early 2014.

Holbeach Hurn, Lincolnshire
To be commissioned in late 2013, the Holbeach project is a joint venture with food producer and processor A.H. Worth & Company. It is expected to process around 30,000 tonnes of food waste when in operation, producing 1.5 MW of electricity.

Retford, Nottinghamshire
Producing up to 3 MW of electricity when fully commissioned in spring 2014, this facility will process maize, agricultural waste and chicken manure from the local area.

Halstead, Essex
Work by the landlord has begun to create the access track for Tamar Energy's Essex plant. The company is then planning to start its work on the AD facility itself at the end of June 2013 which, once operational in 2014, is expected to process 45,000 tonnes of commercial and industrial food waste, to generate 2 MW of electricity.

Established in 2010 and officially launched last year, Tamar Energy also claimed to be the first renewable energy company in the UK's first renewable energy business to exclusively focus on anaerobic digestion.

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Biofuel from Waste Economics Boosted by Genetically Engineered Mutant Fungi
Genetic engineers at the Vienna University of Technology have found a method of producing biofuels from lignocellulose materials, such as wood waste and straw, using fungi.

Co-operative to Send Food Waste Biffa for Biogas Production
British supermarket the Co-operative Group is to recycle all of its food waste at anaerobic digestion facilities which produce biogas for energy generation, as well as fertiliser.

VIDEO: Kroger Opens Food Waste to Biogas Anaerobic Digestion Plant
U.S. retail giant, Kroger has opened a 55,000 ton per year anaerobic digestion food waste to biogas facility to help power its distribution centre in Compton, California.

http://www.waste-management-world.com/articles/2013/04/60-000-tpa-anaerobic-digestion-biogas-plant-approved-in-yorkshir.html

60,000 TPA ANAEROBIC DIGESTION BIOGAS PLANT APPROVED IN YORKSHIRE

30 April 2013
By Ben Messenger
Managing Editor of Waste Management World magazine

Planning permission has been granted for Peel Environmental's combined heat and power (CHP) biogas plant which will use anaerobic digestion to process 60,000 tonne per year of food waste in Wheldrake, Yorkshire. The Manchester, UK based waste treatment infrastructure developer said that consent for its North Selby Anaerobic Digestion and Horticultural Glasshouse facility, which will be located on the former North Selby Mine site, was granted by the City of York Council.

According to the company the £23.5 million project will use the process treat organic commercial and industrial waste and produce 1.5 MW of heat and up to 2.75 MW of electricity - enough energy to power around 3500 homes. Peel went on to explain that some of the heat produced by the facility will be used to heat a horticultural glasshouse, which will be developed alongside and operated by Howden-based specialist Plant Raisers to propagate mainly tomato plants.

The plant is expected to produce up to 30,000 tonnes of digestate each year, which the company said could be used by local farmers as a biofertiliser. The electricity generated is expected to be used both by the glasshouse and exported to the National Grid via an existing on-site connection.

According to Peel, once complete the facility will provide 20,000 tonnes per year of carbon savings compared to sending the waste to landfill - greater than the levels of CO2 produced by City of York Council. The company added that the facility will provide an economic boost to the area, providing up to 256 jobs during construction and 56 full time positions and 50 seasonal positions during operation, with the impact of these in the region of £2.2 million Gross Value Added (GVA) per year. It will also facilitate the expansion of Plant Raisers - a successful Yorkshire business.

"As we look to bring forward other sites for the co-location of waste infrastructure, it is encouraging to see that the value of what we are trying to achieve in terms of developing mixed-use sites with waste infrastructure development at their core has been recognised," explained Myles Kitcher, a director at Peel Environmental.

"As a developer bringing forward merchant facilities, we are confident that we can quickly get this scheme off the ground and into operation," he added.

Read More

Method to Oxidise Renewable Chemicals from Biofuel Byproducts
A method of using oxygen to convert lignin into a source of renewable chemical feedstocks has been developed by chemists at the University of Wisconsin-Madison.

UK Retailers Turning to Anaerobic Digestion & Biogas
An increasing number of major retailers in the UK are turning to anaerobic digestion to generate biogas from their organic wastes, according to the ADBA.

Advanced Biofuels from Waste Needed if UK is to Hit Targets
The UK will need significant supply from as yet unavailable advanced biofuels if it is to meet its Renewable Energy Directive targets, according to a new report.