

AUS Repository

Waste Management in the UAE

Item Type	Project
Authors	Alam Mishu, Afsana;Al Zaabi, Noora;AlMarzooqi, Majed;Ibrahim, Moustafa
Download date	2024-12-03 10:36:38
Link to Item	http://hdl.handle.net/11073/8755

Waste Management in the UAE

Afsana Alam Mishu (CHE)

Noora Al Zaabi (MCE)

Majed AlMarzooqi (MCE)

Moustafa Ibrahim (CVE)

SITUATION

- Municipal waste is a rapidly growing issue in developing and developed countries.
- A technology known as Waste to Energy (WTE) Technology is introduced to reduce the amount of municipal waste.
- Incineration is the combustion of organic materials, which reduces the volume and weight of the waste.

Table 1: Waste Survey and Percentages; UAE, 2014 [1]

Source of Waste	Method of Treatment - Waste Breakdown, UAE, Tons						
	%	Total	Method of Disposing		Methods of Recovery		
			Dumping	Other methods in Disposing	Recycling	Composting	Other methods in recovery
Construction Waste	55.9	14,171,562.9	11,975,438.0	27,440.0	2,153,530.6	0.0	15,154.4
Municipality Waste	20.6	5,228,527.8	4,226,051.5	0.0	395,656.3	560.0	606,260.0
Industrial General Waste (Non hazardous)	15.4	3,899,601.1	3,293,318.5	124,000.0	475,368.6	0.0	6,914.0
Agriculture Waste	3.0	766,081.9	663,610.0	16,054.0	0.0	83,657.9	2,760.0
Sludge of Wastewater	3.0	766,248.1	672,085.3	0.0	0.0	25,792.5	68,370.3
Others	2.1	538,868.3	538,868.3	0.0	0.0	0.0	0.0
Total	100.0	25,370,890.1	21,369,371.5	167,494.0	3,024,555.5	110,010.4	699,458.6

Research Question

How can Municipal Solid Waste (MSW) materials be utilized in generating energy in the UAE?

INCINERATION PROCESS

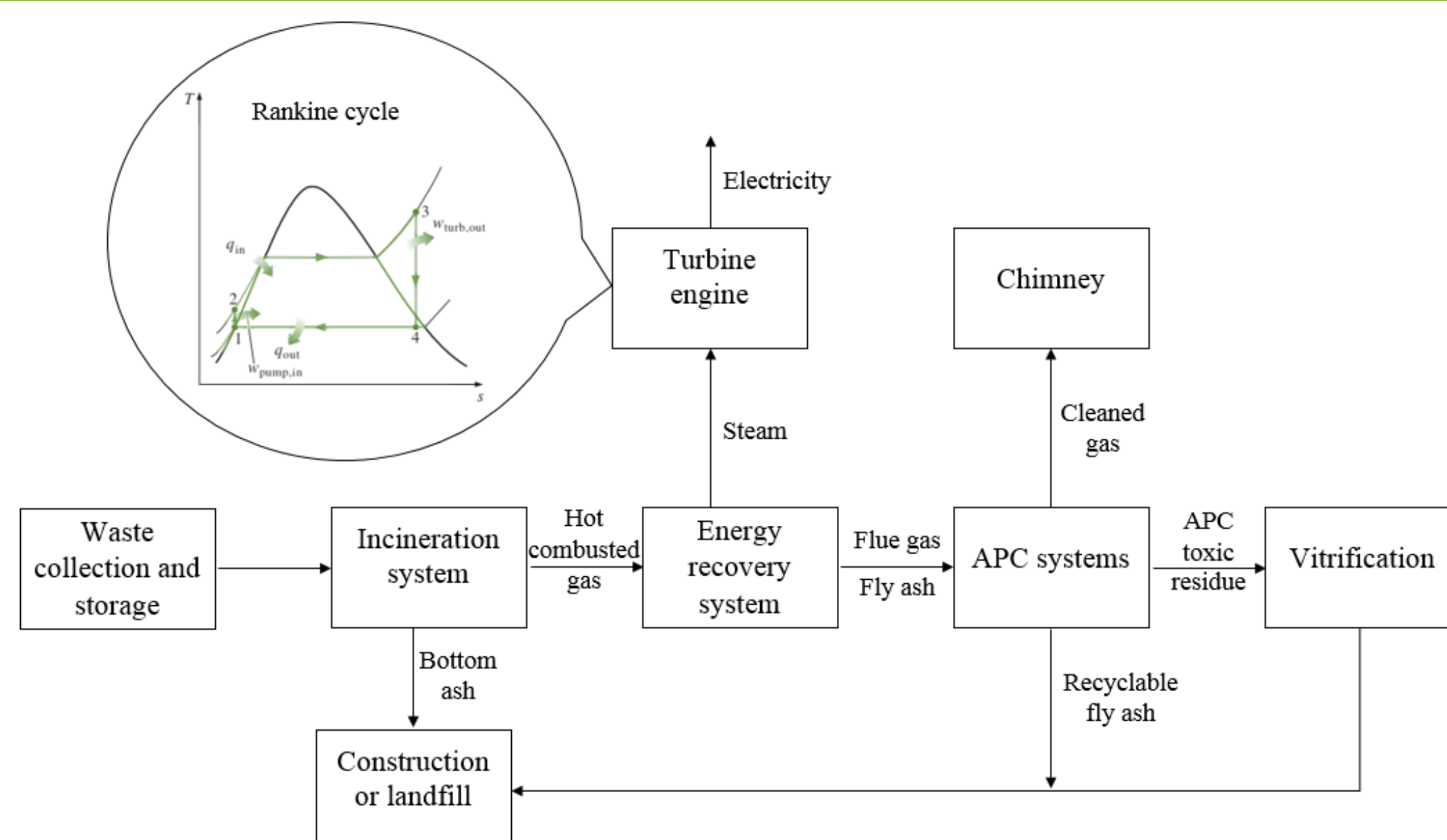


Figure 1: Incineration Process Flow Diagram [2]

AIR POLLUTION CONTROL SYSTEMS

- Air Pollution Control (APC) systems are used to clean flue gas and fly ash that are released from the incineration process.
- The APC units to be used are:

Table 2: Air Pollution Control Units [3]

Air Pollution Control Units	
Selective Non-Catalytic Reduction (SNCR)	NO _x Control in flue gas Injecting Ammonia/ Urea 90% NO _x removal efficiency
Spray Dry Absorption (SDA)	SO ₂ and HCl control in flue gas 75 – 85%SO ₂ removal efficiency 95% HCl removal efficiency
Activated Carbon (AC)	Controls Mercury, Dioxins and Furans in flue gas 99% removal efficiency
Baghouse Fabric Filters (FF)	Controls particulate matter, soot, smoke and metals in flue gas 99 – 99.99% removal efficiency
Cyclone Separator	Removal of heavy metals from MSWI fly ash 90% removal efficiency

PROBLEMS

- The incineration plant needs to be located away from any residential communities.
- The residues from the Air Pollution Control (APC) systems are classified as hazardous waste and are not suitable for direct reutilization or landfill.
- Corrosion in the waste boiler due to contaminants in MSW.

SOLUTIONS

- The incineration plant can be located in the desert, or in a location with preexisting waste management facilities.
- Vitrification is the most suitable thermal treatment process in which the toxic residues is melted into a glassified state.

- In order to avoid corrosion large temperature gradients are to be avoided and controlling the temperatures of the boiler. Also, recirculating sulfur from the APC units would also aid in avoiding corrosion [3].

EVALUATION

- The location requires to have easy accessibility to highways and is also required to be compatible with constructing electric, water and sewage systems [4].
- Vitrification is capable of reducing large volumes of waste into inorganic glasses and the product can be safely disposed of or used in construction of pavements, roads etc.
- To decrease corrosion in a boiler, the temperatures can be kept at a moderate level. However, the boiler will operate with poor electrical efficiency [5]. Another method is to use sulphur-rich compounds, particularly potassium sulphate, which is reluctant to react with the protective layer inside the boiler.

REFERENCES

- [1] "National Bureau of Statistics - Wastes Survey 2014", 2014. [Online]. Available: <http://www.fcsa.gov.ae/EnglishHome/ReportDetailsEnglish/tabid/121/Default.aspx?ItemId=2457&PTID=104&MenuId=1>.
- [2] Z. Xin-gang, J. Gui-wu, L. Ang, and L. Yun, "Technology, cost, a performance of waste-to-energy incineration industry in china," Renewable and Sustainable Energy Reviews, vol. 55, pp. 115–130, Mar. 2016. [Online]. Available: <http://www.sciencedirect.com.ezproxy.aus.edu/science/article/pii/S1364032115012162>.
- [3] A. Hammoud, M. Kassem, and A. Mourtada, "Solid waste to energy strategy in Lebanon: Potential, technology and design," Renewable Energies for Developing Countries (REDEC), 2014 International Conference on, pp. 75–81, Nov. 2014. [Online]. Available: <http://ieeexplore.ieee.org.ezproxy.aus.edu/xpls/icp.jsp?arnumber=7038535>.
- [4] H. A. Eiselt and V. Marianov, "Location modeling for municipal solid waste facilities," Computers & Operations Research, vol. 62, pp. 305–315, Oct. 2015. [Online]. Available: <http://www.sciencedirect.com.ezproxy.aus.edu/science/article/pii/S0305054814001324>.
- [5] M. D. Paz, D. Zhao, S. Karlsson, J. Liske, and T. Jonsson, "Investigating corrosion memory: The influence of previous boiler operation on current corrosion rate," Fuel Processing Technology, 2016. [Online]. Available: <http://www.sciencedirect.com.ezproxy.aus.edu/science/article/pii/S0378382016305513>.