Incinerator In Malaysia: Really Needs?

Haliza Abdul Rahman

Abstract- Increasing population, tremendous urbanisation growth and rapid economic growth influence directly the Municipal Solid Waste generation in Malaysia. Thus, incineration is one of the considered methods of waste treatment that is quickly attracting the municipal authorities' attention in this country because incineration solves many of the problems so common to other methods of municipal garbage disposal. The advantages of incinerator plant including will not have rodent problems, produce bad odours, require large plots of land or require many employees. Therefore, incineration will become one of the best practical choices in treating municipal solid wastes in Malaysia in the near future due to the various constraints such as limited landfill sites, immature recycling and biological treatment infrastructures. However, the advantages and disadvantages of this method need to study deeply and properly before installing such system in Malaysia.

Keywords--- Incinerator, Malaysia, waste treatment, advantages, disadvantages**.**

I. INTRODUCTION

INCINERATION is the common Municipal Solid Waste (MSW) disposal method globally after landfill. Incineration method has many advantages and disadvantages. The main advantage of incineration over all other methods is the volume reduction. This is important in small cities where space is scarce and landfill plots are not available. Another reason why incinerator has more widely used is because the garbage problem has become worsened.

In Europe, with the ban on landfilling untreated waste, scores of incinerators have been built in the last decade, with more under construction. Recently, a number of municipal governments have begun the process of contracting for the construction and operation of incinerators. A number of other European countries rely heavily on incineration for handling municipal waste, in particular Luxembourg, the Netherlands, Germany and France [1]. In the U.S and Canada as well, there has been renewed interest in incineration and other waste-to-energy technologies. In the U.S., incineration was granted qualification for renewable energy production tax credits in 2004 (Renewable US) Projects to add capacity to existing plants are underway, and municipalities are once again evaluating the option of building incineration plants rather than continue landfilling municipal wastes. Incinerator also popular in Japan and Singapore where land is a scarce resource.

Assoc. Prof. Dr. Haliza Abdul Rahman is with the Department of Environmental and Occupational Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, MALAYSIA (e-mail: dr.haliza@upm.edu.my).

Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials, therefore incineration is described as "thermal treatment". The incinerator process is relatively simple to understand. Garbage is brought to the site where it is then fed into the incinerator. Inside the incinerator chambers are flames that are usually around 2400 degrees Fahrenheit that burn the waste in either one stage or in multiple stages. As the waste is burned, ash is produced which is collected for later disposal in a landfill [2].

Incineration of waste materials converts the waste into ash, flue gas and heat. The ash is mostly formed by the inorganic constituents of the waste, and may take the form of solid lumps or particulates carried by the flue gas. Thus, the flue gases must be cleaned of gaseous and particulate pollutants before they are dispersed into the atmosphere.

In some cases, the heat generated by incineration is used to generate electric power [3]. Denmark and Sweden have been leaders in using the energy generated from incineration for more than a century, in localized combined heat and power facilities supporting district heating schemes. In 2005 for example, waste incineration produced 4.8% of the electricity consumption and 13.7% of the total domestic heat consumption in Denmark [4].

In Malaysia, the fast growing economy and the increased focus on the environmental affects have increased the waste collection in Malaysia considerable and thus the need for incinerator. In addition, due to the various constraints such as limited landfill sites, immature recycling and biological treatment infrastructures, incineration will become one of the best practical choices in treating municipal solid wastes. The waste generation rate in big cities such as Kuala Lumpur is continuously rising up every year due to the uncontrollable consumption owing to the increasing population, the attitude towards shopping and the high living standard.

Therefore, for the near future, in order to handle this issue, the federal government through the National Solid Waste Management Department is embarking on a determined path to introduce the first ever mass-scale incinerator facility with capacity of 800-1000 ton of municipal solid waste per day in Kuala Lumpur which expected to be completed in 2015. Currently, Malaysia has five small scale incinerators with the capacity of less than 100 tonnes each in Pulau Langkawi (100 ton/day), Pulau Tioman (10 ton/day), Pulau Pangkor (20 ton/day), Cameron Highlands (40 ton/day) and Labuan (60 ton/day) [5].

II. Material And Methods

This paper involved with secondary data which are collected from journal, proceedings, books and internet sources regarding incinerator related matters.

III. Results And Discussion

Incinerator in Malaysia

1. Really needs?

In reality, the MSW generation cannot be avoided completely as long as humans exist and this issue will always arises simply because societies will continue to generate trash due to increasing populations and the growing demand of modern society. Increasing population and tremendous urbanisation growth and rapid economic growth influence directly the MSW generation in Malaysia. Therefore, today MSW is the biggest environmental problem is Malaysia as well because Malaysians are generating waste products at a rather alarming rate, much faster than the natural degradation process.

In Peninsular Malaysia particularly, the huge quantity of MSW generation has increased from 16,200 tonnes per day in 2001 to 19,100 tonnes per day in 2005 or an average of 0.8 kg/capita/day [5] and the amount increases yearly. In 2012, it is estimated that Peninsular Malaysia alone generated 25,000 metric tons of municipal solid waste daily. The bulk of this is food (48%), paper (15%), plastic (14%) followed by glass, metals and other wastes. On average, the MSW generation increased 2% annually and is expected to reach 2.5–3% due to rapid population and economic growth during the Ninth Malaysia Plan (2006–2010) [5]. However, of the country's 167 landfills were already nearing full capacity, and for short-terms solution the Government suggests to open another 11 soon.

The amount of MSW generated is increasing tremendously and at significant rate. Kuala Lumpur, Johor and Selangor are the top three ranked in MSW generation. In Kuala Lumpur alone, presently the generation of MSW is about 3000 ton/day. From that, about 2000 ton/day of MSW arise in Kuala Lumpur is compacted at Taman Beringin Transfer Station (located at Jinjang) before disposed at Bukit Tagar Sanitary Landfill (BTSL) which located at Batang Berjuntai. BTSL is the largest sanitary landfill in Malaysia, with a built-up area of 1700 acres, operating capacity of 2000 ton/day. It was commenced in 2005 with capital cost of about RM200 million [5].

Despite the aggressive economic development in Malaysia, the solid waste management is relatively poor and haphazard. Local authorities spend up to 60 per cent of their annual budget on waste management, which costs Malaysia between RM110 and RM130 to collect and dispose one tonne of garbage. That sums up to RM1.98 million to RM2.34 million per day or RM854 million per year at the current generation of 18,000 tonnes of solid wastes per day [6].

Thus, the amount of solid waste management in Malaysia and cost to handled it has put pressure on local authorities making them continually seek new management strategies to deal with these wastes generation i.e. demand management, as well as, find new sites for landfill i.e. supply management [7]. Consequently, all local authorities identified facing acute problems in the collection and disposal of MSW and these mainly related to shortage of adequate funds, manpower problems, lack of disposal sites, absence of good management systems and lack of expertise [7].

It is the intention of waste generation in Malaysia is increasing at an alarming rate, thus requiring a prompt solution to the problem. The most practical solution appears to be incineration technology. Therefore in the future, incinerator really needed and will become one of the best practical choices in treating municipal solid waste in Malaysia.

There are currently hundreds of proposals to build incinerators especially in Africa and Asia. However, in Malaysia, incineration is not widely used, as it is still considered as an expensive means of waste disposal. Therefore, since the Seventh Malaysia Plan, the Malaysian Government has recommended the use of incineration in and has since been promoting its use. However, the government needs to study in depth the current scenario on the usage of incinerators and the public sensitivity towards the incineration process. Apart from that, due to the different characteristic of wastes and weather patterns in Malaysia compared to other developed countries like Japan and Europe, imported technology might not be suitable for the Malaysian condition; this has given rise to studies to develop incineration technology that is more suitable for municipal solid waste in Malaysia. Normally, Malaysian solid wastes contain very high organic waste and consequently high moisture content and bulk density.

2. Advantages and disadvantages

Use of incinerators for waste management is controversial. The debate over incinerators typically involves business interests (representing both waste generators and incinerator firms), government regulators, environmental activists and local citizens who must weigh the economic appeal of local industrial activity with their concerns over health and environmental risk [3]. From environmental aspect for example, on July 28, 2000, environmental activists from 12 Asia-Pacific nations launched WASTE NOT ASIA - the region's first alliance to oppose the expansion of waste incineration technologies and promote ecological methods of waste management.

Accordingly, incineration plays an important role in reducing waste volume and may also recover energy. Incinerators reduce the solid mass of the original waste by 80–85% and the volume (already compressed somewhat in garbage trucks) by 95-96%, depending on composition and degree of recovery of materials such as metals from the ash for recycling [3]. After incineration, what's left of the waste is 10% of ashes that need to be disposed of in the landfill. This reduces the use of land and is much safer than the conventional way. Compared to landfill, the advantages of incinerator (with energy recovery) are typically the environmental benefits such as lower carbon emission, avoidance of land contamination, higher energy recovery per ton, outputs of ashes in inert form,

(chemically stable without odour) and requires a minimum area of land. The produced residues, ash and slag as well as the developed flue gases, are odour-free compared to the partly offensive smells caused by dumps [5].

Economically, the benefits are the location which can be near to city and land value with less depreciation unlike landfill. Furthermore, incineration plants can be located close to residential areas, which are the centres of the production of waste, and this helps to reduce the volume of traffic, pollution, noise and of course the costs for the waste transportation. In addition, incineration plants can be in operation 24 hours a day which allows for increased net garbage disposal per day. They also can operate in any type of weather unlike other methods where bad weather can shut down the operation.

Moreover, incineration has particularly strong benefits for the treatment of certain waste types in niche areas such as clinical wastes and certain hazardous wastes where pathogens and toxins can be destroyed by high temperatures. The heat produced by an incinerator also can be used to generate steam which may then be used to drive a turbine in order to produce electricity. The typical amount of net energy that can be produced per tonne municipal waste is about 2/3 MWh of electricity and 2 MWh of district heating [8]. Thus, incinerating about 600 metric tons (660 short tons) per day of waste will produce about 400 MWh of electrical energy per day (17 MW of electrical power continuously for 24 hours) and 1200 MWh of district heating energy each day [9]. In addition, the odours and rodents that are present in other methods are not a problem when using incineration as a garbage disposal method.

However, incinerators emit varying levels of heavy metals such
as vanadium, manganese, chromium, nickel, arsenic, mercury, lead and cadmium. Many of these pollutants are carcinogenic and threaten public health even at very low levels. The toxic impacts of incineration are far reaching as well: for examples, persistent organic pollutants (POPs) such as dioxins and furans travel thousands of miles and accumulate in animals and humans. Many of these pollutants also enter the food supply and concentrate up through the food chain [9].

In addition, incinerator workers and people living near incinerators are particularly at high risk of exposure to these contaminants. Increased cancer rates, respiratory ailments, reproductive abnormalities and other health effects are noted among people living near some incinerators, according to scientific studies and surveys by community groups. Contaminants are also distributed when food produced near incinerators is shipped to other communities [8].

Although the process of incineration is simple, the machinery that drives the process is not. If something goes wrong with the incinerator and maintenance is required, repairs can become very costly. Since incineration is still a relatively new mode of disposal, the machinery is still in its developmental stages and is being improved and will continue to be improved in the future. An incinerator also requires fewer employees to operate it than a municipal landfill and must also be trained and are usually paid more than employees at a landfill.

Incineration also undermines zero waste practices such as recycling and composting, which close the loop on materials efficiency and conserve energy spent on resource extraction and processing. The reason is people's efforts to avoid waste production are minimized when they know that that their waste is burnt in an incineration plant.

Finally, from the economy perspective, the air pollution controls required in incineration plants are extremely expensive. Very often up to one half of the costs of a plant are due to air pollution control facilities. As the laws can change and maybe require updates in the air pollution controls this could lead to much higher costs in the future.

IV. CONCLUSION

Solid waste management has become a critical issue in Southeast Asia including Malaysia since the most popular form for waste disposal still employs open dumping. But, presently, incineration is often touted as one of the best alternative to land filling because this method solves many of the problems so common to other methods of municipal. However, the idea of using incinerators to deal with it has met with string resistance because of concerns about pollution from toxins and fly ash.

Recently, new incineration technology makes it possible to treat municipal and hazardous waste with minimal pollution while generating renewable energy at the same time. Thus, many countries including Malaysia and Singapore are being swamped with proposals for waste incinerator plants. Singapore alone has four incinerator plants - Ulu Pandan Refuse Incineration Plant, Tuas Incineration Plant, Senoko Incineration Plant and Tuas South Invineration Plant will have the capacity to incinerate 8,200 tonnes of refuse daily [10].

In Malaysia, incineration is a topical subject as government presses ahead with plans to build various incinerators in Malaysia to deal with waste problem. However, in Malaysia there are concerned of experts and local community disquiet about the health and environmental impact of incinerators. Since the government of Malaysia launched an incinerator for solid waste in the early 90s, it has become a controversial issue. Selection of landfill sites has become increasingly difficult because the public is highly concerned about health and environmental issues, such as the nuisance of odor, the emission of greenhouse gases, the contamination of groundwater, explosion risks and generally, unsightly appearance of sites

Hence, some people are still concerned about the health effects of dioxin and furan emissions into the atmosphere from old incinerators which experienced by other country; especially during start up and shut down, or where filter bypass is required. Thus, public opposition to incineration is growing such as in Broga, Semenyih, Selangor where the incinerator project has since been terminated by court decision because of lawsuit by residents of the two towns [11]. Therefore, the advantages and disadvantages of this method need to study properly before installing such system in Malaysia

REFERENCES

[1] Kleis, Heron and Dalager, Søren (2004). 100 Years of Waste Incineration in Denmark.

[2] Knox, Andrew (February 2005). "An Overview of Incineration and EFW Technology as Applied to the Management of Municipal Solid Waste (MSW)" (PDF). University of Western Ontario.

[3] "Waste to Energy in Denmark". Ramboll. (2006).

[4] Danish Energy Statistics 2005. Danish Energy Authority. (9 January 2007).

[5] Jaron Keng Zi Xiang. (Tuesday, 10 April 2012). Secretary Malaysia Green and Blue Environment. Protection Society Incinerator for Municipal Solid Waste in Kuala Lumpur.

[6] Mansor, W.G., (1999). Waste Prevention: A Consumerist Approach to Waste Management: Paper presented in EPSM Seminar on Local Communities and the Environment March, 27, 1999.

[7] Malaysian Ministry of Housing and Local Government. (1988), Action plan for the beautiful and Clean Malaysia (ABC Plan) Kuala Lumpur.

[8] Waste incineration – A potential danger? Bidding farewell to dioxin spouting" (PDF). (September 2005). Federal Ministry for Environment, Nature Conservation and Nuclear Safety.

[9] van Steenis, Dick (31 January 2005). "Incinerators – Weapons of mass destruction?" (DOC). RIBA Conference.

[10] National Environmental Agencies of Singapore. (22 November 2000). New Features In Singapore's Largest And Newest Incineration Plant.

[11] S ashi Ambi (April 2, 2006), Burn, Broga, burn..., New Straits Times..