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An Analysis of Kashan Municipal Solid Waste, Iran

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Abstract: Solid waste are important environmental issue in the now new world. Science the proper management of municipal solid waste needs suitable statistical data. This study ordered to determine quantity and quality characteristics of municipal solid wastes generated in Kashan, Iran. This study was done in April 2014-April 2015. Due to standard instructions, one sample per month prepared and analyzed. The results showed 223.3 ton solid waste are generated in average per day. The results revealed that Kashan's municipal solid wastes composed from 75.5% putrescibles, 11.04% plastic, 4.47% study, 3.71% glass, 2.22% textile, 1.28% metals, 0.57% soil, 0.66% wood and 0.55% others. The solid waste generation per capita in the Kashan was 637 g/cap/day and the average of solid waste density in transfer station was 194 kg/m ^{3}. So, waste separation at generating point and composting method will decreased the Kashan environmental pollution and solid waste can be easy and better management.

Key words: Solid waste, municipal waste, quantitative waste, qualitative waste, Kashan

INTRODUCTION

Municipal solid wastes and their distribution in the environment are one of the most important problems for human being. Unfortunately, the problem is wider by increasing in population (Lagrega *et al.,* 2010). The generation rate and physical composition of solid waste such as putrescible, plastic, study, glass, textile and metals are depending on different factors. These differences are varying in different locations (Ahmed and Ali, 2004).

As a result, the quality and quantity of solid wastes are different. Factors such as geographic, location, seasons of the year, collection frequency, economic situation and customs are effective on quality and quantity of solid waste (Hester and Harrison, 2002). Quantitative and qualitative investigation of municipal solid wastes for establishing a solid waste collection management system is among methods for controlling of solid waste generation. Finally, based on these methods we can concentrate more on environmental issues and prevent environmental pollutions (Zarrabi *et al.,* 2013). Due to qualitative and quantitative variety of solid wastes, irregular development of urbanization and lack of suitable technology, solid wastes became a complicated difficulty for our society.

This problem can be solved only by an appropriate management (Amoah and Kosoe, 2014). Essential points in this management are including less generation of solid waste, optimization of technology, health education and promotion of public awareness (Damghani *et al.,* 2008).

Recycling is one of the best points in solid waste management. Now a days, a significant portion of municipal solid waste recycles in many countries (Badran and El-Haggar, 2006; Tin *et al.,* 2006). In Iran now days many different projects have been done for assessment of solid waste recycling (Damghani *et al.,* 2008; Zarrabi *et al.,* 2013; Nazem and Abduli, 2008).

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In 2003, the economic justification of recycling accomplished in the country that tacked into consideration for next massive recycling projects (Walls, 2003). The interesting point is that the appropriate management of hygienic solid waste disposal is possible only by performing variety of researches in different fields of solid waste collection, transportation and disposal (Shekdar, 2009).

So, due to this fact that quality and quantity of solid wastes are based information for management. In this study, quantitative and qualitative proportion of solid wastes in Kashan was studied.

MATERIALS AND METHODS

This study was done with collected samples of solid wastes transfer station from the April 201 4 up to April 2015. One sample per month took and analyzed based on standard instructions (Creswell, 2013). The desired amount of solid waste kept in a place without interfering of wind and environmental factors. For solid waste density measurement, 0.5 m^3 of solid waste placed in aerometer and then different type of materials separated and kept in different plastic bags. Afterward, the obtained separated materials weighted and their percentage and densities calculated.

To obtaining the solid waste generation per capita of the community, precise population information is needed. So, the population information of Kashan acquired from health center. Then by dividing the rate of generated solid waste by population, the solid waste generation per capita calculated.

RESULTS AND DISCUSSION

The first step of an appropriate solid waste management is determination of quality and quantity of solid wastes (Tatsi and Zouboulis, 2002). In other word, solid waste analysis is necessary for selection of suitable technology and appropriate design (Shekdar, 2009). The quantity and quality of municipal solid waste generated in Kashan are shown in Fig. 1. Based on the results of physical analysis putrescible were the most constitutive material in the solid waste 75.5% and recyclable materials are also in second grade about 16.08%.

Science the population of Kashan City in 2015 was about 350,000 and average solid waste was generated 223.3 tons per day. So, capita of solid waste in 2015 was about 638 g/day/person. The highest density of solid wastes was related to summer season that the average rate for the mentioned season was 206.63 kg m^3.

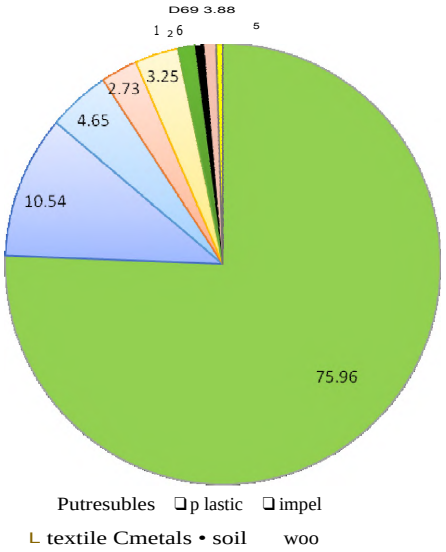

Fig. 1: Municipal solid waste generation in Kashan, Iran

In the other hand, lowest average of density was related to winter season with 186.46 kg/m^3. Quantitative investigations showed that in Kashan City, the highest rate of solid waste generation was related to summer season with average of 200 tons day^{-1} and lowest rate of solid waste generation was related to winter season with 173 tons day^{-1}. Quantitative investigation on Kashan's solid waste clearly showed that the capita of 638 g day^{-1} in 2009 that compare with 2002 412 g day^{-1} considerable increased in Kashan' s.

This change seems to be related to promotion of public health and economic improvement. Many studies have been done to survey capita of waste generation in own country. In USA the average generation of solid waste is 2000, 1 000 g/cap/day for Germany and 657 g/cap/day for Iran. It seems the economic situation in these countries made difference in the rate of solid waste generation. Physical analysis of Portugal's municipal solid wastes on 2002 showed that they are composed of 33-41.5% putrescible, 17-27% study, 3-5.5% textile, 10-14% plastics, 2% metals, 3.5-6.5% glass and 0.7% wood.

According to studies in Hamedan (2009), the amount of solid waste generation 15921.27 kg per year (Kulivand *et al.*, 2009).

Another study showed that solid wastes of Rash City composed of 88.4% of putrescible materials (Moghadam *et al.*, 2009). Solid waste composting is a good solution for disposal the type of putrescible solid wastes and Kashan's solid waste too.

Decreasing environmental pollution and expensed money for disposal of solid wastes are benefits of this

method (Yarmohammadi *et al.*, 2016). Also, common problem in current methods such as odour, insects, waste leachate and ground water pollution are not applicable in production of compost fertilizers. Because of non-degradability of plastics in the nature and causing environmental problems such as destroying of soil microorganism, prevention of soli breathing, etc.

It seems recyclable separation at the generation point is the best solution for plastic disposal. Also, the rate of 4.47% of studys in the solid wastes showed that with recycling programs at educational institutes and offices, felling of thousands trees can be prevented.

CONCLUSION

This study was done to determine quantitative and quality characteristics of Kashan municipal solid wastes generated. Per capita waste generation for this city was about 638 g/day/person in2015. As well as we found by establishing recycling facilities and recycling at generating point and applied composting method seems to be the best method for management of Kashan's solid wastes due to high putrescible components and from this way many Kashan environmental problems decreased significantly. Recomended effects of administrative interventions on improvement of health in workplace, must be done insolid waste management (Ebrahimi *et al.*, 2016).

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