Advanced Science and Technology Letters
Vol.136 (ITCS 2016), pp.30-32
http://dx.doi.org/10.14257/astl.2016.136.08

Reduction Treatment of Food Waste with Malodor in Korea

Il-ho Kim[1, 2], Hyun-dong Lee[1, 2], Jai-yeop Lee[1]*

1: Korea Institute of Civil Engineering and Building Technology, 283 Goyangdae-Ro, Ilsanseo-Gu, Goyang-Si, Korea
2: University of Science and Technology, 217 Gajeong-Ro, Yuseong-Gu, Daejeon-Si, Korea
pas2myth@kict.re.kr*

Abstract. Following the ban of dumping food wastes to ocean, Korean policy and industry have been tending to convert the waste into resources such as composts, livestock feed and fuels. However, the treatment of malodorous compounds generated in these recycling processes remain to be effectively solved. Among the five categories introduced for malodor reduction, adsorption and combustion of microorganisms were recommendable technologies, acting on 22 compounds regulated in Korea. As the by-products of the treatments have high energy level, there is considerable potential of energy production as a resource.

Keywords: food waste, malodor, treatment, Korean policy and regulations

1 Introduction

The London Convention which banned ocean dumping of food waste, thereby totally banning ocean dumping of all wastes, is also incorporated to domestic policy of South Korea from 2014. The amount of food waste generated in South Korea was 12,663 tons/day in 2013, which took about 25.9 % share of the whole life waste amount. The food waste share has been increasing between 2003 and 2008, reaching the peak of 29.1% in between, and after 2008, it showed slight decrease [1]. The post treatment method has been the main policy of South Korea. But the present policy for food waste is promoting food waste generation reduction. The relational department and Korean government, together, prepared 'the comprehensive countermeasures for reduction of food waste' in 2010. Besides, the volume-rate garbage disposal system has been expanded to apartment complex since 2013.

Policy and industries of Korea are tending to use food waste for resources such as composts, livestock feed and fuels. However, the malodors arising from decayed food in the process of turning the wastes into resources, are serious issue to look solution for. The Minister of Korea endorsed regulations against generation of 22 malodor compounds, which release stink smell even at low concentration. Based on previous studies, applicable treatment of these compounds of concern are listed.

ISSN: 2287-1233 ASTL

2 Reviews and Discussions

There are five main categories of food waste malodor reduction methods; namely, chemical cleaning, oxidation, adsorption, combustion microorganisms and deodorant agent spraying. Table 1 illustrates that adsorption and combustion of microorganisms are appropriate techniques to treat all the compounds [2]. Recently, detailed technologies which combined catalysis, ozone injection and electrolysis have been developed [3~5]. These technologies should be reviewed to fit to Korean guideline on recycled resources production.

Table 1. Treatment technology of main malodor compounds and application (The Ministry of Environment of Korea, 2015)

Substance	Chemical Formula	○: exactly appropriate, △: treatment-able, ×: unsuitable					
		liquid chemical cleaning	ozone oxidation	Adsor-ption	Comb u-stion	Micro-organism deodor iz-ation	deodorant agent sprayi ng
ammonia	NH_3	○	○	○	○	○	○
methyl mercaptan	CH_3SH	○	○	○	○	○	○
hydrogen sulfide	H_2S	○	○	○	○	○	○
dimethyl sulfide	$(CH_3)_2S$	○	○	○	○	○	○
dimethyldisulfide	CH_3SSCH_3	○	○	○	○	○	○
trimethylamine	$(CH_3)_3N$	○	○	○	○	○	○
acetaldehyde	CH_3COOH	○	○	○	○	○	○
propionaldehyde	CH_3CH_2CHO	×	△	○	○	○	×
n-butyraldehyde	$CH_3(CH_2)_3CHO$	×	△	○	○	○	×
i-butyraldehyde	$(CH_3)_2CHCHO$	×	△	○	○	○	×
n-valeraldehyde	$CH_3(CH_2)_3CHO$	×	△	○	○	○	×
i-valeraldehyde	$(CH_3)_2CHCH_2CHO$	×	△	○	○	○	×
i-butanol	$(CH_3)_2CHCH_2OH$	×	△	○	○	○	×
ethyl acetate	$CH_3CO_2C_2H_5$	×	△	○	○	○	×
methyl isobutyl ketone	$CH_3COCH_2CH(CH_3)_2$	×	△	○	○	△	×
toluene	$C_6H_5CH_3$	×	○	○	○	△	×
styrene	$C_6H_5CH=CH_2$	×	○	○	○	△	×

xylene	$C_6H_4(CH_3)_2$	×	○	○	○	△	×
propanoate	CH_3CH_2COOH	○	○	○	○	○	○
n-butyric acid	$CH_3(CH_2)_2COOH$	○	○	○	○	○	○
n-valeric acid	$CH_3(CH_2)_3COOH$	○	○	○	○	○	○
i-valeric acid	$(CH_3)_2CHCH_2COOH$	○	○	○	○	○	○

This study reviewed the present state of policy and recently developed technologies to treat food waste and the associated malodorous substances. The technologies applied for reduction of malodors are also evaluated, but the techniques are focusing only on weight reduction and substances generated. One should, therefore, consider in the prospective of altering energy producing resources, especially at the beginning of the treatment process. The by-products also have high chemical energy level; thus, they could be useful resources to be used as energy supply for relying on import trade.

Acknowledgement. This work was supported by the Seoul Business Agency R&BD Program (PS150004).

References

1. The Ministry of Environment of Korea, Environmental Statistics Year book, 2013.
2. The Ministry of Environment of Korea, Guidebook of Bio-gasification facility from Food Waste Malodor, 2012.
3. Kim, H., Deodorization apparatus of food and drink treatment, KR Patent 10-1308156, September, 2013.
4. Kim, S., Advanced air deodorizer, KR Patent 10-0843986, June 30, 2008.
5. Shim, S., Kim, S. and Park, C.: Deodorization module and food waste treatment apparatus having the same, KR Patent 10-1215196, December 17, 2015.

