PB21) Seasonal Variation Characteristics of Odor in Fishery

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1. Introduction

Odor, as used in Offensive Odor Control Law, means ammonia, methyl melcaptan and other substances as likely to cause unpleasant smell and disrupt the living environment. Undesirable odors contribute to air quality concerns and not only affect human lifestyles but also cause headaches, dizziness and queasiness, even lead to more serious disease. In Fish processing, odors are the most objectionable emissions and become a social issues. Generally, the fish in the by-products segment is causing more odor problems and consist primarily of ammonia(NH_3), hydrogen sulfide(H_2S) and trimethylamine(TMA). In addition, More than 1000 of odor complaints are happened from Industrial Complex in Korea reported by Korean Ministry of Environment, especially on July and August in 2006. In Yeosu, an amount of odors are emitted from Fishery Industrial Complex and have seriously affected the normal life of local people. In this study, we attempted to investigate on the analysis of seasonal variation characteristics of odor in fishery.

2. Materials and Methods

There are many different methodologies in use for odor analysis and two of them are used in this study, air dilution olfactory method and instrumental analysis method. In case of air dilution olfactory method, the Tedlar Bag is filled under the odor sample is collected using a vacuum pump into the bag by the pressure difference between the inside and outside and human nose as the odor detector had been used. For instrumental analysis method, we based on such as the GC/FPD, HPLC/UV instruments for odor quantitative analysis. In addition, samples are collected in spring, summer and fall, twice in each season. Six boundary sites(O-1 to O-6) are located at the crossroads of Fishery Industrial Complex and two complaints sites(O-7, O-8) we selected as the representative sites. Twenty-two kinds of odor compounds which will be designated as odor compounds by Korean Ministry of Environment until 2010 as the research object are determined.

3. Results and Discussion

Fig. 1 shows the variation of odor dilution threshold in different seasons at sampling sites. A higher dilution threshold was observed in spring than any other seasons and the data measured at O-6 was significantly higher even over than the limit(20) of Odor Prevention Law 10 times and 4 times in spring and summer, respectively, showd the randomicity and instantaneity of odors. Odor concentration derived from instrumental analysis over each season was summarized in Table 1. For ammonia concentration, the value of spring we measured is higher than others. As is well known, odor concentrations are greatly influenced by many factors such as time, wind direction and some direct and indirect sources. So the high concentration phenomenon showed in spring can be attributed to the impact of sampling conditions. The relationship between odor concentration and odor dilution threshold are shown in Fig. 2. The correlation coefficient(R) value of logarithmic linear is 0.82. In other words, the odor concentration is highly correlated with odor dilution threshold.

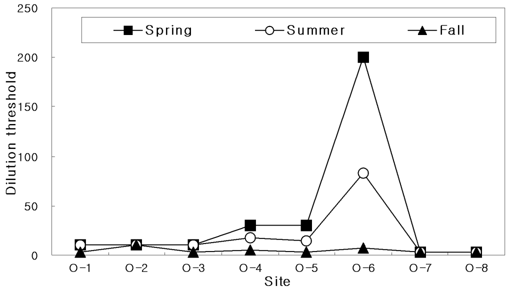

Fig. 1. The variation of odor dilution threshold in different seasons at sampling sites.

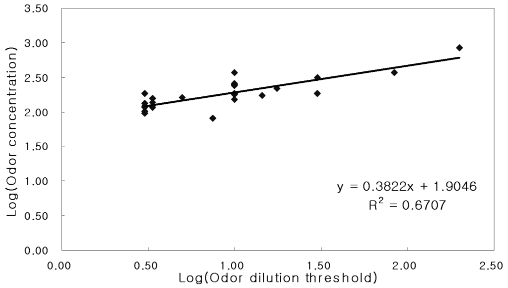

Fig. 2. Relationship between odor concentration and odor dilution threshold.

Table 1. Average odor concentration in each season at the sampling sites.

	Average odor concentration at boundary sites			Average odor concentration at complaint sites		
Compounds	Spring	Summer	Fall	Spring	Summer	Fall
Ammonia	124.5	89.2	60.6	85.6	54.7	60.0
Hydrogen sulfide	0.1	0.4	0.4	ND	ND	ND
Methyl mercaptane	0.3	ND	0.4	ND	ND	ND
Dimethyl sulfide	0.1	0.1	ND	ND	0.1	ND
Dimethyl disulfide	0.1	0.1	0.1	ND	ND	ND
Acetaldehyde	1.5	8.0	8.4	1.3	4.7	11.4
Propionaldehyde	0.8	0.9	0.1	ND	0.7	ND
Butylaldehyde	0.6	1.2	0.9	0.4	0.8	1.2
i-Valeric aldehyde	ND	ND	ND	0.8	ND	ND
n-Valeric aldehyde	ND	2.3	0.3	ND	1.4	0.2
Trimethylamine	3.7	1.7	0.9	1.3	0.7	0.1
Stylene	0.1	0.3	0.1	ND	3.0	ND
Toluene	2.6	8.5	3.1	4.5	8.8	1.9
m,p-Xylene	0.1	0.7	0.9	0.2	1.3	0.5
o-Xylene	0.1	0.2	0.3	0.1	0.4	0.2
Methyl ethyl ketone	0.2	0.3	1.8	0.2	0.9	0.6
Methyl isobuthyl ketone	ND	ND	0.4	ND	0.1	0.1
Butyl acetate	ND	0.1	0.1	ND	0.5	0.1
i-Butanol	ND	ND	ND	ND	ND	ND
Propionic acid	ND	ND	ND	ND	ND	ND
n-Butyric acid	ND	ND	ND	ND	ND	ND
n-Valeric acid	ND	ND	ND	ND	ND	ND
i-Valeric acid	ND	ND	ND	ND	ND	ND

Acknowledgements

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