

# Odor Pollution Control Regulation and Measurement in China

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## Abstract:

This paper mainly introduces odor pollution management in China which can be divided into national emission standard of odor pollutants and local emission standard of odor pollutants. It also describes the enactment procedure of the emission standard and its characters. Meanwhile it recounts the found, generalization and improvement of odor measurement in China.

It has been more than twenty years since Chinese began to study on odor pollution control at eighties last century. At that time, reform and opening was conducted in our country, and industry agriculture and commerce developed very fast, especially for food chemical and pharmacy. As the introduction of new chemical synthesized product, the establishment of urban basic facilities like wastewater treatment plant and landfill plant an the improvement of people's living standard and culture level, people complain for odor pollution which accidentally occurs in cities. Meanwhile for water areas, the eutrophication of lake and sea also caused odor pollution in some regions. In that time there is no method to measure and response the actual status of odor pollution, and no relevant rule or standard to manage and control the pollution effectively. This circumstance called the attention of some institution of environmental science in China like TianJin Academy of Environment Protection Science. The technicians in the academy read and translated a lot of document and information on odor pollution study, analysis, measurement and control technology in abroad. They published the theses on opening magazines and introduce the knowledge to people. Meanwhile, there were some scientist who went to abroad study the relevant scientific theory on odor pollution and some foreign experts who came to China to introduce the relevant theory rules and standard. Undoubtedly, it has greatly accelerated the development of odor pollution control rules and standards in China.

The environmental management department of Chinese government, i.e. National Environment Protection Bureau paid great attention to this circumstance, investigated the odor pollution status in national or abroad, and analyzed the influence of odor pollution to people's production action and life. Some local environment management department in China and the EPB in every city all paid attention to odor pollution people complained. Especially TianJin EPB, they organized the relevant scientist in TianJin Academy of Environment Protection Science to study document on odor pollution in abroad and organized relevant task study on odor pollution, e.g. the task of odor standard study, and establishment of emission standard of odor pollutants. TianJin Science Committee also

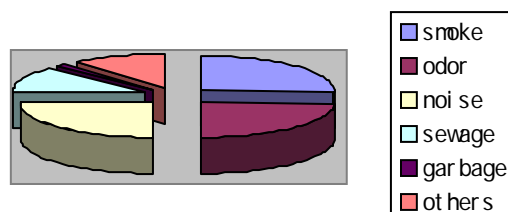
offered great support, and helped to introduce some foreign experts who study on odor pollution. For example, the former standing director of Japan Odor Study Association, Mr. Yixikulo kiyo had visited China several times, held lectures and training classes, and introduced the relative information and its developing trend. These had greatly improved the study on odor pollution in TianJIn and in China.

## 1. Odor Pollution Control Standard in China

TianJin Academy of Environment Protection Science had begun the study task on *odor standard study and enactment of emission standard of odor pollutants in TianJin* since Mar. 1987. Firstly, they investigated the odor pollution status of TianJin China. The investigation methods are as following.

### 1.1 Investigation on people’s complaint letters and visit

From 1987, we visited People’s Congress, Politics Negotiatory Conference and Environment Protection Bureau in TianJin, its six districts incity and three districts along the sea during about half a year. The whole journey is about 2,000 kilometers, and 3,080 complaint letters that were received during the 5 years of middle eighties had been investigated. As the difference of knowledge, lives standard and career of the visitor, they concerned environmental pollution in different aspects and different depth. We had read analyzed and classified these letters carefully, and checked some of the complaint on situ. Then we selected the representative letters complained odor pollution, analyzed the formation of odor pollutants people complained in TianJin, and drew *proportion figure of smoke, water and odor people complained in tianjin*. We divided more than a hundred of odor pollution sources into ten industries namely chemistry, food, paper making, pharmacy and so on.



**Figure 1 proportion figure of smoke, water and odor people complained in tianjin(1)**

From the complaint letters of the 5 years, we found that the main environment problem people complained were smoke noise and odor pollution. In some districts, this complaint letters about these three pollution is up to about 80%~90%.

### 1.2 Questionnaire investigation

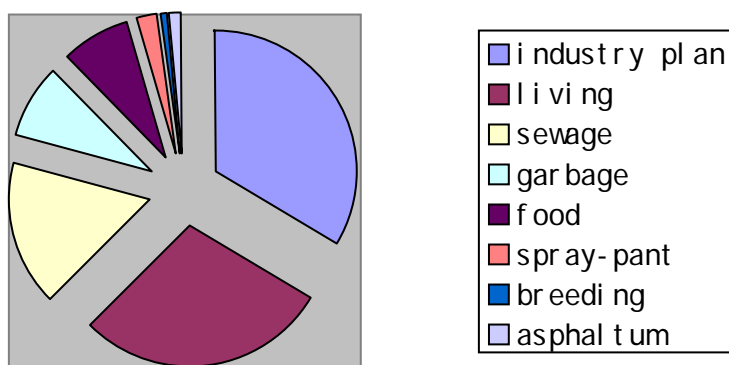
We sent 1962 pieces of questionnaire about ambient odor pollution to 1692 members of 103 street offices in the six districts incity, and received 1642 pieces, the recycle rate is 97.1%. Using questionnaire to investigate odor pollution source and odor pollution status has the following characters: broad investigation extension, large covering area (the incity area of TianJin is about 200 sq.km.), large population been investigated and people

considering their own benefit all filled the questionnaire actively and veritably, so the information we got is true and complete, and the amount of the information and data is quite large. In the recycled 1642 pieces of questionnaire, there were 1319 pieces complained about odor pollution, the proportion was about 80.3%. In the complained odor pollution source, the amount of industry odor pollution source equaled with living odor pollution source. Through this investigation, we not only checked the particular odor pollution source but also confirmed the area and population exposed in odor.

### 1.3 Archives investigation

We investigated 1965 archives on environmental protection of 11 main industry bureau and their affiliated companies, then selected the industries associated with odor pollution.

The distribution and category of odor pollution source in TianJin



**Figure 2 distribution and category of odor pollution source in TianJin9(2)**

Through large investigation, we found that::

- (1) There indeed was odor pollution in TianJin, and in some districts it was quiet serious. People complained ambient odor pollution more and more.
- (2) Odor pollution existed in every district, but the two industry districts were a little more serious.
- (3) It is necessary to enact odor emission standard. In the investigation, some environment protection workers complained that due to the lack of standard there was no regulation to guide odor pollution management and control, and there was no rule to restrict odor pollution source. There was reason why odor pollution problem is hard to be resolved.
- (4) We should begin the study on odor pollution measurement actively. Language can't reflect odor pollution status quantitatively. To reflect odor pollution status objectively and authentically, we have to measure odor pollution and its source.

*TianJin emission standard of odor pollutants* was enacted on 1990, and the revised edition was enacted on 1995 (DB12/-059-95).

In this standard, we stipulated the restricted value of 5 main odor pollutants (ammonia, sulfureted hydrogen, methyl mercaptan, dimethyl sulphide, trimethylamine). The restricted value includes environmental restricted value (unorganized emission ) and organized emission restricted value.

At the end of eighties, our odor pollution laboratory enacted TianJin emission standards of

odor pollutants. It drew the attention of the relevant leaders of National EPB. On 1990, standard department of National EPB admitted to found the study task of *national emission standard of odor pollutants* to enact national standards. We studied three years on this task and enacted *national emission standard of odor pollutants*. We investigated the odor pollution source and status at 14 key provinces and metropolises in China, analyzed the main pollutants in China and stipulated the standard restricted values by the same way of investigating TianJin's pollution source and enacting TianJin emission standard of odor pollutants.

The basis to select main odor pollutants:

1 main odor pollutants emitted by industry. Main odor pollutants means that there are a lot of pollution sources, the emission amount is large and the exposing area is large. Some of the odor pollutants don't have a lot of pollution source and large amount, but they represent a particular industry and also should be stipulated as main odor pollutants.

2 the odor pollutants people complained frequently.

3 The odor pollutants which can be collected and analyzed by the environment protection department in province, cities, district, and country through the current technology.

4 We should establish relevant control technology for odor pollutants which stipulated to be controlled. The purpose of the standard is to offer technology support to environment protection management, and the purpose of environment protection management is to control odor pollution source and reduce odor pollution. If there is no proper control technology, the above purpose is hard to fulfill. So it is very important to own the relevant control technology.

Some questions should be explain for *national emission standard of odor pollutants*:

1 through questionnaire investigation, investigation on complaint letter and visit, and investigation on key odor pollution source of 14 key provinces and metropolises, the main odor pollutants selected are ammonia, sulfured hydrogen, methyl mercaptan, dimethyl sulphide, dimethyl disulphide, carbon disulphide, trimethylamine, styrene. Adding odor concentration, there are nine control items.

2 according to emission character of odor pollutants, there are unorganized emission restricted value and organized emission restricted value stipulated in *national emission standard of odor pollution*. For unorganized emission, atmosphere environment is divided into three types according to *China control law of atmosphere pollution*. Restricted value of every odor pollutants is stipulated according to these three types. For the second type and the third type, two restricted values are stipulated for the industries already existed and the new expand and rebuild industries respectively. For organized emission, restricted values are stipulated by the height of emission chimney. The height of organized emission chimney should be equal or more than 15 meters.

3 through our investigation, we found that there is unorganized emission in almost all the organized industry. So every odor pollution industry should abide to both the two kinds of restricted values.

4 the industry that emits the eight stipulated odor pollutants should not only fulfill the eight restricted values but also should fulfill the requirement of odor concentration.

5 this standard is also suitable for odor pollutants emitted by sewage draining plan. Its odor concentration must be equal or less than the restricted value of boundary concentration.

6 restricted values of both single odor pollutants and compound odor pollutants have been stipulated in *China national emission standard of odor pollutants* (GB14554-93). It is suitable for actual odor pollution status and is very convenient to apply to real measurement and control project.

## **2. Odor pollution measurement in China**

Odor pollution measurement and identification is a key and difficult matter for odor pollution study management and control. Odor pollutants are mainly complex compound with multi-component and low concentration. From the eighties last century, we began the study on odor measurement and odor identification from two ways. The identification technology of odor pollutants mainly depend on the development of analysis instrument, reference substance and reference gas. It no doubt that during the development of analysis instrument and reference gas, the identification technology on odor pollution will greatly improve. It is very beneficial for the development of understanding of odor pollution and its control technology.

However, odor pollution is people's olfactory sense, namely the stimulus to people's olfactory organs. So odor pollution is smelled by people's olfactory organ. The analysis measurement only shows the components and concentration of odor pollutants. To reflect odor pollution degree to people's lives environment, we should use olfactory measurement, namely measure odor pollution and its source by human's olfactory organs.

At the very beginning, we planed to adopt injection method to measure odor pollution. But we found that in that way the collecting volume is too small to be used for compare, and due to the absorption in its grinding part, the result is quite lower. However, it has practical usage in some extent because of it simply convenient and less investment.

At that time, the development of olfactometer was not mature and it was very expensive. According to the status of odor pollution measurement, we choose the triangle bags method. Thank for the help and support of Mr. Yixikulo kiyo, we mastered this method in a short time. Now triangle bags method which created by Tokyo institute of environment protection, has been widely used in China during the twenty years, and has been written in *China national emission standard of odor pollutants* (GB14554-93) as the main odor measurement method recommended. At present, triangle bags method has been use in environment protection departments and industries in more than thirty provinces and metropolises, especially the developed zone along sea. According to incomplete statistic, the training classes held for introducing triangle bags method are more than thirty times, and there were about one thousand people had been trained. In China, the panel members all have their certificates. Now there are about 300 trained panel members and about 30 trained judges.

Our State Key Laboratory of Odor Pollution Control has conducted more than 1000 times measurement to more than 100 plans in our work. We have study about 10 study tasks using triangle bags method and gotten ten thousands of measuring results. If every result need 6 peoples observes, there are one hundred thousands people attended olfactometry. If we calculated the measuring results and attended people in China by that way, the values are more significant.

So we must see that triangle bags method is not only a measuring method, but also an important form to propagandize odor pollution knowledge to people and call on them to

attend in environment protection work.

Reference:

- (1) Shi Lei et al.; Summary on Odor Pollution Study (in Chinese);2002;p42
- (2) Shi Lei et al.; Summary on Odor Pollution Study(in Chinese);2002;p46