Odor Regulation and Odor Measurement in Japan

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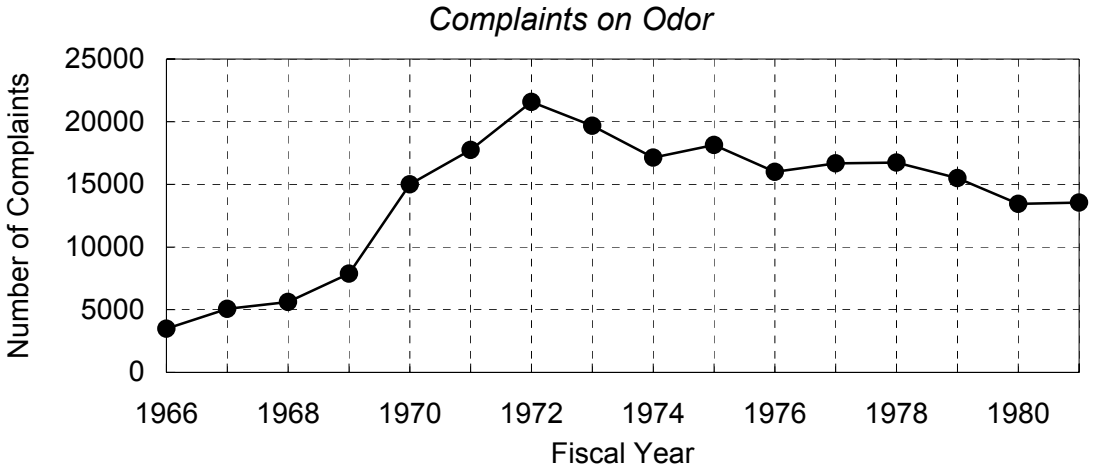
Abstract
The Offensive Odor Control Law, which enacted in 1972, introduced an instrument measurement method on each substance. The number of complaints on offensive odors, especially from factories and livestock farms, has gradually declined. However, the number of complaints on offensive odors of service industries has been increasing. It is difficult to apply the instrumental odor measurement method to odors from those service industries. The 1995 Amendment to the Law introduced olfactory measurement using “triangular odor bag method” and obliged local government to contract with certified operators when they commission olfactory measurement. The Ministry published a manual of quality control on olfactory measurement and a manual of safety assurance of olfactory measurement in 2002. In order to support technical development, the Ministry started technology verification on odor control equipment for small service industries.

1. Establishment of National Policy on Odor Control

During 1960’s, local Governments had received increasing complaints on offensive odors. First, large factories, such as oil refineries and pulp industries, were established in many areas of Japan. Also, urban area spread out and houses were constructed even near livestock farms.



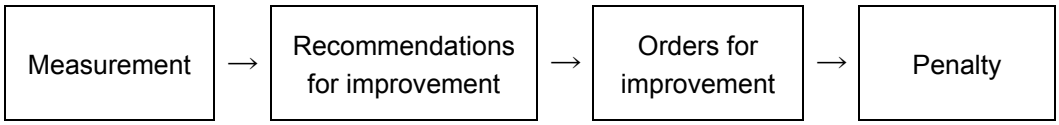
The Ministry of Welfare launched studies on environmental odor control in latter half of 1960s. The most difficult issue was the establishment of odor measurement methods.

The Society for the Study of Offensive Odor was launched in 1969. This was the predecessor of Japan Association on Odor Environment. The Ministry of Welfare contracted with the Society to carry out the research and development of odor measurement methods. The Society recommended the instrumental measurement method in 1970. The main reasons were as follows;

(1) Odorous substances cause social problem above the level of ten times to hundred times higher than detective threshold. Therefore, the instrumental measurement can be already technically applicable.
(2) The instrumental measurement can easily detect emitter of odor.
In addition, the olfactory measurement method was not fully established yet at that time.

In 1971, the Ministry of Welfare sent the Bill on the Offensive Odor Control to the Diet and it was passed in May 1971. The Environment Agency, established in July 1971, succeeded odor control policies from the Ministry of Welfare. Then it prepared the implementing rules of the Offensive Odor Control Law (hereafter called “the Law”), and the Law was enacted in May 1972.
The Law introduced an instrumental odor measurement method on each substance, mainly by utilizing gas chromatography. Now 22 substances are designated under this law (see annex).
The Law stipulates that;

(1) Prefectural governors shall designate regulation areas and shall establish regulatory standards on acceptable concentration of each odorous substances in accordance with national guidelines.
(2) Factories and other business establishments in regulation areas shall comply with regulatory standards.
(3) Mayors may make recommendations or orders to factories and other business establishments in regulation areas to take measures to reduce the emission of odor emission, when they do not comply with regulatory standards and the offensive odor from them is damaging living environment of residents.
(4) If those factories and other business factories do not comply with above-mentioned orders, they may be penalized.



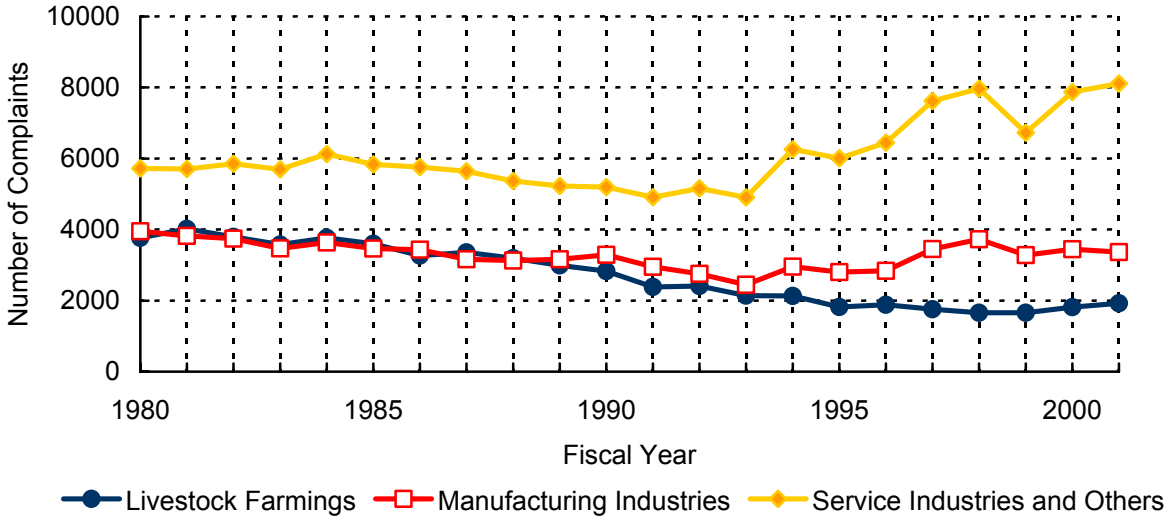
Why are only the regulation areas subject to the regulation? The reason comes from the nature of odor problem. There are a variety of ways how people feel odors, for example, there are some differences between cities and agricultural areas. The typical areas to be regulated are built-up areas and suburban areas with schools and hospitals. The number of municipalities that have regulation areas has increased year by year, and amounts to 1,792 which is 55.2% of the total in the end of FY of 2001. The municipalities that do not have any regulation area are mostly rural villages. In FY2001, 80% of complaints on offensive odor occurred in regulation areas.

In FY2001, based on the Law, local governments made 6,844 inspections, ordered reports on 772 cases and made recommendations on 7 cases. In FY2001, they also made informal recommendations on 11,376 cases and made measurement on 850 factories and business establishments with 2,821 samples.

2. The Changing Situation

The numbers of complaints on offensive odors from factories and livestock farms, have a gradually declined by mid 1990s. However, the number of complaints on offensive odors of service industries, e.g. restaurants and garages, has been increasing.
It is difficult to apply the instrumental odor measurement methods to odors from those service industries, because they emit many kinds of odor substances. It is estimated that the instrumental measurement methods are only applicable to 30% of factories and business establishments concerning offensive odor.

Number of Complaints on Odor except Concerning Outdoor Burning



3. 1995 Amendment to the Law

The Environment Agency had started studies on the olfactory measurement methods in the middle of 1970's. The Tokyo Metropolitan Government had already established the "triangular odor bag method" in 1972. The Environment Agency verified reliability of this method. The report of the study stressed the need of quality assurance for measurement operators. The Environment Agency established the national method for olfactory measurement using "triangular odor bag method" and the national certification system for operators of olfactory measurement in 1992.
At that time, over 30 local governments including 13 prefecture besides the Tokyo Metropolitan Government had already introduced the olfactory measurements to their bylaws or guidelines to control offensive odor.
In this context, the Environment Agency drafted the amendment to the Law in order to introduce the olfactory measurement using "triangular odor bag method", and the amendment went through the Diet in 1995.

The amendment stipulates that a Prefectural Governor shall choose the regulation using either the instrumental measurement method of the concentration of designated odorous substances or the olfactory measurement method, which is called “odor index regulation”.
The major advantages of the olfactory measurement method are as follows;
(1) It is applicable to any odorous substances.
(2) It can evaluate the additive and multiplicative effects of odorous substances.
(3) The results well meet the residents’ sentiment.
(4) Therefore it is widely used in other developed countries as a reliable method.

4. Operators of Olfactory Measurements

Mayors may make recommendations or orders based on the results of measurements to factories and other business establishments, and these orders based on the Law may lead to penalties. Therefore these measurements requires accuracy. The amended Law obliged local government to contract with certified operators when they commission olfactory measurement.
The Environment Agency contracted with the Association to carry out the certification system of operators of olfactory measurements. If a person wants to have a certification as the operator of olfactory measurements, he/she is required to pass the paper examination carried out by the Association. After passing the paper examination, he/she shall pass olfactory test. The purpose of the test is to eliminate persons who do not have normal ability of olfaction.

Occupational categories of persons certified for Operators as of 1 April 2003

Type of Occupation	Number	%
Measurement and Analysis	921	44.3
Research and Study	338	16.2
Engineering and Planning	255	12.3
Executive and Management	126	6.0
Trade and Sales	127	6.1
Manufacturing and Quality Control	93	4.5
Others	221	10.6
Total	2081	100

At the end of the FY 2002, 2081 persons have the certification. Around 40% of them are working for private laboratories for measurement and analysis.
(The Ministry estimates that about 0.8 million odor-bags were sold in 2002 in Japan.)

5. Introduction of “Odor Index Regulation” to the Local Governments

After the amendment in 1995, the number of local governments that adopt “odor index regulation” increased slowly. One reason was that full set of national guidelines on regulatory standards for odor emission had completed in just 2000. However, Tokyo Metropolitan Government, the biggest prefectural government in Japan, introduced odor index regulation by the Law in July 2002. This accelerated the adoption in other areas. (Tokyo Metropolitan Government had their bylaw with “odor index regulation”.

However this bylaw limited its application to designated factories and business establishments. The Law does not have this kind of limitation, so the Law is applicable much more widely than the bylaw.)
The Ministry of the Environment is promoting this movement by carrying out seminars in many regions and by providing information materials.

6. Quality Control and Safety Assurance of Olfactory Measurement

In order to spread “odor index regulation” to local governments, quality control of olfactory measurement is essential. The Ministry contracted with the Association to make a manual of quality control on olfactory measurement and the Ministry published it in 2002.
Also, in carrying out olfactory measurement, it is important to assure safety of sampler, panelists and operators. The Ministry contracted with the Association to make a manual of safety assurance of olfactory measurement in and published it in 2002.

7. Technology Verification on odor control equipment

As already mentioned, the number of complaints concerning odors from service industries has increased. Those service industries include many kinds of small business. They are not able to install odor control equipment, which is expensive or occupies large space. The makers of equipment are providing information on their goods, however the information is not verified by the third parties.
In order to support technological development, the Ministry of the Environment contracted with the Association in 2002, to carry out technology verification on odor control equipment for small service industries. The Association received application of 51 technologies from 38 companies and it made technology verification for 20 technologies. The report of result has been published in this June.

8. Concluding Remarks

Japan has set up the system for odor control, consisted of the Law and its implementing rules, local bylaws, measurement methods, certification for operators, and quality control process. Corporation among the Ministry, local Governments and experts of the Association has been essential to develop and implement the system.
There remain some issues. First, the Ministry should continue promoting the odor index regulation and the olfactory Measurement to be adopted by further local governments. Secondly, they should keep quality control process. Thirdly, small, cheap and easy-to-maintain equipment is required for small business to control offensive odor.

References

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Annex

Specified Offensive Odor Substances

Acetaldehyde,	Ammonia,
Butyraldehyde,	Butyric acid,
Dimethyl disulfide,	Dimethyl sulfide,
Ethyl acetate,	Hydrogen sulfide,
Isobutyraldehyde,	Isobutyl alcohol,
Isovaleraldehyde,	Isovaleric acid,
Methyl isobutyl keton,	Methyl mercaptan,
Propion aldehyde,	Propionic acid,
Styrene,	Toluene,
Trimethylamine,	Valeraldehyde,
Valeric acid,	Xylene