

# Odor Regulation in Japan

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## Keywords

*Offensive Odor Control Law, Odor Index Regulation, Triangular Odor Bag Method*

## Abstract

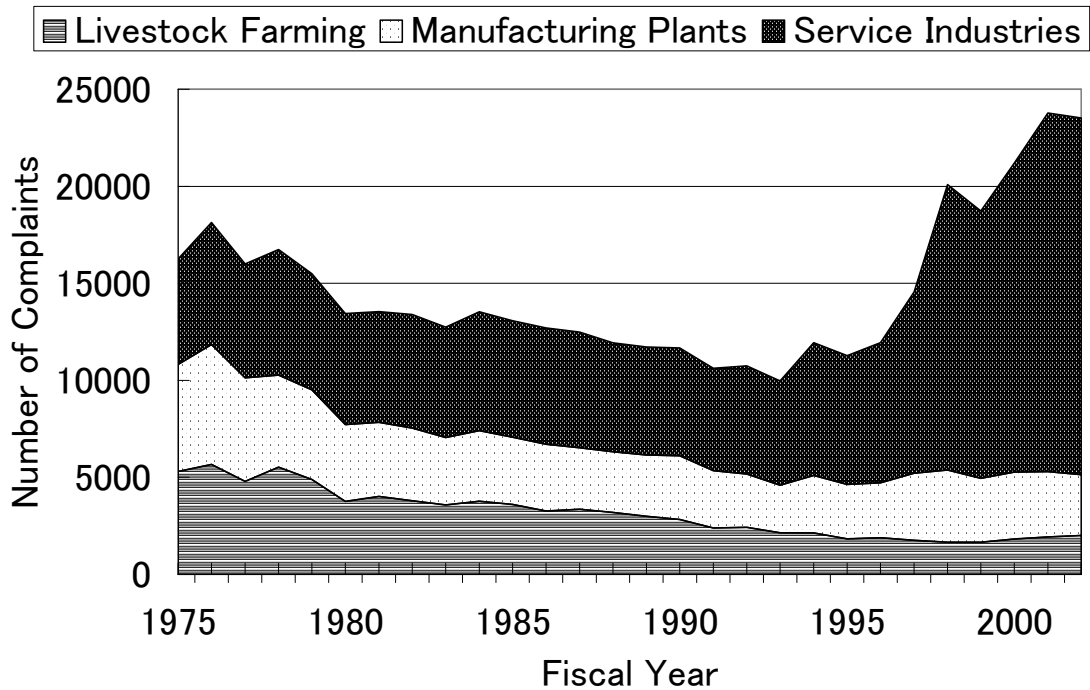
The “Offensive Odor Control Law”, enacted in 1972, regulates offensive odors emitted from business activities in an aim to preserve the living environment and people’s health. Various efforts toward improvement under this law resulted in decline of complaints, with the least complaints in 1993. However, the number has been increasing since then. In 2001, there were record numbers of complaints. One of the causes of this increase is suspected that people have become more sensitized to odors generated in daily life. When the law was enacted, the regulation was focused on the concentration of offensive odor substances. However, as complaints about offensive odors became more diversified, this regulation was no longer sufficient to deal with the increasing number of complaints caused by unregulated substances or complex odors. To improve these situations, the law was revised in 1995 and the odor index regulation was newly introduced, with “Triangular Odor Bag Method”, an olfactory measurement method, being officially adopted for measuring the index. Ministry of the Environment is asking local governments to introduce odor Index regulation by carrying out seminars and by providing information materials.

## 1. History of Offensive Odor Control in Japan

With the progress of industrial development and urbanization, complaints about environment pollution such as air pollution, noise and offensive odors increased sharply in the 1960s in Japan. To take measures against offensive odors, the “Offensive Odor Control Law” (hereafter called “the Law”), that regulates offensive odors emitted from business activities, was enacted in 1972. It could be progressive as few countries have laws applying only to offensive odors.

Various efforts toward improvement under the Law resulted in decline of complaints, with the least complaints in 1993 as shown in the figure. However, the number has been increasing dramatically since then. In 2001, there were record numbers of complaints. One of the major causes is the increase in those about service industries such as restaurants and about private households. On the other hand, complaints about livestock farming and manufacturing plants have been gradually decreasing.

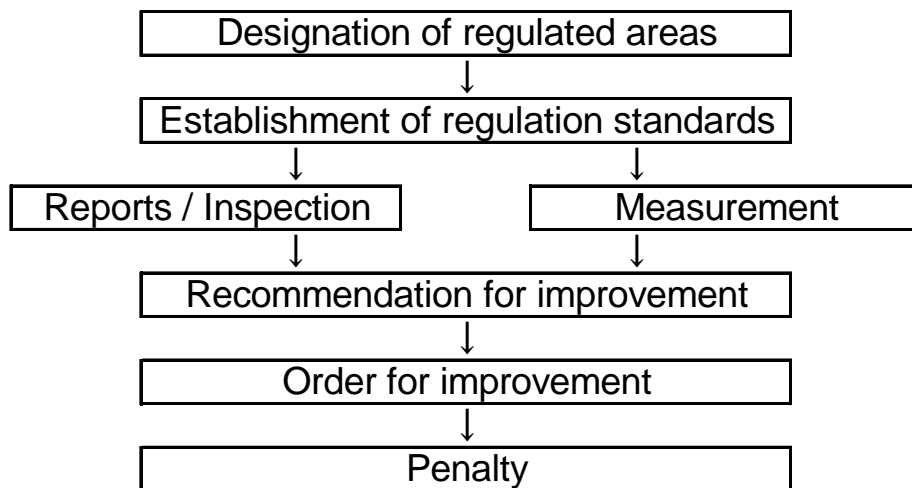
## Annual changes of complaints about offensive odors



## 2. Legal Framework of the Offensive Odor Control Law

Aim of the Law is to preserve the living environment and people's health by reducing offensive odors. To achieve its aim, the Law covers regulatory measures against offensive odors emitted from business activities as described below.

### Framework of the Offensive Odor Control Law



## 2.1 Designation of Regulated Areas

Areas are designated by local governments based on geographical and demographical conditions. Within regulated areas, emissions of offensive odors from business activities are regulated. As of 2002, 1804 local governments nationwide have such regulated areas (55.8% of the total).

All kinds of factories and workshops within regulated areas are under regulation of the Law. This applies regardless of type, scale or management organization of business.

## 2.2 Establishment of Regulation Standards

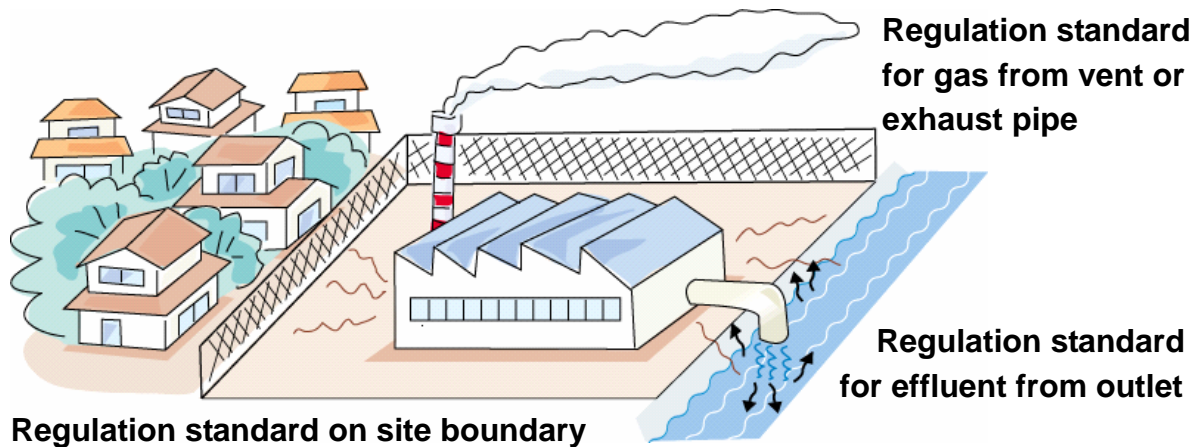
The Law introduced an instrumental odor measurement method on “Offensive Odor Substances”, mainly by utilizing gas chromatography, when it was enacted in 1972. “Offensive Odor Substances” is a group of chemical substances that could constitute unpleasant odors and possibly impair the living environment of residents. Currently, 22 substances as described below have been specified and local governments determine each standard value within a designated range. After revision of the Law in 1995, local governments were entitled to adopt “Odor Index Regulation” instead of odor substances regulation (as described later).

### 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

The following 3 types of odor emissions from factories and workshops are regulated. Local governments could establish 3 applicable regulation standards corresponding to those emission types. Business proprietors within regulated areas are obliged to comply with these regulation standards.

### 3 Types of Odor Emissions from Factories and Workshops



#### 2.3 Report and Inspection

Local governments are entitled to demand a report and to conduct an on-site inspection of operating conditions and preventive measures at odor emitting facilities.

#### 2.4 Measurement

Local governments should conduct measurement of offensive odors for the purpose of preserving the living environment of residents. Measurement can also be commissioned to certificated corporations or persons.

#### 2.5 Recommendation, Order and Penalty

When offensive odor from a factory within a regulated area exceeds the regulation standard and simultaneously impairs the living environment of residents, local government shall recommend or order the business proprietor of the factory to improve operating conditions and preventive measures of odor emitting facilities. Penalty shall be imposed on violator.

### 3. Odor Index Regulation

When the law was enacted in 1972, the regulation was focused on the concentration of offensive odor substances. However, as complaints about offensive odors became more diversified, this regulation was no longer sufficient to deal with the increasing number of complaints caused by unregulated substances or complex odors. To improve those situations, the law was revised in 1995 and the odor index regulation was newly introduced. "Odor Index" is an index that quantifies the intensity of odors. Olfactory measurement is used to determine the odor index. The officially adopted method in Japan is the "Triangular Odor Bag Method". In this method, six or more members of the panel are given a set of three bags; one with a

sample in it and two with odor-free and asked to choose the odorous bag. The odor is then gradually diluted and the test is continued until it becomes impossible to identify the bag with odor. The odor index is calculated by the dilution rate at which the panel can no longer tell the correct bag.

$$\text{Odor Index} = 10 \times \log (\text{Dilution Rate} )$$

Olfactory measurement is superior to instrumental odor measurement in its capability to deal with diverse odorants, to evaluate additive and multiplicative effects of odorants, and to meet residents' sense of suffering from offensive odors. For these advantages, it is widely used in other developed countries as a reliable method.

#### **4. Olfactory Measurement Operator**

Local government may make recommendations or orders to factories or other business establishments based on the results of measurements, and these orders may lead to penalties. Therefore, these measurements require accuracy. The amended Law also obliged local government to contract with certified operators when they commission olfactory measurement.

An olfactory measurement operator is a person in charge of management and organization of entire series of olfactory measurement from panel selection, sampling, performance of tests and summarizing the results based on the Triangular Odor Bag Method.

This is a National Certification granted to those who passed both the written examination and an aptitude test using five standard odorants. Currently, there are 2,224 certified operators nationwide (as of March 2004).

#### **5. Introduction of “Odor Index Regulation” by Local Governments**

Whether local governments adopt odor substances regulation or odor index regulation depends on their geographical and demographical conditions. 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 2002. This accelerated the adoption in other areas. As of April 2004, more than 200 local governments nationwide have introduced the regulation.

Ministry of the Environment is promoting this movement by carrying out seminars and by providing information materials about odor index regulation.

In order to spread “odor index regulation” to local governments, quality control of

olfactory measurement is essential. The Ministry made a manual of quality control on olfactory measurement and published it in 2002. Also, in carrying out olfactory measurement, it is important to assure safety of samplers, panelists and operators. The Ministry also made a manual of safety assurance of olfactory measurement and published it in 2002.

As already mentioned, the number of complaints concerning odors from service industries has increased. Those service industries include many kinds of small business. It is difficult for them to install odor control equipment, which is expensive or occupies large space. Although the manufacturers are providing information of their equipments, it is not verified by the third parties. In order to support technological development, the Ministry has been conducting technology verification on odor control equipment for small service industries.

## **6. Concluding Remarks**

Japan has set up the system for odor control, including the Law and its implementing rules, measurement methods, certification for operators, quality control, and safety assurance.

There remain some issues. First, the odor index regulation should be introduced to more local governments. Secondly, effort for quality control and safety assurance should be maintained. Thirdly, small, reasonable and easy-to-maintain equipment is required for small business to control offensive odor.

With these policies, future decline in the number of complaints for offensive odor is expected.