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Technical guidelines for fugitive emission monitoring of air pollutants

大气污染物无组织排放检测技术导则

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Foreword

In order to cooperate with the implementation of GB 16297-1996 *Comprehensive Emission Standard of Air Pollutants,* and to further standardize the technical requirements for fugitive emission monitoring of air pollutants, this standard is formulated.

This standard is linked up to Annex C of GB 16297-1996. Starting from the migration diffusion rules of air pollutants; and combining with various specific conditions of fugitive emission, this standard provides further regulations and guidance to the simple determination of meteorological conditions; determination of the suitability degree of meteorological conditions; and the selection of the monitoring period, the setting methods of monitoring site, etc.

This standard applies to Environmental Monitoring Station to implement the supervision and monitoring to the stationary pollution source of fugitive emission; and the monitoring of completion acceptance of construction project environmental protection facilities. It is also applicable to the monitoring of stationary pollution source to perform self-management.

The standard was proposed by Department of Science, Technology and Standards of Ministry of Environmental Protection of the People's Republic of China.

The standard was responsibly drafted by Shanghai Environmental Monitoring Center, and Shanghai Institute of Meteorological Science.

The State Environmental Protection Administration is responsible for the interpretation of this standard.

Standards of State Environmental Protection Administration

Technical guidelines for fugitive emission monitoring of air pollutants

HJ/T 55-2000

1 Subject content and scope of application

1.1 Subject content

This standard specifies the regulations and guidance to setting methods of fugitive emission monitoring point; the determination and selection of monitoring meteorological conditions; the calculation of the monitoring results, etc. It is the supplement and detailed document of Annex C of GB 16297-1996 *Comprehensive Emission Standard of Air Pollutants*.

1.2 Scope of application

1.2.1 This standard applies to Environmental Monitoring Department to implement the supervision and monitoring to the stationary pollution source of fugitive emission, for the purpose of implementing Annex C of GB 16297-1996. It is also applicable to various pollution source's organizations to perform the similar monitoring for self-management.

1.2.2 This standard is a technical guidance document. The environmental monitoring department shall implement the relevant regulations and requirements of this standard in accordance with the regulations and principles specified in Annex C of GB 16297-1996, with reference to the specific circumstances and needs.

1.2.3 The setting of the fugitive emission monitoring points for air pollutants generated from industrial furnace, coke oven and cement plant shall still be in compliance with the emission standard of air pollutants specified in GB 9078-1996, GB 16171-1996; and GB 4915-1996. The remaining relevant issues are implemented in accordance with the provisions of this standard.

2 Reference standards

The provisions contained in the following standard may, through the reference in this text, constitute part of this standard.

GB 16297-1996 *Comprehensive Emission Standard of Air Pollutants*

5.2 Basic situation investigation of monitored fugitive emission source

In addition to the categories and emission rate (estimated value) of emission pollutants, it shall also investigate the shape, size, height and the specific location in the building of the exhaust port of the fugitive emission source. There shall be photos of the exhaust port and the building.

5.3 Meteorological data investigation of emission source region

Under general situation, the local “all year round” meteorological data can be known from the meteorological observatory (station) of monitored pollution source, including:

-- Monthly predominant wind-direction and wind-direction frequency;

-- Monthly average wind-speed and the maximum and minimum wind-speed;

-- Monthly average temperature and temperature changes and other situations.

If possible, it is the best to understand the local temperature inversion and atmospheric stability and other variations of meteorological elements of pollutants.

To understand the local "all year round" meteorological data is to guide the selection of monitoring period.

5.4 Preparation of instruments, equipment and monitoring data

5.4.1 Preparation of monitoring data

GB 16297-1996 and this standard are the leading technical basis for the fugitive emissions monitoring. In the standard analysis methods for pollutants from stationary sources, the sampling methods and sample analysis method related to fugitive emission are the most important method basis, so the relevant contents shall be read and understood before monitoring.

5.4.2 Preparation of simple determining instruments of wind-direction and wind-speed on site

Usually the three-cup portable anemorumbometer may be used. It may also adopt other portable anemorumbometer with the same function.

The performance of instrument shall be verified by the Metrological Supervision Department. And necessary commissioning and inspection shall be implemented before use.

5.4.3 Preparation of sampling instruments and reagent.

Make preparation in accordance with the instrument-equipment and reagent specified in the sampling section related to the fugitive emission monitoring in the standard analysis

7.4.4 Determining the boundary of eddy area by sight

Make ready for suitable artificial smoke source (for example, using incense stick with appropriate size). Place it in the upwind of the eddy boundary. Observe the movement of the smoke-flow by naked eyes to determine the boundary of the eddy zone.

8 Classification of suitability degree of each meteorological factor to fugitive emission monitoring

8.1 Classification method of suitability degree

It is classified into four classes based on the value of each meteorological factor.

Class a: It is adverse to the diffusion and dilution of pollutants. It is suitable for carrying out fugitive emission monitoring;

Class b: It is less adverse to the diffusion and dilution of pollutants. It is relatively suitable for carrying out fugitive emission monitoring;

Class c: It is conducive to the diffusion and dilution of pollutants. It is relatively not suitable for carrying out fugitive emission monitoring;

Class d: It is very conducive to the diffusion and dilution of pollutants. It is not suitable for carrying out fugitive emission monitoring.

8.2 Classification of suitability degree of wind-direction changes

The average wind-direction itself means nothing to the diffusion and dilution of pollutants. Use the standard deviation (7.1) of average wind-direction within 10 minutes to represent the range of wind-direction change. The classification of its suitability degree for fugitive emission monitoring is shown in Table 5.

Table 5 Classification of suitability degree of wind-direction changes

Size of wind-direction changes (±S°)	<15°	15°-29°	30°-45°	>45°
Classification of suitability degree	a	b	c	d

8.3 Classification of suitability degree of wind-speed

Use average wind-speed (10 minutes average wind-speed measured value can also be based on. For details, see this standard 7.1) to divide the suitability degree for fugitive emission monitoring, see Table 6.

Table 6 Classification of suitability degree of wind-speed

Average wind-speed (m/s)	1.0*-2.0	2.1-3.0	3.1-4.5	>4.5
Category of suitability degree	a	b	c	d

organization is very wide, then arranging monitoring points in the downwind of emission sources makes no sense. And the main problem is to investigate that whether the fugitive emission pollutes the outside of its adjacent enclosure and exceeds the standard limits. Therefore, under this condition, it shall be selected that the outer enclosure nearby shall be equipped with monitoring points, when the wind toward one side of enclosure close to the emission sources; or in static and quasi-static wind (with a wind-speed less than 1.0m/s) state, the monitoring points shall be set up at the outside of nearby enclosure (organization boundary), depending on the natural diffusion of fugitive emission pollutants. The relevant issues are described below.

-- When the fugitive emission source is close to the enclosure (organization boundary), the wind-direction is towards the enclosure far away from the emission source, and the emission source has a certain height, then the monitoring points shall be set up in accordance with following situations:

As shown in Figure 6, firstly, the monitoring personnel shall estimate the maximum ground-level concentration area of fugitive emission pollutants. And monitoring points shall be set up at the scope of maximum concentration area (Point A in the Figure). In accordance with the relevant provisions of GB 16297-1996, location of the monitoring point set up in accordance with this principle can be 10m away from the outside of the enclosure. And the location and distance of the maximum ground-level concentration area are estimated by Formula 6.

$$X_{max}=\left(\frac{H}{\sqrt{2}\,b}\right)^{q-1} \qquad (6)$$

Where,

H -- Effective height of emission sources. For fugitive emissions, its lifting of heating and power usually is not considered, so the geometric height of emission source can be used to replace its effective height, m;

b, q -- the coefficient of power function of vertical diffusion parameters σ_Z, namely $\sigma_Z = bx^q$, its specific value is shown in Annex A.

Though A in Figure 6 is with the maximum ground-level concentration, the concentration has been greatly reduced eventually since that fugitive emission pollutants have subjected to the dilution and diffusion in the distance when migrating from P to A. Therefore, when conditions permit, the monitoring point shall still be set up at the side of the enclosure's border, but the sampling air inlet shall be B in Figure 6. The height of B is calculated by Formula 7:

$$a=\left(\frac{H-X}{\sqrt{2}\,b}\right)^{q-1} \qquad (7)$$

Where,

When the fugitive emission source is on the lateral windward side of the building, the pollutants will move closely against the wall to its downwind-direction. In this case, the monitoring point shall be set up against the wall (Point A in Figure 12) in the downwind-direction of the emission source or at the end of wall (Point B in Figure 12) in the downwind-direction.

9.2.2.5 Setting of monitoring points for the same fugitive emission source with two or more emission points

-- If it can be confirmed, before monitoring, that the emission rate of one of multiple emission points (refers to the emissions of pollutants per unit time) is significantly larger than those of the other emission point, then the monitoring point shall be set up at the point where has the highest emission rate. And the other emission points may be ignored.

-- If it can be confirmed, before monitoring, that the emission rates at two emission point are close to each other and the diffusion conditions of pollutants are normal (no eddy and local circulation, etc.), then the estimation shall be made to the table (see Annex B; 2Y numerical table). When the distance between two emission points are less than 2Y, the concentration of two emission points at the downwind concentration overlapping area will exceed the concentration that is formed by any single emission point at the diffusion area. In this case, 2 of 4 monitoring points may be set up at the concentration overlapping area; the other 2 points are set up with respect to the 2 independent emission points. Finally, the highest measured concentration is taken. If the distance between two emission points is greater than 2Y, the monitoring points shall be set up based on the two emission points. Finally, the highest measured value is taken; setting up monitoring point in concentration overlapping area shall not be considered.

-- When there is eddy or local circulation, the mixing of pollutants emitted from two points is intensified and the situation becomes more complicated. In this case, the monitoring points shall be set up based on the specific field conditions. And setting up monitoring points in mixing area shall be significantly considered.

9.2.2.6 Setting of monitoring points when the emission source is up to certain height

If conditions permit, the position of air collecting inlet shall be enhanced to offset the height of emission sources, so that the point setting is the most favorable.

If conditions do not permit to increase the height of air collecting inlet, then the monitoring points shall be set up after estimation of the maximum ground-level concentration area of fugitive emission. The estimation method refers to Article 2 of 9.1.3 in this standard.

9.3 Settings of monitoring points in complex case

9.3.1 Under particularly complex cases, it is impossible to set up monitoring points by

separately applying the above content. It is necessary to carry out careful analysis of the situation and set up monitoring points through applying the relevant terms comprehensively.

9.3.2 Under particularly complex cases, it is unlikely to have an exact depiction of the movements and distributions of pollutants and draw exact conclusions. In this case, the monitoring personnel shall utilize the available field conditions as far as possible such as colors and odors of fugitively emitted waste gases, smog distribution, and terrain characteristics and even artificial smoke source or other means to analyze the movements and possible maximum concentrations of pollutants to set up monitoring points.

9.3.3 Due to the specific circumstances of fugitive emissions, meteorological conditions and terrain variations are varied. The monitoring personnel are likely to encounter the specific circumstances not described in this standard. In this case, creativity shall be developed to set up monitoring points in a scientific and reasonable manner and in accordance with Annex C of GB 16297-1996 *Comprehensive Emission Standard of Air Pollutants* and other relevant principles.

10 Methods for sampling, analysis and evaluation of fugitive emission monitoring

10.1 Sampling frequency of fugitive emission monitoring

For sampling at monitoring point of fugitive discharge, average value shall be calculated based on the samples taken in continuous one hour.

If concentration is too low, sampling time can be extended properly;

If sensitivity of analysis method is high and samples are required to take in a short time, sampling in equal time interval shall be taken and average value shall be calculated based on four samples in one hour.

The fugitive emission reference points shall be sampled simultaneously with monitoring points. And the sampling time and sampling frequency shall be the same.

In order to capture the time distribution of the highest concentration at monitoring point, the arranged sampling time for each monitoring may be longer than one hour.

10.2 Sampling methods of fugitive emission monitoring

The control of fugitive emissions is based on their degree of ambient air pollution. Therefore, "monitoring points" of fugitive emissions shall be set up at the ambient air. China has developed the supporting standard analysis methods based on the air pollutant emission standards. In which, the relevant sampling part has been provided respectively

pollution source, $x = b - m$

(5) Determine whether the fugitive emission of this pollution source exceeds the standard (suppose that the "fugitive emission monitoring concentration limit" of this pollutant is y)

Conclusion: Because of x > y, the fugitive emission of this source exceeds the standard.

11 Standard implementation

When this Standard cannot be implemented due to the factory cluster emitting the same kind of pollutant or special terrain, meteorological conditions and other factors, then a report shall be developed by the environmental monitoring authority. After it is approved by the county-level and above people's government's competent administrative authority of environmental protection, for specific pollution sources, it may be delayed or exempted to implement the monitoring of fugitive emissions of air pollutants.

Annex C

(Normative)

Rules for observation the cloud cover

The cloud cover refers to the percentage of cloud covering the sky view. The location for estimating cloud cover must be without any shade. When part of the sky is covered by obstacles such as mountain and house, the cloud cover shall be estimated based on the part of the sky not covered. If part of the sky is covered with rainfall, this part of the sky shall be regarded as covered with the cloud generating the rainfall.

The observation for cloud cover includes the total cloud cover and low cloud cover. The total cloud cover refers to the total percentage of the sky covered with all clouds when observing. The low cloud cover refers to the percentage of the sky covered with low clouds. Both shall be rounded up to integer.

I. Observation for total cloud cover

If there is no cloud in the whole sky, the total cloud cover shall be recorded as 0; If the sky is completely covered with clouds, it shall be recorded as 10; If the sky is completely covered with clouds, but the blue sky can be seen as long as from the rifts in clouds, it shall be recorded as 10^{-}; if the cloud accounts for one tenth of the whole sky, the total cloud cover shall be recorded as 1; If the cloud accounts for two tenths of the whole sky, the total cloud cover shall be recorded as 2, and the rest shall be deduced by analogy.

If there is a little cloud in the sky and its percentage is less than 0.5 tenths, the total cloud cover shall be recorded as 0.

The total cloud cover shall be recorded in the appropriate column of observation book, and calculate the daily total and daily average (same in the following chapters).

II. Observation for low cloud cover

The method for observing low cloud cover is same as the method of total cloud cover. If there is no low cloud in the whole sky or there is a little low cloud but its percentage is less than 0.5 tenths, the low cloud cover shall be recorded as 0; If half of the sky is covered with the low clouds, the low cloud cover shall be recorded as 5; If the whole sky is covered with low clouds, the low cloud cover shall be recorded as 10, but if the blue sky or upper clouds can be seen from the rifts in clouds, the low cloud cover shall be recorded as 10^{-}. For example: If the sky is covered with Fn and the upper clouds instead of the blue sky can be seen from the rifts in the Fn, then the total cloud cover and low cloud cover shall be respectively recorded as 10 and 10^{-}; Moreover: If the sky is covered with Sc and the blue sky can be seen from the smaller rifts in the Sc, then both the total cloud cover and low cloud cover shall be recorded as 10^{-}.

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