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Replacing GWPB 5-2000

Emission standard of cooking fume

饮食业油烟排放标准

(Trial)

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Emission standard of cooking fume

1 Subject content and scope of application

1.1 Subject content

This standard specifies the maximum allowable emission concentration of cooking fume of the catering industry and the minimum removal efficiency of cooking fume's purification facilities.

1.2 Scope of application

1.2.1 This standard applies to urban built-up areas.

1.2.2 This standard is applicable to the emission management of cooking fume from existing catering business organizations, as well as the management of the cooking fume emission during the design, environmental impact assessment, completion acceptance and operation period of environmental protection facility of newly established catering business organizations. The food processing organizations and the internal staff canteens of non-profit organizations that emit cooking fume shall refer to this standard.

1.2.3 This standard does not apply to emission of household cooking fume.

2 Normative references

The provisions contained in the following standards constitute provisions of this standard through quotation in this standard:

GB 3095-1996 Ambient air quality standard

GB/T 16157-1996 The determination of particulates and sampling methods of gaseous pollutants emitted from exhaust gas of stationary source

GB 14554-1993 Emission standards for odor pollutants

3 Definition

This standard uses the following definitions.

3.1 Standard status

It refers to the state when the temperature is 273 K and the pressure is 101325

Pa. The standard concentration value as specified in this standard is the value of dry cooking fume under standard conditions.

3.2 Cooking fume

It refers to the volatile oil, organic matter and its thermally decomposed or pyrolysis products during food cooking and processing, collectively referred to as cooking fume.

3.3 City

It is the same as the definition of city in the Urban Planning Law of the People's Republic of China, that is, municipalities, cities, towns established by the state in accordance with the administrative system.

3.4 Catering business organizations

All fume exhausting stoves, that are in the same building and belong to the same legal person, are counted as one catering business organization.

3.5 Unorganized emission

Emission of cooking fume that has not been purified by any cooking fume's purification facility.

3.6 Cooking fume's removal efficiency

It refers to, after the cooking fume is processed by the purification facility, the percentage OF the mass of the cooking fume that has been removed AND the mass of cooking fume before the purification.

$$P = [(c_{before} \times Q_{before} - c_{after} \times Q_{after}) / c_{before} \times Q_{before}] \times 100\%$$

Where:

P - Removal efficiency of cooking fume, %;

c_{before} - Concentration of cooking fume in front of treatment facility, mg/m^3;

Q_{before} - The exhaust air volume in front of the treatment facility, m^3/h;

c_{after} - Concentration of cooking fume behind the treatment facilities, mg/m^3;

Q_{after} - The exhaust air volume behind the treatment facility, m^3/h.

4 Standard limit

4.1 The limit of minimum removal efficiency of the cooking fume's purification

5.5 When the catering industry produces special odors, it shall follow the index of odor concentration index in the "Emission standard for odor pollutants".

6 Monitoring

6.1 Sampling position

The sampling position shall be preferentially selected in the vertical pipe segment. It shall avoid flue elbows and sharply changing cross-sections. The sampling position shall be that, in the downstream direction of the elbow and the reducer, it is not less than 3 times the diameter; meanwhile in the upstream direction of the above components, it is not less than 1.5 times the diameter. For a rectangular flue, the equivalent diameter D = 2AB/(A + B), where A and B are side lengths.

6.2 Sampling point

When the cross-sectional area of the exhaust pipe is less than 0.5 m^2, it measures only one point, which takes the median value of the dynamic pressure. When the cross-sectional area exceeds the above-mentioned cross-sectional area, follow the relevant provisions of GB/T 16157-1996.

6.3 Sampling time and frequency

When implementing the emission limit index system as specified in this standard, the sampling shall be performed during the normal operation of the organization which emits cooking fume; the sampling number shall be 5 consecutive samplings, 10 minutes for each sampling.

6.4 Sampling conditions

Sample collection shall be carried out during the peak hour of the operation of the organization which emits cooking fume (cooking, food processing or other operations that produce cooking fume).

6.5 Processing of analytical results

Among the five sampling analysis results, compare any one of the data with the maximum value. If the data is less than a 1/4 of the maximum value, the data is invalid and cannot be used in the average calculation. After the data are rounded off, at least three data will participate in the average calculation. If the data does not meet the above conditions, it requires sampling again.

6.6 When monitoring the emission concentration, the measured emission concentration shall be converted into the emission concentration at the reference air volume:

Appendix A

(Normative)

Sampling method and analysis method of cooking fume from catering industry

Sampling and analysis method for determine of cooking fume by metal filter cartridge absorption and infrared spectrophotometry

A.1 Principles

Use the isokinetic sampling method to extract the gas in the fume exhaust pipe. Absorb the cooking fume in the cooking fume collection head. Put the collection filter element that has collected the cooking fume in a PTFE sleeve which is equipped with a cover. After returning to the laboratory, use carbon tetrachloride as a solvent for ultrasonic cleaning. Move it into a colorimetric tube to make the volume reach to the mark. Use infrared spectrophotometry to determine the content of the cooking fume.

The content of cooking fume is calculated, respectively, by the absorbance A_{2930}, A_{2960}, A_{3030} at the band where the wave numbers is 2930 cm^{-1} (the stretching vibration of the C-H bond in the CH_2 group), 2960 cm^{-1} (the stretching vibration of the C-H bond in the CH_3 group), 3030 cm^{-1} (the stretching vibration of the C-H bond in the aromatic ring).

A.2 Reagents

A.2.1 Carbon tetrachloride (CCl_4): The scanning absorbance value within the range of 2600 cm^{-1} ~ 3300 cm^{-1} does not exceed 0.03 (4cm cuvette). Under normal circumstances, the analytically pure carbon tetrachloride can meet the requirements after only one distillation.

A.2.2 High-temperature reflux edible peanut oil (or rapeseed oil, blended oil, etc.). The method of refluxing oil at high temperature: Add 300 ml of edible oil into a 500 ml three-necked bottle; insert a thermometer which has a range of 500 °C; first control the temperature at 120 °C; heat it with the opening uncapped for 30 minutes; then, install an air condenser right above it; raise the temperature to 300 °C; perform reflux for 2 h, to obtain standard oil.

A.3 Apparatus and equipment

A.3.1 Instrument: Infrared spectrometer, which can scan the absorbance value between 3400 cm^{-1} and 2400 cm^{-1}; it is cooperated with a 4 cm quartz cuvette

sampling flow, negative pressure of the meter, temperature and sampling time. Record the filter cartridge number.

(8) The cooking fume sampler collects cooking fume.

A.4.2 Sample storage: The filter cartridge that has collected cooking fume shall be immediately transferred to the PTFE cleaning cup. Tightly close the cup lid, If the sample cannot be determined within 24 hours, it can be stored in the freezer of the refrigerator (≤ 4 °C) for 7 days.

A.5 Test conditions

A.5.1 After cleaning, the filter cartridge shall be placed in a ventilated and dust-free place to dry it naturally;

A.5.2 Before and after sampling, ensure that no other oily items contaminate the filter cartridge.

A.6 Determination procedures of samples

(1) For the filter cartridge after sampling, use 12 ml of re-steamed carbon tetrafluoride solvent to soak it in the PTFE cleaning cup; apply the cleaning cup's lid;

(2) Put the cleaning cup in the ultrasonic instrument, to ultrasonically clean it for 10 min;

(3) Transfer the cleaning solution to a 25 ml colorimetric tube;

(4) Then in the cleaning cup, add 6 ml of carbon tetrachloride, to perform ultrasonic cleaning for 5 minutes;

(5) Transfer the cleaning solution into the above 25 ml colorimetric tube as well;

(6) Then, use a little carbon tetrachloride to clean the filter cartridge and PTFE cup twice; transfer them together into the above 25 ml colorimetric tube; add carbon tetrachloride to dilute it to the graduation mark;

(7) Determination by infrared spectrophotometry: Warm up the infrared tester for more than 1 hour before determination; adjust the zero point and full scale; fix a certain set of correction factors;

(8) Preparation of standard series: Accurately weigh 1 g of the standard sample of corresponding refluxed edible oil on a balance, which has an accuracy of 1/100000, into a 50 ml volumetric flask. Then, use the re-steamed (control temperature 70 ~ 74 °C) analytically pure CCl_4 to dilute it to the mark, to obtain a high-concentration standard solution A. Take

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