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**Emission standard of air pollutant for gasoline filling
stations**

加油站大气污染物排放标准

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Emission standard of air pollutant for gasoline filling stations

1 Scope

This Standard specifies gasoline vapor emission limits of gasoline filling stations, control technical requirements and testing methods.

This Standard is applicable to gasoline vapor emission management of existing gasoline filling stations as well as environmental impact assessment, design, completion acceptance of new, modified and expanded gasoline filling station projects and gasoline vapor emission management after completion.

2 Normative references

The provisions in the following documents become part of this Standard, through reference in this Standard. For undated documents, the latest version applies to this Standard.

GB 50156, *Code for design and construction of automobile gasoline and gas filling station*

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

HJ/T 38 Stationary source emission - Determination of nonmethane hydrocarbons - Gas chromatography

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 gasoline filling station

A special place for filling gasoline into car fuel tank.

3.2 gasoline vapor

Volatile organic compounds (non-methane total hydrocarbons) generated during the filling, unloading and storage of gasoline at gasoline filling stations.

3.3 vapor emission concentration

Under standard conditions (temperature is 273K, pressure is 101.3kPa), the mass of non-methane total hydrocarbons contained in every m^3 of dry gas discharged, in g/m^3 .

3.4 vapor recovery system for gasoline filling station

A vapor recovery system for gasoline filling station is composed of vapor recovery system for unloading, closed storage of gasoline, vapor recovery system for filling, online monitoring system, and vapor emission processing equipment. The role of this system is to TRANSFER the gasoline vapor generated during the unloading, storage and filling of the gasoline filling station, through closed collection, storage and sending into the tank of a tank car, and TRANSPORT to the oil storage depot for centralized recovery into gasoline.

3.5 vapor recovery system for unloading gasoline

A system that collects the gasoline vapor generated when a tank car unloads gasoline, through a closed manner, into the tank of the tank car.

3.6 vapor recovery system for filling gasoline

A system that collects the gasoline vapor generated when a tank car fills gasoline, through a closed manner, into the underground storage tank.

3.7 overfill protection measurement

The overfill that might happen when controlling gasoline unloading by using shut-off valve or float valve or other anti-overflow measures.

3.8 underground storage tank

A fully-buried storage tank under the ground.

3.9 pressure/vacuum valve

Also known as P/V valve, vent valve, mechanical breathing valve, which can adjust the pressure difference between the inside and outside of the tank so that the gas inside and outside the tank can communicate.

3.10 dynamic back pressure

The resistance when condensate liquid stays in the gasoline vapor pipeline or causes gas to pass through the pipeline for other reasons.

3.11 vapor recovery system tightness

The sealing degree of vapor recovery system under certain gas pressure.

3.12 air to liquid volume ratio

The ratio of the volume of gasoline vapor collected when filling to the volume of gasoline added to the tank at the same time.

3.13 vacuum-assist

In the vapor recovery system for filling gasoline, use the vacuum generator to assist recovering the gasoline vapor generated during gasoline filling.

3.14 on-line monitoring system

The system that online monitors whether the air to liquid volume ratio in the vapor recovery process for filling gasoline as well as the vapor recovery system tightness of the vapor recovery system and pipeline liquid resistance are normal. When abnormality is found, it can remind the operator to take corresponding measures, and can record, store, process and transmit monitoring data.

3.15 vapor emission processing equipment

The device that recovers the gasoline vapor discharged from the vapor recovery system for gasoline filling station, through methods such as attaching, absorption, condensation, membrane separation.

4 Gasoline vapor emission control and limit

4.1 The gasoline vapor emitted during unloading, storing and filling of gasoline filling station shall use the gasoline vapor recovery method based on closed collection to control.

4.2 Technical assessment

4.2.1 The vapor recovery system for filling gasoline shall conduct technical assessment and issue a report. The assessment mainly includes: investigating and analyzing technical information, verifying relevant certification documents, evaluating air to liquid volume ratio of multiple flows and guns, testing operations of at least 3 months in concession, providing range of air to liquid volume ratio of which the control efficiency is greater than or equal to 90%, listing equipment of vapor recovery system.

4.2.2 The vapor emission processing equipment (hereinafter referred to as the processing equipment) and on-line monitoring system shall conduct technical assessment and issue a report. The assessment mainly includes: investigating and analyzing technical information, verifying relevant certification documents, providing proof of actual use in China or abroad, testing operations of at least 3 months in concession.

5 Technical measures

5.1 Emission control of gasoline vapor of unloading gasoline

5.1.1 It shall use submersible unloading method. The height of the gasoline outlet of the unloading pipe from the bottom of the tank shall be less than 200mm.

5.1.2 The gasoline unloading and oil recovery interface shall be installed with DN100mm shut-off valve, sealed quick connector and cap. For the exiting gasoline filling stations, if unloading emission control measures have been taken but the interface size does not match, it may use a reducing diameter one to connect.

5.1.3 The connecting hose shall be connected to the unloading truck with a DN100mm sealed quick connector. No residual oil can be left in the connecting hose after unloading.

5.1.4 All gasoline vapor pipeline emission ports shall be equipped with pressure/vacuum valves according to the requirements of GB 50156.

5.1.5 The underground pipeline connected to the exhaust pipe shall slope to the oil tank. The slope shall not be less than 1%. The pipeline diameter is not less than DN50mm.

5.1.6 For gasoline filling stations that have not taken technical measures for filling and storage of gasoline vapor recovery, when unloading, the gasoline measuring hole and other parts that may cause gas short circuit shall be sealed, so as to ensure that the gasoline vapor generated by unloading gasoline is sealed and replaced in the tank of tank car.

5.2 Gasoline vapor emission control of gasoline storage

5.2.1 All components that affect the tightness of gasoline vapor stored, including gasoline vapor pipelines and connected flanges, valves, quick couplings, and other related components shall be guaranteed to be free of air leakage when less than 750Pa.

5.2.2 The underground storage tank shall use electronic liquid level gauge to measure the tightness of gasoline. The electronic liquid level measurement system with leak detection function shall be selected.

5.2.3 It shall adopt overfill protection measurements that meet relevant requirements.

5.3 Emission control of vapor recovery for filling gasoline

Annex A

(normative)

Testing methods for liquid resistance

A.1 Application scope

This appendix is applicable to the liquid resistance testing of the underground vapor recovery pipeline from the gasoline dispenser to underground storage tank. It shall test the liquid resistance of the underground vapor recovery pipeline from each gasoline dispenser to underground storage tank.

Special attention: the regulations on safety production of gasoline filling stations shall be strictly implemented during testing.

A.2 Testing principle and overview

A.2.1 Fill the vapor recovery pipeline with nitrogen at the specified nitrogen flow. Simulate gasoline vapor through gasoline vapor recovery pipelines.

A.2.2 Use a pressure gauge or equivalent device to detect the liquid resistance of the gas through the pipeline. Know the degree of resistance to gas in the pipeline due to various reasons and use to judge whether it shall affect the vapor recovery.

A.3 Deviation and interference

A.3.1 Any leaks in the relevant vapor pipelines shall result in low fluid resistance measurement.

A.3.2 If it starts testing when nitrogen flow stabilizes less than 30s, it shall produce erroneous liquid resistance measurement.

A.4 Testing equipment

A.4.1 Nitrogen and nitrogen bottles. Uses commercial grade nitrogen, high-pressure nitrogen cylinder with two-level pressure regulator and a 6.9kPa relief valve.

A.4.2 Pressure gauge. Use the pressure gauge described in A.5.1, A.5.2 and A.5.3.

A.4.3 Float flowmeter. Use the float flowmeter described in A.5.4. It and the pressure gauge shall form the testing equipment for liquid resistance (see Figure A.1).

A.6 Testing procedures

A.6.1 Open the bottom pot of the gasoline dispenser being tested. Find the three-way and testing joints reserved on the vapor recovery riser pipe for filling gasoline.

A.6.2 Connect the liquid resistance testing device to the three-way testing connector through a hose.

A.6.3 Ground the nitrogen bottle. Connect the nitrogen pipe to the nitrogen inlet connector of the liquid resistance testing device.

A.6.4 Open the vapor interface valve of vapor recovery system for unloading gasoline of corresponding tank.

A.6.5 If testing new, modified and expanded gasoline filling stations, 10L gasoline shall be injected into the pipeline before soil coverage on vapor pipelines and ground hardening construction.

A.6.6 Turn on the nitrogen bottle. Set the pressure of the low-pressure regulator to 35kPa. Use a float flow control valve to regulate the nitrogen flow. Starting with the lowest nitrogen flow in Table 1, respectively test the liquid resistance corresponding to 3 flows. Before reading the pressure gauge value, the nitrogen flow shall be stable for more than 30s.

A.6.7 If any one of the three liquid-resistance tested values is greater than the maximum pressure limit specified in Table 1, the liquid resistance of the gasoline filling station shall be nonconforming. If the test value cannot be determined due to the jitter of the pressure gauge, the liquid resistance test is deemed nonconforming.

A.6.8 Remove the hose connected to the three-way testing connector. Restore the connection of the original vapor recovery pipeline.

A.6.9 Close the vapor interface valve of the corresponding tank.

A.7 Testing record

See Table F.1 in Annex F for liquid resistance testing result record of vapor recovery pipelines.

which shall affect the vapor recovery system tightness testing of the entire system, it shall set up a short-circuit pipeline with a shut-off valve.

B.4 Testing equipment

B.4.1 Nitrogen and nitrogen bottle, same with A.4.1.

B.4.2 Pressure gauge. Use the pressure gauge described in B.5.1 and B.5.2.

B.4.3 Float flowmeter. Same with A.4.3. It and the pressure gauge shall form the testing device for vapor recovery system tightness (see Figure A.1).

B.4.4 Stopwatch. Same with A.4.4.

B.4.5 Three-way testing connector. Same with A.4.5.

B.4.6 Hose. Same with A.4.6.

B.4.7 Grounding device. Same with A.4.7.

B.4.8 Leak detection solution. Any solution that can be used to detect gas leaks, used to inspect the vapor recovery system tightness of system components.

B.5 Sensitivity, range and accuracy

B.5.1 The minimum diameter of mechanical pressure gauge dial is 100mm. The measuring range is 0~750Pa. The accuracy is 2% of full measuring range. The minimum scale is 25Pa.

B.5.2 When the full measuring range of electronic pressure measuring device is 0~2.5kPa, the accuracy is 0.5% of full measuring range. When the full measuring range is 0~5.0kPa, the accuracy is 0.25% of full measuring range.

B.5.3 The minimum vapor space of a single oil tank shall be 3800L or 25% of the volume of the oil tank. Take the smaller value of the two. The maximum total vapor space to connect the oil tank shall not exceed 95000L. The above does not include the volume of all vapor pipelines.

B.5.4 The flow rate of filled nitrogen is 30~100L/min.

B.5.5 Float flowmeter is the same as A.5.4.

B.5.6 Stopwatch same as A.5.5.

B.5.7 All measuring instruments shall be calibrated according to measuring standards.

B.6 Procedures before testing

calibration point. The calibration frequency shall not exceed 90d.

B.6.8 Use formula B.1 to calculate the time required to pressurize the system to 500Pa.

B.6.9 Use a hose to connect the testing device of vapor recovery system tightness and the nitrogen bottle, three-way testing connector. Open the cut-off valve on the short circuit. Read the initial pressure of oil tank and underground pipeline. If the initial pressure is greater than 125Pa, release the pressure to make the pressure of the oil tank and underground pipeline less than 125Pa.

B.6.10 Any electronic pressure gauge shall be preheated and drift checked before use (see B.3.4).

B.7 Testing procedures

B.7.1 Pressurize the vapor recovery system (or independent sub-system). Open the nitrogen cylinder valve. Set the pressure of the low-pressure regulator to 35kPa. Adjust the nitrogen flow rate in the range of 30~100L/min. Start the stopwatch. Pressurize to about 550Pa. During the pressurizing process, if the time required to reach 500Pa has exceeded 2 times the calculated value of formula B.1, then stop testing and indicate that the system does not have the testing conditions.

B.7.2 Close the nitrogen valve when charging to about 550Pa. Adjust the pressure relief valve to reduce the pressure to 500Pa and start the stopwatch.

B.7.3 Record the system pressure every 1min. After 5min, record the final system pressure.

B.7.4 Release the pressure of the vapor recovery system according to the safety regulations of the gasoline filling station.

B.7.5 Remove the hose connected to the three-way testing connector. Restore the connection of the original vapor recovery pipeline.

B.7.6 If the vapor recovery system consists of several independent vapor recovery subsystems, then each independent subsystem shall be tested for vapor recovery system tightness.

B.8 Procedures after testing

Compare the system pressure testing value after 5min with the minimum residual pressure limit in Table 2 to determine if the gasoline filling station complies with the standard. If the actual vapor space value is between the two vapor space values listed in Table 2, then use the interpolation formula B.2 to calculate the minimum residual pressure limit.

Annex C

(normative)

Testing methods for air to liquid volume ratio

C.1 Application scope

This appendix is applicable to the air to liquid volume ratio testing of vapor recovery system for gasoline filling station.

Special attention: the regulations on safety production of gasoline filling stations shall be strictly implemented during testing.

C.2 Testing principle and overview

Install a tight adapter at the nozzle of the refueling gun. The adapter is connected to the gas flow meter. The air flow first passes through the gas flow meter, and then enters the vapor collection hole on the nozzle of the refueling gun. The ratio of the measured gas volume to the gasoline volume measured simultaneously by the gasoline dispenser is called the air to liquid volume ratio. Through the testing of the air to liquid volume ratio, the recovery effect of the vapor recovery system can be known.

C.3 Deviations and interference

C.3.1 If the nozzle of the refueling gun and the adapter cannot be matched well for various reasons, the test cannot be performed.

C.3.2 If the filling flow rate of the tested refueling gun cannot reach more than 20L/min, the test cannot be performed.

C.3.3 If other refueling guns that share a vacuum pump with the refueling gun being tested are sealed, the test results shall be deviated.

C.3.4 If the tested refueling gun brings gasoline into the testing device, the air to liquid volume ratio test value of the refueling gun shall be considered invalid.

C.3.5 Before testing, do not empty the gasoline in the gas line of the refueling hose and the vapor pipe of the refueling machine, otherwise the test results shall be deviated.

C.3.6 Before the air to liquid volume ratio test, the O-ring of the air to liquid volume ratio adapter shall be properly lubricated, otherwise the test results shall be deviated.

C.7.8 If the air to liquid volume ratio calculated according to formula C.1 is within the standard limits, the air to liquid volume ratio of the tested refueling gun is up to the standard.

C.7.9 If the air to liquid volume ratio is not within the standard limits, and the difference between the air to liquid volume ratio detection value and the limit is less than or equal to 0.1, two more air to liquid volume ratio tests shall be performed. But do not make any adjustments to the filling pipeline or the vapor recovery pipeline. In order to ensure the accuracy of the measurement, the necessary adjustments to the gas-liquid ratio detection device are allowed, including the air to liquid volume ratio adapter and the refueling gun. If the air to liquid volume ratio testing device is adjusted, the previous test result of this gun shall be invalid. Take the arithmetic average of 3 test results. If the average value of the air to liquid volume ratio is within the given limits, the air to liquid volume ratio of the refueling gun is up to the standard. If the average value is outside the limit range, it means that the air to liquid volume ratio test of the refueling gun is not up to the standard.

C.7.10 If the air to liquid volume ratio is not within the specified limit range, and the difference between the tested value of the air to liquid volume ratio and the limit value is greater than 0.1, the air to liquid volume ratio test of the tested refueling point does not meet the standard.

C.7.11 In order to avoid the accumulation of gasoline, after each test, drain the condensed gasoline in the hose between the gas flowmeter and the oil barrel component for testing and the hose between the air to liquid volume ratio adapter and the gas flowmeter.

C.8 Procedures after testing

C.8.1 Remove the air to liquid volume ratio adapter from the refueling gun.

C.8.2 Carefully pour the filled gasoline back to the corresponding gasoline storage tank. Keep the testing barrel grounded before pouring gasoline. Without the consent of the owner of the gasoline filling station, do not mix different grades of gasoline in the oil barrel. If different grades of gasoline are mixed in the oil barrel, the mixed gasoline shall be poured back to the lower grade oil storage tank.

C.8.3 Before finally determining whether the air to liquid volume ratio test meets the standard, perform a leak check on the adapter according to C.6.6. If the testing device fails the leak check, all data obtained during the air to liquid volume ratio test shall be invalid.

C.8.4 Before transportation, carefully seal the inlet and outlet of the gas flowmeter to prevent foreign matter from entering the flowmeter.

1.1m high guardrail. The sampling hole is 1.2~1.3m above the platform. If the sampling position is less than 1.5m above ground level, the monitoring operation platform and guardrail may not be set.

D.2.5 The installation of the sampling hole and operation platform shall be completed and accepted at the same time as the vapor recovery and treatment project.

D.3 Testing method

D.3.1 The testing of the emission concentration of the processing equipment shall be carried out during the period when the ambient temperature is not lower than 20°C and when the filling is relatively concentrated.

D.3.2 Each processing equipment shall be tested. The sampling time of each processing equipment is not less than 30min. It can conduct continuous sampling or equal time interval sampling. The number of samples collected at equal intervals is not less than 3.

D.3.3 Other sampling requirements shall be implemented according to GB/T 16157.

D.3.4 The analysis method is implemented according to HJ/T 38.

D.4 Testing equipment

D.4.1 Sampling joint. There shall be a universal sampling joint connected to the outlet sampling hole of the processing equipment. The connection method of the sampling joint and the sampling hole can be designed according to different sampling methods. However, the length of the sampling tube placed in the sampling hole tube on the sampling joint shall not be less than 56mm. The distance that the sample enters the collector through the sampling tube and other components shall not exceed 300mm. The inner diameter of the sampling tube is 5mm.

D.4.2 For sampling with a syringe, refer to the sampling joint below. The sampling joint is a flange cover. The size is consistent with the sampling hole flange. At the center position of the flange cover, seal and weld a section of sampling tube through the flange cover. The length of the sampling tube inserted into the sampling hole tube is 56mm. The length of the other side is 20mm, and the inner diameter of the sampling tube is 5mm.

D.4.3 Sampling joint material. Sampling joint shall use copper, aluminum or other materials that do not generate sparks and static electricity.

D.5 Testing record

Refer to Table F.4 in Annex F for the record of vapor emission test results of

Annex E

(informative)

Calibration method for on-line monitoring system

E.1 Application scope

This appendix is applicable to the calibration of the on-line monitoring system of vapor recovery system for gasoline filling station.

E.2 Principle and overview of on-line monitoring system

E.2.1 A gas flowmeter is connected in series on the vapor recovery pipeline in the gasoline dispenser. By measuring the recovered vapor volume and comparing with the volume of liquid gasoline corresponding to the vapor volume, monitor the air to liquid volume ratio during vapor recovery process.

E.2.2 Install a pressure sensor on the vapor recovery pipeline in the connected vapor storage space. By measuring the change of pressure value, monitor the vapor recovery system tightness.

E.2.3 The data collected by the flowmeter and pressure sensor is sent to the data processing system. When the vapor recovery system is in an abnormal working state, the monitoring system shall issue a warning. If no processing measures are taken within the warning period, the system shall alarm and take measures to stop filling gasoline.

E.3 Pressure sensor calibration test procedures

Step 1: Record the serial number of the gasoline dispenser and installed pressure sensor.

Step 2: Remove the cap from the pressure sensor environmental reference port valve. Rotate the valve 90° to open it. Make the valve accessed with air.

Step 3: Open the diagnostic mode menu on the front panel of the console. Enter the smart sensor calibration menu. Record the pressure value.

Step 4: Observe whether the pressure value is within $\pm 50\text{Pa}$. If the pressure valve is not within this range, leave the valve position as described in step 2. Replace the sensor according to the pressure sensor installation guide. Then repeat the test according to step 3 to meet the pressure range.

Step 5: Cover the cap of the pressure sensor environmental reference port

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