Application of Activated Carbon in the Municipal Solid Waste Incineration Industry

Activated carbon for flue gas desulfurization and denitrification

Replacement of activated carbon in exhaust gas treatment equipment

Steps and Precautions

Activated carbon, as an efficient adsorbent material, is widely used in exhaust gas treatment systems. Regular replacement of activated carbon not only ensures the stable operation of the system but also prevents secondary pollution caused by adsorption saturation. However, in practical operations, many operators, due to unfamiliarity with the replacement procedure, often overlook critical steps and precautions. The following section provides a detailed overview of the replacement procedures for activated carbon in exhaust gas treatment systems, along with the associated precautions.

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Step 1: Pressure reduction and system shutdown

Before beginning the replacement of the activated carbon, it is first necessary to reduce the pressure in the air purification system to zero. The purpose of this step is to ensure that no unexpected pressure release

occurs during the replacement process, thereby safeguarding the safety of the operators. The specific steps are as follows:

Close the inlet and outlet air valves: First, close the inlet and outlet valves of the air purification system to halt airflow within the system.

Pressure relief: manually open the discharge port at the bottom of the oil separator and gradually release the internal pressure of the system until the system pressure drops to 0 MPa.

Verification: Ensure that all valves are tightly closed, and reconfirm that there is no residual pressure within the system.

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The key to this step is to completely relieve pressure; otherwise, it may disrupt subsequent operational procedures and even lead to safety incidents.

Step 2: Open the system flange cover

Once the system pressure drop reaches zero, the flange cover may be disassembled:

Tools and preparation: Use an appropriate wrench to sequentially loosen the upper and lower flange cover nuts. If the flange has a hand hole, you may first remove the upper flange and the hand hole.

Remove the flange cover: Carefully unscrew the bolts on the flange cover in sequence; note that the bolts on the upper flange do not need to be fully removed to prevent activated carbon from falling into the bolt holes.

Storage: Properly store the removed flange cover, bolts, and nuts for use during subsequent installation.

Note that when opening the flange cover, a container for holding activated carbon should be prepared to prevent the activated carbon from spilling, which could lead to waste and contamination.

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Step 3: Remove the used activated carbon

Removing the used activated carbon is a critical step in the replacement process:

Tools to be used: Use an industrial vacuum cleaner or other appropriate tools to thoroughly remove the activated carbon from the container.

Prevent contamination: Collect the removed activated carbon in designated areas to avoid contaminating the workshop floor.

Inspection: Observe the surface of the activated carbon for any oil stains. If oil stains are detected, promptly perform maintenance and servicing on the filter element and the air compressor.

The key objective of this step is to thoroughly regenerate the spent activated carbon to prevent residues from adversely affecting the loading of new activated carbon and the normal operation of the system.

Step 4: Clean up the system internals

Before replacing the new activated carbon, the interior of the system must be thoroughly cleaned:

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Cleaning tool: Use a hammer to gently tap the oil separator to dislodge the activated carbon adhering to the inner walls.

Cleaning: Wipe the inner walls of the degreaser with a clean cloth; if necessary, clean with soapy water, then dry with compressed air.

Inspect the ventilation heads: ensure that both the upper and lower ventilation heads are intact. If the steel wire mesh is damaged or exhibits rust, thoroughly remove the rust and replace it with 50-mesh steel wire mesh.

Thorough cleaning and inspection ensure that no residual contaminants remain within the system, thereby preventing any adverse effects on the adsorption capacity of the new activated carbon.

Step 5: Reinstall the flange cover.

Once the cleaning is complete, reinstall the flange cover:

Install the flange covers: Sequentially reinstall all flange covers and handhole flange covers, except for the upper flange cover, back into their original positions.

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Tighten all bolts and nuts to ensure they are securely fastened and to prevent air leakage.

Asbestos pad inspection: If the asbestos pad is damaged, replace it with a new one; if no spare is available, wrap it with non-asbestos tape.

The key objective of this step is to ensure the sealing integrity of the flange connection, thereby preventing a decline in system operational efficiency caused by gas leakage.

Step 6: Load new activated carbon

Special attention must be paid to the packing density and dust control when loading new activated carbon:

Loading activated carbon: Based on the anticipated loading volume, gradually add the required amount of new activated carbon into the degreaser.

Vibration: Gently tap the legs or other parts of the oil separator to compact the activated carbon and prevent powdering.

Dust removal: Use a fan to blow away dust generated during the filling process, ensuring that the activated carbon is compactly packed.

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During the loading process, ensure that the activated carbon is uniformly distributed and densely packed to maximize its adsorption performance.

Step 7: Close the flange cover and perform a leak test.

Once loading is complete, the flange cover must be reinstalled, and a leak check must be performed:

Install the upper flange cover: securely fasten the upper flange cover and tighten all bolts and nuts.

Airtightness test: Open the air inlet valve, pressurize the system to approximately 0.8 MPa, and then use tactile inspection or soapy water to check all connection points for any air leaks.

Adjustment: If a leak is detected, the relevant bolts must be tightened again, and the system should be rechecked.

Airtightness testing is a critical step in ensuring that the system is free of leaks, and it directly impacts the operational efficiency and safety of the system.

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Step 8: Dust suppression and site cleanup

Once all replacement work has been completed, perform the final blowdown and cleaning:

Dust purging: Use compressed air to thoroughly purge the interior of the oil separator to prevent dust from entering the adsorption tower.

Storage of excess material: Any excess activated carbon should be sealed and stored for future use.

Site cleanup: Clean the work area thoroughly, dispose of waste materials, and ensure that the work area remains tidy.

This step not only ensures the cleanliness of the system but also reduces environmental pollution and enhances operational efficiency.

Replacing activated carbon in an exhaust gas treatment system is a technically demanding task that requires operators to strictly adhere to established procedures. In practical operations, maintaining a rigorous approach and paying close attention to every detail are essential to ensuring the reliable operation and safety of the system, thereby further enhancing the performance and efficiency of the exhaust gas treatment process.

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