Working Process And Basic Knowledge Of PSA Nitrogen Generator Simplified

Our Product Introduction

Basic Information

- Place of Origin: CHINA
- Brand Name: GASPU
- Certification: ccs ce
- Model Number: MNG -100

Product Specification

- Automation: Fully Automation
- Dscharge Pressure: 0.7-0.85 Mpa
- Nitrogen Dew Point: -40 Or -60
- Purity: 99.999%-99.9995%
- Oxygen Producing Method: PSA Pressure Swing Adsorption
- Air Dryer: Include
- Dew Point: -50
- Flow Rate: 10-5000 Nm3/hr
- Air Compressor: Option
- Sample: Available
- Oem: Offered
- Performance: High Performance
- Highlight: **Basic Knowledge PSA Nitrogen Generator**, **Simplified PSA Nitrogen Generator**, **Working Process PSA Nitrogen Generator**

More Images

Our Product Introduction

Product Description

Working principle and process flow of PSA nitrogen generator
1, Basic knowledge
1. Gas knowledge
Nitrogen, as the most abundant gas in the air, is inexhaustible and inexhaustible. It is colorless, odorless, transparent, belongs to the sub inert gas category, and does not sustain life. High purity nitrogen is often used as a protective gas in places that isolate oxygen or air. The content of nitrogen (N_2) in air is 78.084% (the volume composition of various gases in air is: N_2: 78.084%, O_2: 20.9476%, argon: 0.9364%, CO_2: 0.0314%, other gases include H_2, CH_4, N_2O, O_3, SO_2, NO_2, etc., but the content is very small), molecular weight is 28, boiling point: -195.8 , condensation point: -210 .
2. Knowledge of stress
The pressure swing adsorption (PSA) nitrogen production process involves pressure adsorption and atmospheric desorption, and compressed air must be used. The optimal adsorption pressure of the currently used adsorbent - carbon molecular sieve is 0.75~0.9 MPa. The gas in the entire nitrogen production system is under pressure and has impact energy.
2, Working principle of PSA nitrogen production:
CMS pressure swing adsorption nitrogen generator is an automated equipment that uses carbon molecular sieves as adsorbents, and utilizes the principles of pressure adsorption and pressure reduction desorption to adsorb and release oxygen from the air, thereby separating nitrogen gas. Carbon molecular sieve is a cylindrical granular adsorbent made mainly from coal, processed through grinding, oxidation, shaping, carbonization, and special pore processing technology. Its surface and interior are filled with micropores, and it is black in color. The pore distribution is shown in the following figure:
The pore size distribution characteristics of carbon molecular sieves enable them to achieve dynamic separation of O_2 and N_2. This pore size distribution allows different gases to diffuse into the micropores of the molecular sieve at different rates without repelling any gas in the mixture (air). The separation effect of carbon molecular sieve on O_2 and N_2 is based on the slight difference in the kinetic diameter of these two gases. The kinetic diameter of O_2 molecules is smaller, so they have a faster diffusion rate in the micropores of carbon molecular sieve, while the kinetic diameter of N_2 molecules is larger, so the diffusion rate is slower. The diffusion of water and CO_2 in compressed air is not much different from that of oxygen, while the diffusion of argon is slower. The final enriched gas from the adsorption tower is a mixture of N_2 and Ar.

The adsorption characteristics of carbon molecular sieves for O2 and N2 can be visually represented by equilibrium adsorption curves and dynamic adsorption curves:

From these two adsorption curves, it can be seen that an increase in adsorption pressure can simultaneously increase the adsorption capacity of O2 and N2, with a larger increase in the adsorption capacity of O2. The pressure swing adsorption cycle is short, and the adsorption capacity of O2 and N2 is far from reaching equilibrium (maximum value), so the difference in diffusion rate between O2 and N2 causes the adsorption capacity of O2 to greatly exceed that of N2 in a short period of time.

Pressure swing adsorption nitrogen production utilizes the selective adsorption characteristics of carbon molecular sieves, using a cycle of pressurized adsorption and depressurized desorption to alternately introduce compressed air into the adsorption tower (which can also be completed in a single tower) to achieve air separation, thereby continuously producing high-purity product nitrogen gas.

2, Basic process flow of PSA nitrogen production:

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After being compressed by an air compressor, the air enters the air storage tank through dust removal, oil removal, and drying. It then passes through the air inlet valve and left suction valve before entering the left adsorption tower. The tower pressure increases, and oxygen molecules in the compressed air are adsorbed by carbon molecular sieves. Unadsorbed nitrogen passes through the adsorption bed and enters the nitrogen storage tank through the left suction valve and nitrogen production valve. This process is called left suction and lasts for several tens of seconds. After the left adsorption process is completed, the left adsorption tower and the right adsorption tower are connected through upper and lower pressure equalization valves to achieve pressure balance between the two towers. This process is called pressure equalization and lasts for 2-3 seconds. After the pressure equalization is completed, the compressed air enters the right adsorption tower through the air inlet valve and the right suction valve. The oxygen molecules in the compressed air are adsorbed by the carbon molecular sieve, and the enriched nitrogen enters the nitrogen storage tank through the right suction valve and the nitrogen production valve. This process is called right suction and lasts for several tens of seconds. At the same time, the oxygen adsorbed by the carbon molecular sieve in the left adsorption tower is released back into the atmosphere through the left exhaust valve, which is called desorption. On the contrary, when the left tower adsorbs, the right tower also desorbs simultaneously. In order to completely release the oxygen released from the depressurization of the molecular sieve into the atmosphere, nitrogen is blown out of the adsorption tower through a normally open blowback valve to remove the oxygen inside the tower. This process is called blowback, which occurs simultaneously with desorption. After the right suction is completed, enter the pressure equalization process, then switch to the left suction process and continue cycling.

The working process of the nitrogen generator is controlled by a programmable controller to control three two position five way pilot solenoid valves, and then controlled by the solenoid valves to open and close eight pneumatic pipeline valves respectively. Three two position five way pilot solenoid valves control the left suction, pressure equalization, and right suction states respectively. The time flow of left suction, pressure equalization, and right suction has been stored in the programmable controller. In the power-off state, the pilot air of the three two position five way pilot solenoid valves is connected to the closing port of the pneumatic pipeline valve. When the process is in the left suction state, the solenoid valve controlling the left suction is energized, and the pilot gas is connected to the opening ports of the left suction air valve, left suction production air valve, and right exhaust valve, so that these three valves open, completing the left suction process and simultaneously desorbing from the right adsorption tower. When the process is in a pressure equalization state, the solenoid valve controlling the pressure equalization is powered on, and other valves are closed; Connect the pilot gas to the opening ports of the upper and lower pressure equalization valves, causing them to open and complete the pressure equalization process. When the process is in the right suction state, the solenoid valve controlling the right suction is energized, and the pilot gas is connected to the opening ports of the right suction valve, right suction production valve, and left exhaust valve, causing these three valves to open and complete the right suction process, while the left adsorption tower desorbs. In each process, except for the valve that should be opened, all other valves should be in the closed state.

3, Pressure swing adsorption oxygen production, with zeolite molecular sieve adsorbent as the core, selects to adsorb nitrogen gas at higher pressure according to the adsorbent. Unadsorbed oxygen accumulates at the top of the adsorption tower and is output as product gas. When the adsorption tower is close to adsorption saturation, the feed air stops entering and instead flows to another adsorption tower that has completed regeneration to equalize the pressure, followed by pressure relief and regeneration. The uniformly pressurized adsorption tower introduces the raw air for adsorption. Two adsorption towers alternate and repeat in this way to complete the process of oxygen production.

Industrial pressure swing adsorption oxygen production can use pressure adsorption and atmospheric pressure desorption processes; Ultra high pressure vacuum desorption process; Penetrating atmospheric pressure vacuum