Inherit Peking University Spirit，Create Technology Pioneer

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前言
Preface

Beijing Peking University Pioneer Technology Co.,Ltd. (shortly called PIONEER) is engaged in research & development of PSA (pressure swing adsorption) technology, design & construction of PSA facilities and high efficiency adsorbents and catalysts. The VPSA–O_2 separation technology of PIONEER won the 1st Class Scientific and Technology Progress Medal awarded by the Ministry of Education of China in 2006 and the VPSA–CO separation technology won the 2nd Class National Technology Invention Award of China in 2007. PIONEER has already strengthened its position as world leader in this field of technology.

Since founded in 1999, over 100 PSA Plants, including the world’s largest units–single set of VPSA–CO and VPSA–O_2 equipments, have been designed and supplied by PIONEER. These PSA systems are suitable for the most different applications in the chemical industry, steel, non–ferrous metals, glass, paper manufacturing, sewage treatment, etc. At present, our state–of–art techniques and products have been exported to US, UK, Spain, South Korea, Thailand and some other counties.

Zhang Jia Ping (Board Chairman)

Company Profile

变压吸附气体分离领域的领航者
Leader in the field of Pressure Swing Adsorption

Beijing Peking University Pioneer Technology Co., Ltd. (hereinafter referred to as "PIONEER") is mainly engaged in design and manufacture of PSA gas separation equipments for chemical industry, steel, non-ferrous metallurgical, glass fiber, paper making, electronic, refuse incineration and water treatment. Up to date, over 200 sets of medium/large-scale equipments have been built, with performance reaching the international advanced standard.

PIONEER has one R&D center, one pilot base, one Beijing key Laboratory of Engineering, two sorbent plants and one valve manufacturing plant. Nowadays, PIONEER is endeavored to improving the core competitiveness through R&D in cooperation with the College of Chemistry and Molecular Engineering, Peking University, and becoming the leader in the field of PSA gas separation on the domestic market.



Milestone

- 1999 Beijing Peking University Pioneer Technology Co., Ltd. was established.
- 2001 The first set of VPSA–O_2 plant was put into production.
- 2003 The first set of PSA–CO plant was put into production.
- 2004 The first set of PSA–H_2 plant was put into production.
- 2006 PIONEER's VPSA–O_2 plant was awarded the first prize for Science and Technology Progress by the Ministry of Education.
- 2006 PIONEER's PSA–CO technology was granted the second prize of National Technology Invention.
- 2009 The world's largest PSA plant cluster was successfully put into production.
- 2010 The world's largest VPSA–O_2 plant was put into production.
- 2012 The world's first industrial plant for separating CO and H_2 from calcium carbide exhaust was put into production.
- 2013 Fhe world's first industrial plant for separating CO from blast furnace gas was put into production.
- 2014 At the 15th anniversary of its establishment, PIONEER has become the first choice brand in the industry of PSA gas separation.

Main businesses

- VPSA–O_2 engineering technology and complete sets of equipment
- PSA–CO engineering technology and complete sets of equipment
- PSA–H_2 engineering technology and complete sets of equipment
- Engineering technology for separating CO and H_2 from the steel plants exhaust and complete sets of equipment
- Engineering technology for purifying and separating industrial exhausts including calcium carbide and yellow phosphorus and complete sets of equipment
- Technical consulting, operational services and commissioned development of new products and technologies
- Sorbents and catalysts

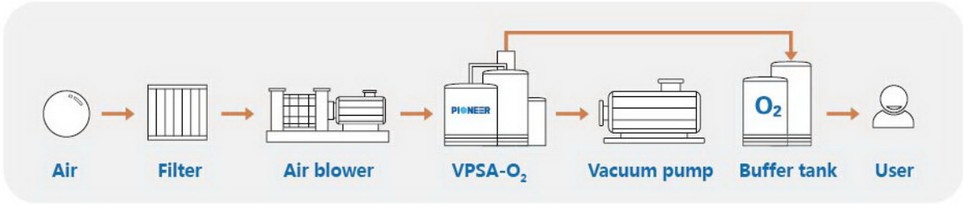
VPSA-O_2

Based on the high-efficient lithium-based VPSA-O_2 adsorbent PU-8, combining with the unique airflow distribution technology, advanced process design and reliable supplementary devices, PIONEER has successfully ensured energy-efficient and large-scale VPSA-O_2 plants to provide O_2 product at a lower cost.

PIONEER has built up over 100 sets of VPSA-O_2 plants and taken the lion share in the field of VPSA-O_2 in China. The VPSA-O_2 technology won the first prize for Science and Technology Progress by the Ministry of Education.

PIONEER is committed to mutual development with the customers, by providing economical O_2 utilization program, optimization of existing plants or on-site gas supply.

■ 变压吸附空气分离O_2工艺流程示意图



Technical Advantages

1. Experienced engineering

PIONEER has built the most VPSA-O_2 plants in China, including the world's largest VPSA-O_2 plant.

2. Excellent energy consumption

Energy consumption of PIONEER's VPSA-O_2 plant is <0.35 kWh/m³ O_2, which is among the lowest, around the world .

3. Internationally-leading process design

PIONEER has built up the first set of radial bed in China.Independently-developed five-bed, air intake and other original process designs have proved obvious advantages.

4. The independently-developed lithium-based adsorbent

PIONEER's independently-developed and produced lithium-based VPSA-O_2 adsorbent PU-8 is featured by high selectivity and high working capacity of nitrogen, which is among the best around the world.

5. Mature and reliable system running

The long-term engineering practice has proved that PIONEER's VPSA-O_2 plants are stable and the supplementary devices are mature and reliable, thus ensuring the continuous production for users.

O_2 Oxygen

Typical Applications

- Steel: Blast furnace oxygen-rich coal injection, electric furnace steelmaking.
- Non-ferrous metallurgy: combustion-supporting for non-ferrous metals metallurgy including copper, lead, nickel, zinc, tin and gold.
- Chemical: gasification furnace oxygen-rich gas making, carbon black production, sulphur trioxide production etc.
- Kiln energy-saving: combustion supporting for glass kilns, cement kilns and oxygen-rich combustion supporting for waste incinerators
- Papermaking: pulp bleaching process.
- Sewage treatment: OEAA technology, oxygen source for ozonizer.

PSA-CO

PIONEER's independently-developed and produced PSA-CO adsorbent PU-1 was granted the Chinese, USA and Canadian patents. PU-1 has ultra-high adsorption capacity and selectivity for CO, which are the key features for PSA-CO technology.

PIONEER originates the high performance PSA-CO technology based on PU-1 adsorbent, achieving the efficient separation of CO from nitrogen, methane and other components.,which is of great importance for the carbonyl synthesis industry. This technology won the Second Prize for National Technology Invention.

PIONEER has designed and built dozens of PSA-CO plants for users, with the features including low cost of gas product, high purity, high yield, flexibility of feed gas, moderate operating conditions and easy load regulation


国家技术发明奖
证 书
证书号：2006-F-213-2-05-R04

■ 变压吸附分离CO工艺流程示意图



CO
Carbon monoxide

Typical Advantages

1. Wide applications
PIONEER's PSA-CO technology is suitable for any CO-rich feed gas.

2. Ranking 1st in market share
PIONEER builds the most PSA-CO plants in China, and holds over 90% of market shares.

3. High purity and recovery
The high purity of CO products (up to 99.99%) and high recovery (80%-95%) ensure high-quality and low-cost CO gas product for downstream synthesis.

4. Patented adsorbent
Patented PSA-CO adsorbent PU-1 is highly efficient for producing high-quality CO.

Typical Applications

PIONEER's PSA-CO technology has been successfully applied in ethylene glycol, butyl alcohol, acetic acid, acetic anhydride, formic acid, oxalic acid, oxalacetate, dimethyl formamide, dimethyl carbonate, TDI and MDI.

PIONEER builds the most PSA-CO plants in the world, including the world's largest PSA plant cluster (20,000Nm^3/h of O_2 product, 20,000Nm^3/h of CO product and 40,000Nm^3/h of H_2 product), the world's first plant for purifying CO and H_2 from calcium carbide exhaust, and the world's first plant for separating CO from blast furnace gas.

PSA-H_2

Using the independently-developed and produced PSA-H_2 adsorbent, PIONEER's Rapid PSA-H_2 process features low investment and operating cost, high purity and recovery of gas product, flexibility of feed gas and easy load regulation.

PIONEER's Rapid PSA-H_2 technology can purify H_2 from shift gas, coke oven gas, semiwater gas, methanol purge gas, methanol pyrolysis gas, ammonia pyrolysis gas, formaldehyde exhaust, refinery reformed gas, refinery FCC dry gas and refined gas.

Typical Advantages

1. Innovative Process Design

PIONEER's innovative Rapid PSA-H_2 process features shorter period and smaller bed size in comparison with the existing process, which greatly reduces the investment and operating cost.

2. Independently-developed Adsorbent

PIONEER's independently-developed and produced PSA-H_2 adsorbent has excellent performance indicators and features high capacity and flexibility of feed gas.

3. Outstanding Product Index

The high purity (up to 99.999%) and recovery (≥90%) of H_2 products are of great importance for energy conservation and efficiency improvement.

Typical Applications

1. Application in chemical synthesis

Currently H_2 is mainly used as intermediate or raw material for chemical synthesis, for example, of ammonia, methanol, ethylene glycol, butyl alcohol and phosgene for further generating TDI and MDI, etc..

2. Application in petroleum refining

H_2 is applied in various processes of petroleum refining and petrochemicals, including hydrocracking, catalytic hydrogenation, hydrotreating, hydrodesulphurization and benzene hydrogenation to cyclohexane.

3. Application in modern coal chemical industry

H_2 can be used for direct or indirect synthesis of liquid fuels, olefins and other important chemical products, for example, direct coal liquefaction, indirect coal liquefaction (F-T synthesis) and coal-to-substitute natural gas (methanation), etc.

4. Application in reduction

H_2 is widely used as reducing gas in heat treatment and production of metal hydride.

Industrial Exhaust Gas Treatment Technology

Since industrial exhaust gas not only pollutes the air directly, but also may do harm to human health and have irreversible negative impact on the environment, the world pays more and more attention to comprehensive utilization of industrial exhaust gas.

Some of industrial exhaust gases may have greater economic value. Taking calcium carbide furnace exhaust as instance, to produce 1 ton of calcium carbide, the furnace may generate 400m³ of exhaust gas, equivalent to 200kg of standard coal. Appropriate utilization can reduce the carbon emission, and turn the waste into treasures to create greater economic value while achieving energy conservation and emission reduction.

Steel plant exhaust gas treatment

Steel plant exhaust gases are rich in valuable CO, H_2, yet it is difficult to separate CO from blast furnace gas and converter gas. Based on its mature PSA–CO technology, PIONEER has successfully developed a specific process and formed its unique technology for separating CO from blast furnace gas and converter gas. In January 2013, the world's first plant for separating CO from blast furnace gas was successfully put into production in Hengyang Valin Steel Tube Co., Ltd. PIONEER's PSA technology can also be used to separate and purify H_2 from coke oven gas.

Calcium carbide furnace exhaust treatment

Currently the calcium carbide furnace exhaust is merely used for power generation, lime burning and waste heat boiler. PIONEER's PSA–CO technology can separate CO from calcium carbide furnace exhaust for the synthesis of chemical products much more valuable. In 2012, the world's first industrial plant for purifying CO from calcium carbide furnace exhaust, designed and built by PIONEER, was put into production in Xinjiang Tianye Group.

Phosphorus furnace exhaust treatment

Though phosphorus furnace exhaust is rich in CO, the presence of impurities, especially the phosphorus and phosphine, prevents it from utilization. PIONEER has successfully developed DePOX catalyst—a new dephosphorization catalyst, which can continuously remove phosphorus and phosphine under the harsh circumstance of phosphorus furnace exhaust. On this basis, PIONEER can provide overall solutions for purification and comprehensive utilization of phosphorus furnace exhaust.

New Ways of Efficient Use of Blast Furnace Gas

Hengyang Valin Steel Tube Company Limited has successfully achieved industrial application for separating CO from blast furnace gas with low cost and large scale by the use of PIONEER's technology for separating CO from blast furnace gas. The practice shows that, this is a kind of innovative technology with tremendous application value, which will inevitably play a very useful role in consumption reduction and income increase, energy conservation and emission reduction, and sustainable development in China's iron and steel industry. After separation and purification of effective component of CO from the blast furnace gas, it can be used for the following three purposes:

1.To produce high value–added chemical productst

CO is a kind of important raw material with chemical synthesis. It can purify CO from the blast furnace gas to over 99%, which is used for the production of ethylene glycol, acetic acid, dimethyl carbonate, polycarbonate, TDI, DMF and other chemical products, thus significantly enhancing the added value of the gas. To obtain CO by the use of blast furnace gas has a large cost advantage. With the rapid development in the non–steel industry, it has attracted attention by many domestic and overseas famous iron and steel enterprises.

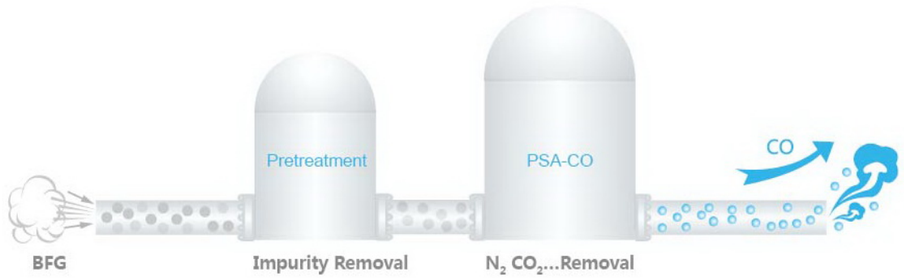
2.To be premium fuel

To increase concentration of CO from the blast furnace gas to about 70%, and make heat value of the product reach above 8200kJ/Nm3 will make it become premium metallurgical gas, which can replace coal or natural gas for combustion, so as to meet production needs, and supply for combustion section in iron making links.

3.To be reducing gas of blast furnace injection

The research shows that, to increase concentration of CO from the blast furnace gas and converter gas by the use of separation technology, and then to inject into the blast furnace will significantly improve the CO content of the furnace, and indirect reduction acceleration of the sinter in the furnace shell, and also significantly improve the operational performance of the blast furnace, increase production and substantially reduce energy consumption.

北大先锋可为钢铁企业提供“三气”高效利用整体解决方案，以及全方位的技术和工程服务。



高炉煤气分离CO应用示意图

Sorbents

Sorbent is crucial for PSA plants. With the increasing market share, PIONEER has built up two production bases and expanded its total capacity of sorbents production to 10,000 tons/year. Through the strict quality control and persistent production process optimization, PIONEER is always keeping a high level of sorbent performance. The sorbent products has been exported to many countries in Europe, America and Southeast Asia.

Xie Youchang

Professor of College of Chemistry, Peking University, physical chemist, and key founder of PIONEER

谢有畅教授说：科学研究的目的最终在于学以致用，不断发现新型结构的分子筛是基础理论研究，具有科学指导意义，而将已知结构的分子筛进行大规模的生产及工业化应用则具有实际应用价值。分子筛的应用非常广泛，可以作高效干燥剂、选择性吸附剂、催化剂、离子交换剂等，目前已确定结构的分子筛有160余种，成功大规模工业化应用的仅有20余种。北大先锋从成立以来就致力于将科研成果转化为生产力，已成功实现多种吸附剂和催化剂的推广应用，我们为此感到自豪。

建议增加吸附剂可出售的介绍

Sorbents independently developed and produced by PIONEER:

> The lithium–based VPSA–O_2 adsorbent PU–8

The N_2 adsorption capacity of PU–8 at 1atm, 25℃ is 22–23ml/g, and the separation coefficient of nitrogen and oxygen is 8–10, which are 2–3 times of those of conventional molecular sieve for oxygen generation respectively, ranking the most advanced sorbent around the world. PIONEER is the only enterprise in China at present that can ensure stable production of such product.

> PSA–CO adsorbent PU–1 series adsorbent

The CO adsorption capacity of PU–1 at 1atm, 25℃ exceeds 50ml/g. It can be used to separate and purify CO from industrial gas mixtures including water gas, semiwater gas, syngas, exhaust from steel plants, calcium carbide exhaust gas, phosphorus exhaust gas and acetic acid tail gas.

> Deoxydation catalyst—PU–5

It can be used to remove O_2 from gases containing CO and other inert gases down to 1ppm or less.

> Special PSA–H_2 adsorbent

It is featured by high adsorption capacity and adsorption rate, suitable for separating H_2 from the gas mixtures containing hydrogen.

Applications

Chemical and Petrochemical

PSA technology has been widely applied in chemical and petrochemical industries. PIONEER can provide PSA–O_2/CO/H_2 separation plants, with technical consulting and solutions on the separation of complex gas components or purification of intractable gas impurities.

New Coal Chemical Industry

New coal chemical industry targets clean energy and chemical products. which covers CTL, coal to methanol, coal to DME, CTO, coal to MEG etc.. PIONEER can provide CO and H_2 separation plants, featured by low investment, short construction period, easy load regulation and rapid startup/shutdown.

Steel

PIONEER can provide rich oxygen for blast oxygen–rich or electric furnace steelmaking, and can offer overall solutions for the treatment of steel plant exhaust to further improve the energy balancing and comprehensive utilization in steel industry.

Non–ferrous Metallurgy

PIONEER can provide reliable and low–cost O_2 source for customers in non–ferrous metal smelting industry, which are the main customers group of PIONEER's VPSA–O_2 technology.

Industrial Exhaust Gas Treatment

PIONEER has successfully mastered the purification and separation technologies against industrial exhaust gases including blast furnace gas, converter gas, coke oven gas, calcium carbide furnace exhaust, sulphuric acid tail gas and phosphorus exhaust gas, and can provide users with overall solutions from exhaust treatment to downstream applications.

Other Industries

PIONEER's VPSA–O_2 technology can be widely applied in combustion supporting for glass/fiber kilns, oxygen–rich combustion supporting for waste incinerators, pulp bleaching in papermaking industry, combustion supporting for cement kilns and OEAA in sewage treatment, etc..

Quality and Service

Chemical and Petrochemical Satisfying Customers—Core Business Philosophy

PIONEER is committed to satisfying the needs of customers, solving the problems of customers and developing with the customers. We promise to construct stable and reliable high-quality projects in line with the national standards, with performance indicators meeting the design requirements.

We assist customers in coping with the challenges in competitiveness, ROI and environmental demands through the product quality control, innovative modes of supply and the application of new technologies.

Sound Service System

Pre-sale Service Department—tailor the most reasonable and cost-effective overall gas solutions for customers based on the specific needs and actual situations of customers.

Design and Engineering Department—work closely with the customers and accumulate rich experience; pass the certification of ISO-9001:2008 quality management system, ensure strict implementation of national and industry standards and requirements to fully guarantee the construction schedule and quality of projects.

After-sales Service Department—conduct regular tracking and visit on the application situations of customers, assist customers in maintenance, repair and replacement of spare parts; work with the Design and Engineering Department to optimize the process design and provide upgrade services for the customers; provide remote services to solve field problems.

Research and Development

Based on the importance of industrial gases, PIONEER is committed to exploring more efficient and more environment-friendly gas application technologies and overall solutions that satisfy the practical needs of customers better. We believe that new demands may give birth to new markets. PIONEER is willing to cooperate with customers in R&D and help them improve their competitiveness.

PIONEER, based on the powerful research strength of State Key Laboratory for Structural Chemistry of Unstable and Stable Species, Institute of Physical Chemistry, College of Chemistry and Molecular Engineering, Peking University, has built a rigorous and efficient platform for R&D.

In 2012, PIONEER passed the accreditation of Beijing key Laboratory for Engineering. It will continue devoting manpower and financial resources to strengthen the R&D infrastructure, to further optimize the circumstantial configurations necessary for industrial R&D and provide favorable conditions for R&D teams.

Corporate Vision

To be a respectful enterprise
To be an industrial leader
To be a century-old enterprise

Insisting on the business philosophy of "satisfying the customers, employees, shareholders and the society", PIONEER has been striving to become an outstanding enterprise with high brand influence that can ensure long-term healthy development and sustainable excellent value creation, and to become widely recognized and respected by customers, employees, shareholders and the society.

Inheriting the spirit and excellent traditions of Peking University, PIONEER prefers to become the leader in the fields of industrial gas, to contribute internationally competitive products and technologies for energy conservation and environmental protection, other than merely makes profit.

Under the tenet of "innovation, development, satisfaction and improvement", PIONEER is committed to persistently innovating in technologies and management, and continuously strengthening its core competitive force to become a century-old powerful enterprise.