

美国纽泽西 **Branch Environmental Corporation (Branch)** 提供气提塔设备及洗涤净化塔的设计与供应已有**16**年以上的历史。尤其是洗涤塔的设计往往视不同情况、需要而应用不同型式、类别以及结构材质。**Branch** 因于设计与制造洗涤净化塔有多年经验而发展出有关去除氮氧化合物(**NOx**)洗涤塔的专利技术。迄今，**Branch**于美国和世界许多国家的许多工业界已提供数百件洗涤塔或气提塔的设备系统。

**Branch** 能提供以下技术设备以及视各使用者所实际需求的空气污染控制系统、污水臭味去除系统、或有机物或酸类吸附回收系统：

U.S. Branch Environmental Corporation located in New Jersey has designed and built scrubbers for over sixteen years. Scrubbers include many different types and styles as well as different materials of construction. Through the years, Branch Environmental has developed several patented technologies for NOx scrubbing. Branch has supplied many different industries in USA and many other countries more than hundreds of scrubbers and strippers .

US Branch can supply the following technologies and custom-built air pollution control systems、 wastewater odor removal systems、 chemical absorption systems for organics or acids.

1. 填充料床式洗涤净化塔 (Packed Tower Bed Scrubber)
2. 高能文式洗涤净化塔 (HE Venturi Scrubber)
3. 喷射文式洗涤净化塔 (Ejector or Jet Venturi Scrubber)
4. 撞击板碟式洗涤净化塔 ( Impingement Tray Tower)
5. 玻璃纤维床式气雾去除塔 (Fiberbed Mist Eliminator)
6. 选择性触媒式反应器去除氮氧化合物 (Selective Catalytic Reduction)
7. 特殊应用技术如去除氮氧化合物 (**NOx**) 洗涤塔 (Special Units for applications such as **NOx**)
8. 完全乾式烟气处理系统 (All Dry Flue Gas System)
9. 半乾式烟气处理系统 (Semi-Dry Flue Gas System)
10. 大型发电厂脱硫洗涤净化塔设备系统 (Large Scale Flue Gas Desulfurization Systems)
11. 气提塔 (Air Stripper)

12. 活性炭吸附器 (Activated Carbon Bed)
13. 尾气直接燃烧炉 (Thermal Oxidizer)
14. 尾气触媒式燃烧炉 (Catalytic thermal Oxidizer)

请参阅 **Branch** 网址 <http://www.branchenv.com>

- **填充料床式洗涤净化塔 (Packed Tower Bed Scrubber)**

适用于酸性气体如氰化物\*、二氧化硫、硫化氢、氟酸、氯气、盐酸等的废气吸除或回收。利用硷性溶液如氢氧化钠、漂白液（次氯酸钠）和酸性气体于填充料床接触反应去除之，或利用清水直接吸附强酸如氟酸、盐酸等以回收。

- \* 须利用强力氧化剂如漂白液（次氯酸钠）将氰化物反应成稳定、较无害的氰酸盐。

Applicable to removal or recovery of acid gases such as Cyanide\*, SO<sub>2</sub>, H<sub>2</sub>S, HF, Cl<sub>2</sub>, and HCl. A scrubbing (alkaline) solution such as NaOH or NaOCl solution is sprayed over a bed of packing, where acid gases will be removed by the reaction between gas and liquid, or fresh makeup water is used to absorb strong acid for recovery. \* use NaOCl solution.

亦适用于硷性气体如含氨氮（阿摩尼亚）的废气吸除或回收再利用。

使用酸性溶液如硫酸或磷酸和氨氮于填充料床接触反应成含硫酸氨或磷酸氨的晶体盐类，其可用来做肥料。

Also, applicable to removal or recovery of alkaline gases such as Ammonia (NH<sub>3</sub>). A scrubbing (acid) solution such as sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) or phosphoric solution (H<sub>3</sub>PO<sub>4</sub>) is sprayed over a bed of packing, where ammonia will be reacted to form a very concentrated salt. This crystal and salt is used for fertilizer, since it usually consists of either ammonium sulfate or ammonium phosphate.

90+% HCN Removal efficiency guaranteed 保证90+%氰化物去除率

99+% H<sub>2</sub>S Removal efficiency guaranteed 保证99+%硫化氢去除率

99.8% H<sub>2</sub>S Removal efficiency anticipated 实际期望99.8%硫化氢去除率

95+% SO<sub>2</sub> Removal efficiency guaranteed 保证95+%二氧化硫去除率

98% SO<sub>2</sub> Removal efficiency anticipated 实际期望98%硫化氢去除率

95+% NH<sub>3</sub> Removal efficiency guaranteed 保证95+%阿摩尼亚去除率

98% NH<sub>3</sub> Removal efficiency anticipated 实际期望98%阿摩尼亚去除率

- **高能文式洗涤净化塔 (HE Venturi Scrubber)**

适用于含很微细 (1 micron or greater) 粉尘、气雾、烟气等的废气清除。

虽亦可去除一些酸性气体但由于接触时间不够而往往需要利用一填充料床式洗涤塔以清除剩余的酸性气体。由于此技术利用高速废气将污水雾化而与

微细粉尘、气雾、烟气等接触、截击并去除之。故需耗用较多的操作电力。

Applicable to removal of very fine (1 micron or greater) dust, fumes, or mist. They can remove some gas, but contact time is limited and other designs such as packed tower scrubber is usually for polishing the remaining acid gases.

HE venturi scrubbers rely on a high velocity airflow in the scrubber to atomize water and remove particles down in the submicron range.

Therefore, operation of HE venturi scrubbers requires high power consumption.

- **喷射文式洗涤净化塔 (Ejector or Jet Venturi Scrubber)**

适用于流量变化且含高浓度强酸如氟酸、氯气、盐酸等的废气吸除或回收。利用高速、高压水流将废气吸入而通常不用抽风鼓机，之后，将含高浓度强酸以及粉尘同时去除。

Applicable to removal or absorption for recovery of strong acid laden waste gas with variable flow rates. Utilize high liquid rates under pressure to entrain waste gas without a fan, then remove high concentrations of strong acids such as HF, Cl<sub>2</sub>, and HCl as well as particulates simultaneously from waste gas.

- **「撞击板碟式洗涤净化塔」 (Impingement Tray Tower)**

适用于需有效吸附、去除酸性气体以及拦截粉尘、盐类。此类净化塔常应用于都市垃圾焚烧项目。

The multi tray design can handle solids including particulate and salts and also provide good acid absorption. It is very often applied to municipal solid waste (MSW) incineration systems.

- **玻璃纤维床式气雾去除塔 (Fiberbed Mist eliminator)**

适用于含非常微细 (< 1 micron) 油雾、酸/硷雾、盐雾等的废气清除。利用非常低流量的废气通过一强力高压压缩制成的玻璃纤维床以有效去除非常微细或低浓度的气雾、盐雾等。

Applicable to removal of extremely small particles (< 1 micron) such as oil, acid mist, or a soluble salt. The principle of operation involves an extremely compressed medium of fiberglass with low gas velocity.

- **选择性触媒式反应器去除氮氧化合物 (Selective Catalytic Reduction - SCR)**

适用于排放温度于 160 – 320 °C间的烟气。利用喷射入阿摩尼亚与氮氧化合物于SCR反应器反应生成氮气和水。于一般SCR反应器的设计与操作

情况，氮氧化物可增加喷入阿摩尼亚与氮氧化物间的比例以提高氮氧化物去除率至约90%。

Applicable to flue gas with exit temperature in the range of 160 – 320 °C. Ammonia is injected into the waste gas stream and react with the NOx present in the SCR reactor to form N<sub>2</sub> and H<sub>2</sub>O. )

Under typical SCR design and operating conditions, NOx reduction efficiency is directly proportional to the NH<sub>3</sub>:NOx ratio up to NOx reduction levels of approximately 90%.

- **特殊应用技术**如去除氮氧化物(NOx)洗涤塔 (Special Units for applications such as NOx)

为避免耗用过多化学反应剂和SCR所需高温范围，发展出一特殊表面触媒剂做为填料，加上一般洗涤塔于常压操作下及所使用的硷性溶液和NOx于填充料床上接触、反应去除之。

To avoid the problems of high chemical cost and high operating temperatures, a special surface catalyst media was developed to be operated using conventional scrubber chemistry with a caustic solution at ambient temperature.

- **完全乾式烟气处理系统** (All Dry Flue Gas System)

适用于要求二氧化硫的去除率需达到50% - 65%和氯化氢的去除率需达到80%或以上的项目。完全乾式烟气处理系统主要由「乾反应剂 (如石灰) 于管道中之喷注系统」与一「袋室集尘器」所组合的。

Applicable to air pollution control efficiencies for 50% - 65% of SO<sub>2</sub> removal and 80%+ of HCl removal. All Dry Flue Gas System comprises mainly duct sorbent injection with reagent such as dry lime and a baghouse.

- **半乾式烟气处理系统** (Semi-Dry Flue Gas System)

适用于要求二氧化硫的去除率需达到70% - 85%和氯化氢的去除率需达到95%或以上的项目。半乾式烟气处理系统主要由一喷洒石灰浆的「乾燥吸附反应器」与一「袋室集尘器」所组合的。

Applicable to air pollution control efficiencies for 70% - 85% of SO<sub>2</sub> removal and 95%+ of HCl removal. Semi-Dry Flue Gas System comprises mainly a spray dryer absorber (SDA) using lime slurry and a baghouse.

- **大型发电厂脱硫洗涤净化塔设备系统** (Large-scale Flue Gas Desulfurization Systems)

大型脱硫洗涤净化塔设计原理与构造如同填充料床式洗涤塔，但并无填充料床且使用较多的循环泵及喷嘴。

Branch can also supply large-scale Flue Gas Desulfurization systems for Power plants, of which design and construction are very similar to a packed tower scrubber but without packed bed, instead, with more circulation pumps and associated spray nozzles.

95+% Removal efficiency of SO<sub>2</sub> guaranteed 保证95+%二氧化硫去除率  
98% Removal efficiency of SO<sub>2</sub> anticipated 实际期望98%硫化氢去除率

- **气提塔** (Air Stripper)

适用于将溶于地下水或污水中的有机挥发物如苯、乙苯、二甲苯、三氯乙烯，以及具臭味物质如硫化物和氨氮 (阿摩尼亚) 等自水中经调节pH后\*、空气抽提吸出。「气提法」较「生物分解法」适合应用于污水的高级处理，因其操作较生物法易为控制且能应付流量变化大与浓度负荷突变的大多数工业污水。

Branch 供应过许多特殊设计的气提塔系统，包括最近完成几件处理MTBE的项目。

一般保证90+%硫化氢气提去除率，亦可能达99%气提去除率，需视实际处理状况如水温而定。

一般保证80+%阿摩尼亚气提去除率，亦可能达95%气提去除率，需视实际处理状况如水温而定。

\* 污水于常温20°C，气提硫化氢需调节 pH至4.0 — 5.0，  
气提阿摩尼亚需调节 pH至11—11.5。

水温愈高所需调节pH值可相对减少。譬如，若污水温度60°C，气提硫化氢需调节 pH至6.0-，气提阿摩尼亚则需调节 pH至9.5+。

Applicable to removal of VOCs such as BTEX (Benzene, Toluene, Ethyl Benzene, Xylenes), TCE, and odor substances such as sulfides and ammonia from wastewater after pH adjustment. Air stripping for nitrogen removal in the

tertiary wastewater treatment has the advantage of being more amenable to control than biological processes and more adaptable to the fluctuating flows and concentrations inherent to most of industrial wastewater systems. Branch has built units for many unusual applications. Recently, several units have been installed on MTBE projects.

H<sub>2</sub>S removal efficiencies of 90+% can be achieved consistently using air stripper technology. Designs as high as 99+% H<sub>2</sub>S removal can be built.

Typical ammonia removal efficiencies vary from 80 to 95% depending on specific site requirements.

- **活性炭吸附器 (Activated Carbon Bed)**

适用于去除某些低浓度气体污染物，包括戴奥辛（二噁英）、硫化氢、氯化氢、氨氮、和硫醇等。戴奥辛(二噁英)去除率可达95%以上，硫化氢、氯化氢、氨氮、和硫醇等则可达95%以上。

Applicable to removal of low concentrations of Dioxins/Furans, Hydrogen Sulfide, Hydrogen Chloride, Ammonia, and Mercaptans. Typical removal efficiency of Dioxins/Furans is 95%+, and 99%+ for Hydrogen Sulfide, Hydrogen Chloride, Ammonia, and Mercaptans.

- **尾气直接燃烧炉 (Thermal Oxidizer)**

适用于直接焚烧含有机挥发物质、流量不超过2,000 – 3,000 acfm的废气。或可以加装一热交换器以预热废气而可节省许多燃料。

Applicable to treat up to VOCs laden waste gas of up to 2,000 – 3,000 acfm. Gas heat exchangers may be used to preheat the incoming gas and reduce operating cost considerably.

- **尾气触媒式燃烧炉 (Catalytic Thermal Oxidizer)**

适用于焚烧含浓度低于2,500 ppm有机挥发物质的的废气。通常触媒式燃烧炉运输操作温度为直接焚烧炉的1/3，约为 370 °C左右即可有效摧毁VOCs并可减少燃料耗量。

Applicable to treat lower VOC concentrations (2,500 ppm or less), catalytic thermal oxidizer reduces the supplemental fuel cost significantly. Typically, operating temperature will be 1/3 of those for a thermal oxidizer. In many cases only 370 °C is required for destruction efficiency of VOCs.