

System Engineering Solutions

Optimizing Reliable Returns for your Process



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SUNRESIN NEW MATERIALS CO.LTD.



Company Profile



• Introduction to System Engineering



• Valve technologies-Sepsolut® & Puritech®



• Project Applications and References



• System Engineering Services

Company Profile

Introduction

Sunresin is an innovation oriented high-tech enterprise focusing on providing the best process solutions to its customers with ion exchange resins and adsorbents integrated into optimized equipment and technical services. These products and components are the fruits of intensive R&D and 20+ years of market presence. It's a unique listed company in Ion Exchange and Adsorbent Resin industry with Stock Code SZ 300487.

Sunresin manufactures about 50,000M³ of Ion exchange and adsorbent resin materials annually, and supplies customers with hundreds of SMB equipment systems. Sunresin products portfolio includes about 30 categories and more than 200 different resin types which are broadly used in industries such as: Industrial & Civil Water Treatment, Food Processing, Biotech, Pharmaceuticals, Plant Extraction, Waste Water Treatment, Brine purification and Hydrometallurgy, etc.

Sunresin regards Innovation, Quality and Service as the foundation of enterprise development. With strong technical strength, rich manufacturing experience and strict international standards, continue to provide customers with better products and more reliable technical support; With a pragmatic and forward-looking attitude, promote the industry to higher technology and sound development.

Sunresin is committed to higher level development of adsorption separation materials and system integration technology.

R&D

- **5** R&D teams
- **7%** revenue investment annually
- **58** patents, Intellectual property rights for all its core technologies
- **100+** creative and experienced chemists and engineers
- Continuously improving technology and facilities to update product efficiency



Second Prize for Progress in Science and Technology awarded by the State Council of China



Company Structure

Headquarter & R&D



Sunresin Park, Headquarter



Sunresin, R&D center



SR-Nankai University Joint R&D center

Manufacturing



Sunresin, Gaoling



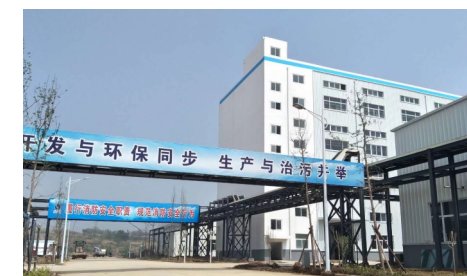
Sunresin, System Engineering Park



Sunresin, Special Resin Factory



Sunresin, Pucheng



Sunresin, Suncycle Hebi



Sunresin, Puritech Belgium

Sunresin offers:

- Top quality Ion Exchange Resin & Adsorbents
- Feasibility studies
- Continuous countercurrent Ion exchange/adsorption technology
- Patented Sepsolut valve-array system and Puritech Multi-port valve system
- Optimized Process Design & Simulation
- Optimized Design of complete installation engineering
- Optimization from Pilot trials to Scale production
- Remote commissioning and installation guidance
- EPC project



Fixed Bed (Manual/Automatic)

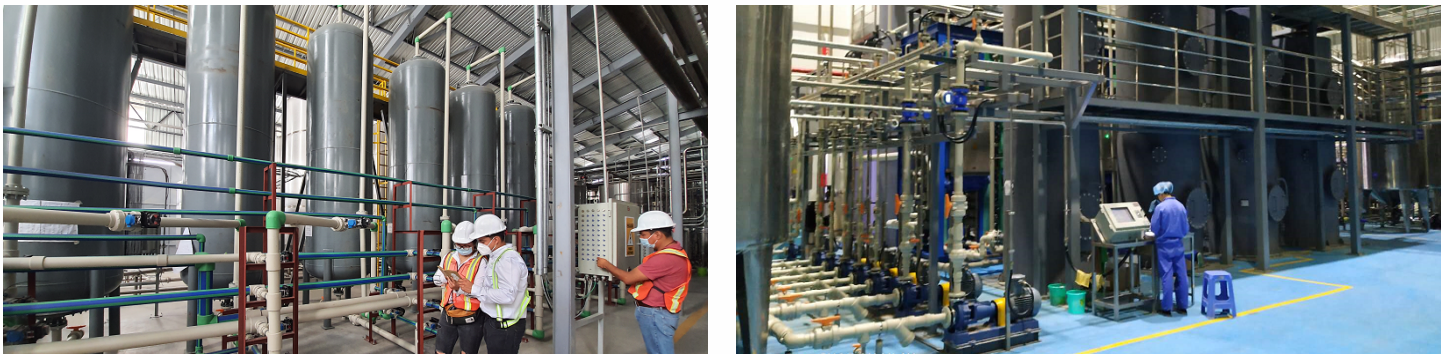
Combining advanced process and intelligent control system, Sunresin is able to deliver fixed bed processing unit with both manual and automatic solutions for better adaptation and compatibility with customers' operation demands. The flexibility, stability and operation efficiency have been widely acknowledged by customers all over the world.

Application References

- Purification of Amino Acid, Lactic Acid, Lemon Acid, Citric Acid
- Deionization of Juice
- Purification of Vitamin C
- Gallium recovery and Iron removal in Alumina production from coal ash
- Lithium carbonate recovery from salt brines
- High fructose corn syrup separation
- Iohexol production
- Cobalt-Nickel separation
- Nickel recovery

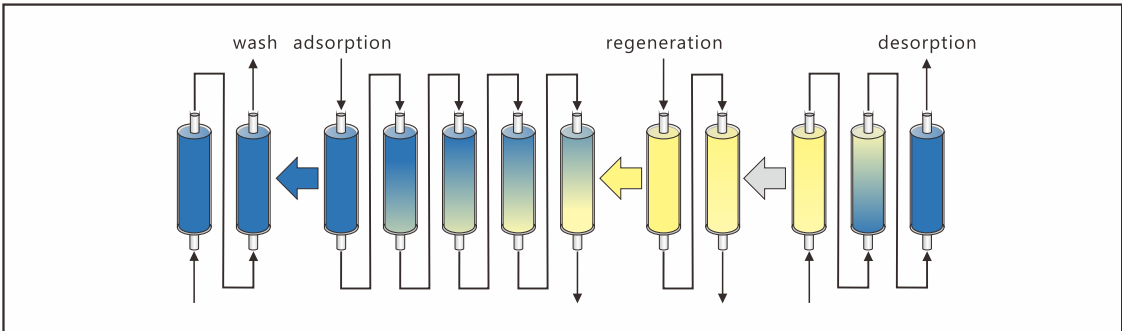
SMB (Simulated Moving Bed)

With increasing knowledge of resin applications and widespread use of automatic control systems, the transition from fixed bed to SMB has been rapidly achieved. By adopting serial/parallel connection mode, the saturated resins can be moved out of the working area rapidly and improve the resin utilization efficiency, increasing product concentration and decreasing the regenerant consumption.



SMB System Process Flow

With the full utilization of the transition section, adsorption, washing, desorption and regeneration can be carried out simultaneously. By constantly optimizing the process flow, the material consumption is remarkably decreased.



Comparison Chart of systems features

Item	Fixed Bed	Simulated Moving Bed (SMB)
PROS	· Simple structure & low investment · Simple process, manual operation · Simple pipeline switch	· Rational process design, high utilization of resins · Highly automatic and continuous operation · Highly compact structure, less pipeline and area occupation · Higher yield, concentration, stability and purity of product · Lower consumption of water and chemicals · Lower emission of wastes amount, environmental friendly · More flexible production operation
CONS	· Large area occupation · Complex pipelines · Low utilization of resins · Unstable product utility · High consumption of materials and regenerants	· Higher requirements to equipment machining precision and control system

Comparison Chart of Performance

	Fixed Bed	SMB	SMB saving
Resin Volume			30~50%
Minimal concentration of material input	2-3 Brix	0.5-1.0 Brix	30~50%
Water volume for rinsing & replacing materials	2-4 BV	1-1.6 BV	30~50%
Regenerant volume	Over 100~200%	Over 20~50%	30~50%
Water volume for rinsing regenerants	2-4 BV	30~50%	30~50%

SSMB

With years of synthesis and continuous ion exchange experience, Sunresin has developed a highly applicable Simulated Moving Bed chromatography system, which is widely used in sugar alcohol separation, amino acid purification, fermentation liquor demineralization, effective plant monomers separation, bio small molecules purification etc. The chromatographic system is characterized by high separation accuracy, excellent product quality, high yield, low solvent consumption, good system stability, automated continuous operation, and high production efficiency.



EPC

With a strong Engineering team and key know-how for ion exchange resins, Sunresin has delivered EPC solutions to customers around the world, in a one-stop shop fashion based on customers' site conditions.

As a Global Engineering Contractor, Sunresin provides a wide range of services such as feasibility studies, process development, surveys, engineering, procurement and construction. Sunresin has carried out a great number of projects around the world to support of supporting companies' expansion.

In the past few years, Sunresin has successfully implemented our know-how and state-of-the-art EPC engineering expertise in some of the world's largest ion exchange projects.

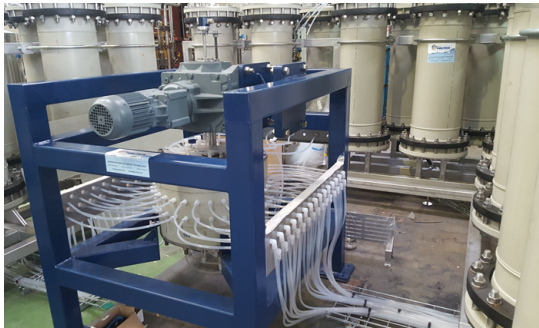
Application References

- Lithium carbonate project - Jintai, Qinghai
- Gallium extraction project - CHALCO Guizhou
- Fly ash gallium extraction project - Shenhua Group Co. Ltd.
- Calcium chloride removal and iron removal project - Shenhua Group Co. Ltd.
- Pigment extraction - DOHLER Turkey
- Citric acid demineralization - Turkey
- Stevia extraction - Guatemala
- Cobalt recovery - Congo (DRC)

Valve technologies--Sepsolut® & Puritech®

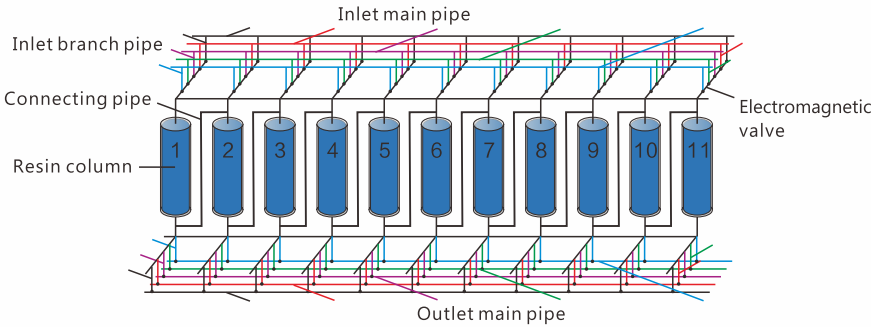


Sepsolut® & Puritech® Complementation

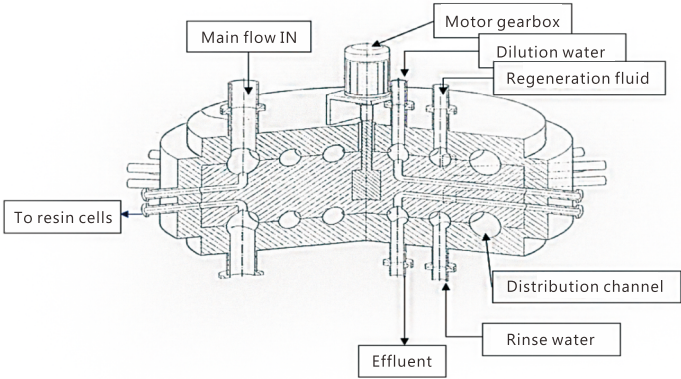
Item	Sepsolut® valve-array	Puritech® Multi-port valve
Features	· Resin and columns fixed, simulate moving by valves on & off. · Nomechanical abrasion, low power consumption. · Suitable for systems with big resin volume.	· Resin and columns fixed, sophisticated internal material distribution system, simulate moving by multi-port valves on & off. · Suitable for system with various materials, complex process and high separation requirements.
Example	 Source: Qinghai Zangge brine lake lithium extraction project	



· Sepsolut® Valve-array System



· Puritech®-Multi-port Valve System

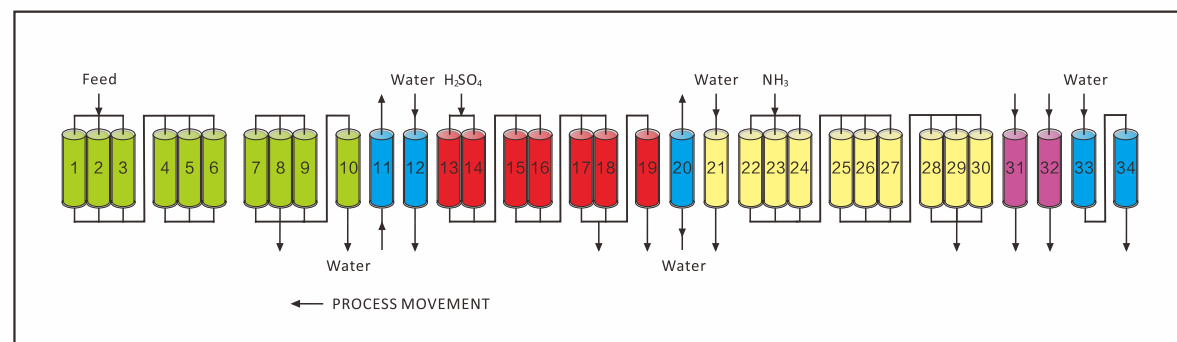
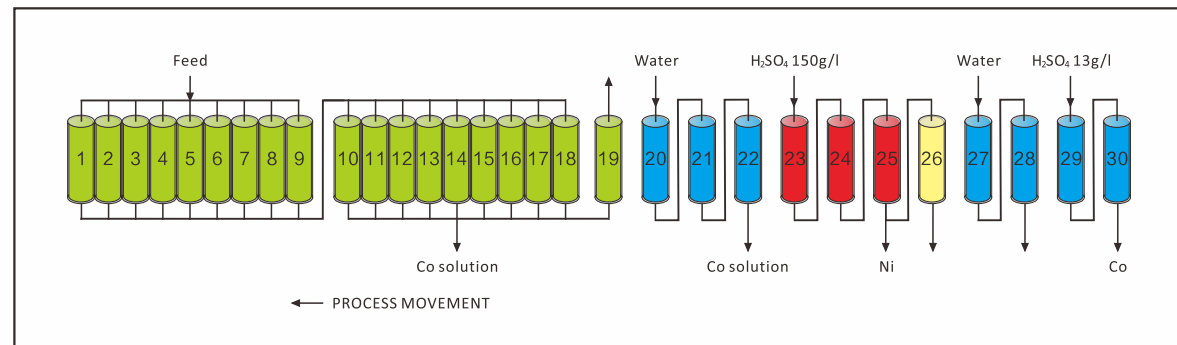
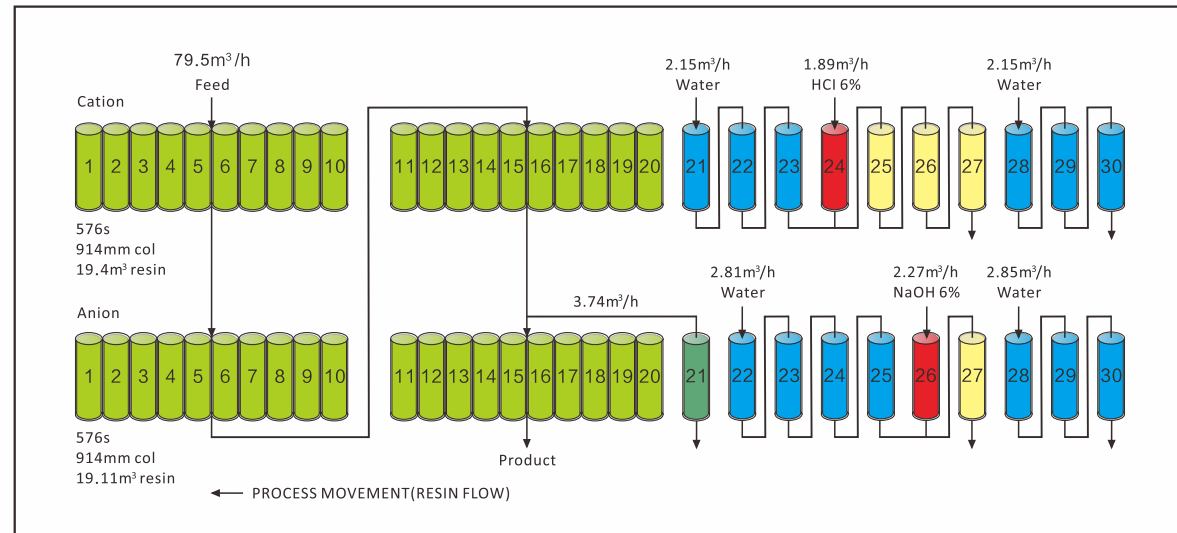


· Puritech® Multi-port Valve System Operation Sketch

Maximum flow rate: 700m³/h
Cost saving: smaller column size, easier operation
Higher efficiency of ion exchange process without complex valve nesting

• Process Flow Chart

With combination of Sepsolut® and Puritech® valves, the SMB system can satisfy extremely complicated process.

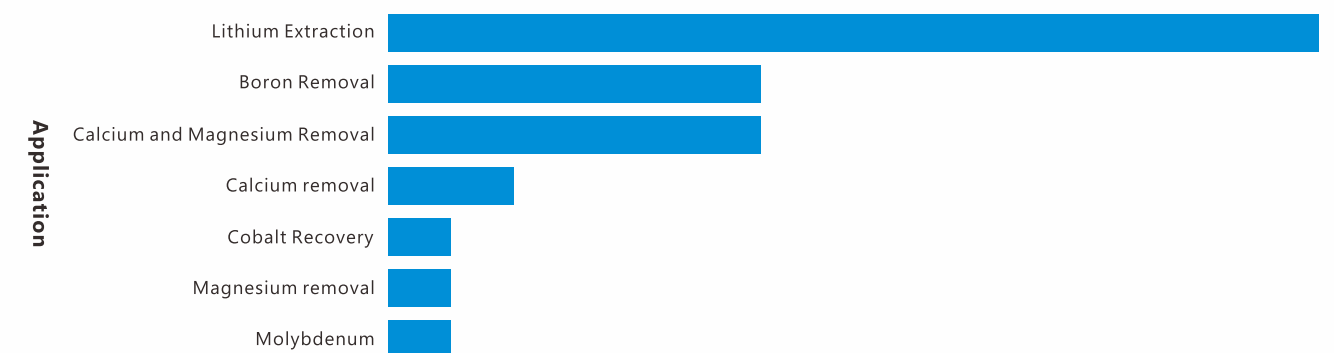
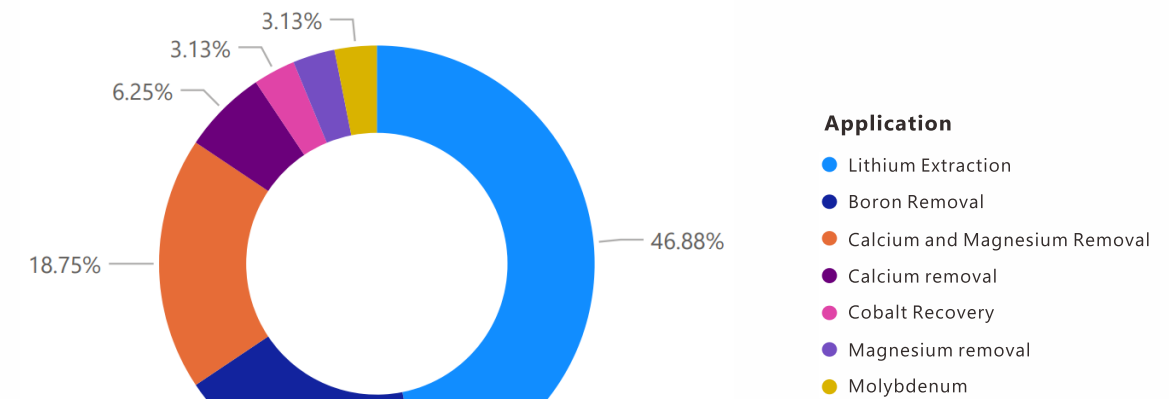


Project Applications and References

Hydrometallurgy

Sunresin has years of experiences in hydrometallurgy from R&D, lab tests, pilot tests and large scale industrialization projects, covering a large number of metal ions. Over the years, thanks to its cutting-edge resin technologies and expertise in system engineering and processes, Sunresin has successfully designed and delivered a great number of such systems to customers in hydrometallurgy applications, in a one-stop-shop fashion.

Projects in Hydrometallurgy by Application



Projects in Hydrometallurgy

• **Lithium**

As the world transitions to “Green Energy” , Lithium has become one of the most sought-after metals in battery production which empowers industries such as Electrical Vehicles. Sunresin's adsorption technology including adsorbents, Simulated Moving Bed (SMB) equipment and industrial process have been widely and successfully used in a number of Lithium Extraction projects in China and around the world.

For about a decade, Sunresin has been a front running global player in Direct Lithium Extraction (DLE) from salt brine, with its patented adsorbents, Simulated Moving Bed systems (Sepsolut valve array and Puritech® multi-port valves system) for continuous ion exchange, as well as its experience and expertise in carrying out large scale projects utilizing these technologies.

Zangge lithium line(10,000 tpa)



Jintai lithium line(3,500 tpa)



• **Nickel**

The traditional method for Nickel recovery, solvent extraction, has some undeniable drawbacks such as the risk of fire as well as the loss of a part of the solvent and the contamination of the effluents by toxic organic substances. From an operational point of view the solvent is contaminated with iron thus requiring a pretreatment allowing the precipitation of Fe³⁺ before the extraction. During this precipitation, about 10% nickel passes through the tailings and is difficult to recover. In addition, the saponification of the extractant consumes NaOH thus increasing the operational costs.

Sunresin offers a new generation of Nickel-selective chelating resin, Seplite® LSC495, that overcomes the disadvantages associated with solvent extraction, and has successfully established high-purity Nickel production line in China and Indonesia, using its own ion exchange system.

Seplite® LSC495 offers high selectivity for Nickel and is unaffected by Iron in solution. Consequently, no pretreatment is necessary, which makes it possible to reduce the losses of Nickel. Regeneration of Seplite® LSC 495 can be carried out by sulfuric acid and does not lead to saponification of the bis-Picolylamine chelating group. Thanks to its very high selectivity, the cost of Nickel production gets significantly reduced.



• **Gallium**

Sunresin is an experienced solution provider for Gallium recovery from Bayer liquor in the Alumina industry. As the key resin supplier, Sunresin provides the market with high performance resins selective for Gallium. Products for both processes, acid and alkali method, are available with 4N Ga systematic equipment. Sunresin integrates resin manufacturing, applied technology, and patent equipment into Gallium recovery production lines, therefore realizing comprehensive capability to serve customers in EPC mode.



• **Cobalt**

As a rare metal with high energy density, Cobalt is an important element of ternary batteries.

With our patented Simulated Moving Bed (SMB) technology for continuous ion exchange, as well as the selective Cobalt adsorption materials, Sunresin is able to increase the concentration of Cobalt ions in the precipitation liquor significantly, turning the original mother liquor with little value into a new source of Cobalt supply.

Sunresin's complete solution for Cobalt extraction has been successfully implemented in a recent large-scale EPC project in Congo , increasing the concentration of Cobalt ions in the precipitation liquor from 0.1g/L to 20g/L.

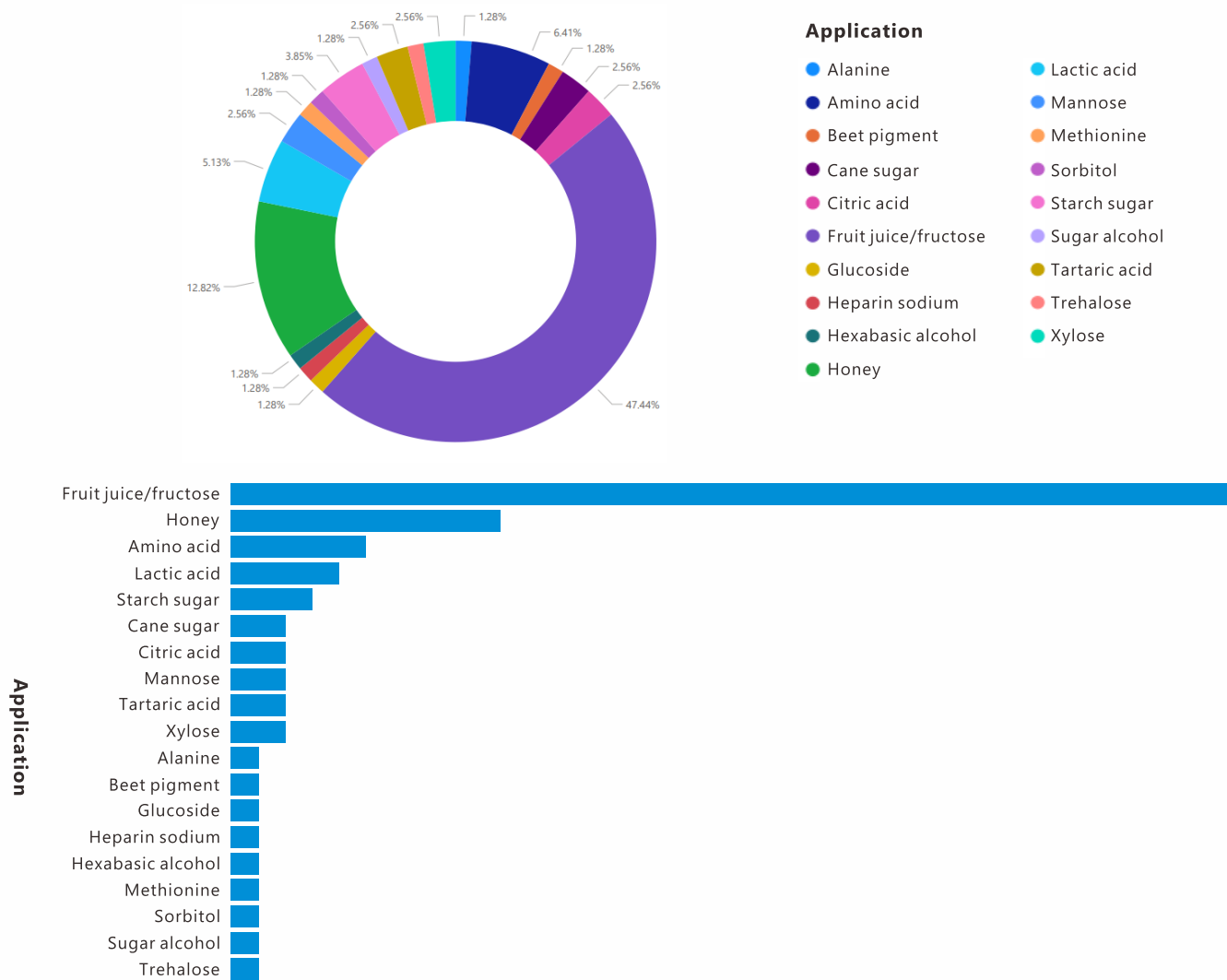
Ruashi Cobalt Recovery line in Congo (DRC)



Food Industry

Since the beginning of the century when Sunresin started activities, our adsorbent resins and separation solutions have been applied in food processing. Today in the Chinese market, the adsorbent techniques applied in juice industries all originated from Sunresin initiation. After 20 years' continuous technical innovation and industrialization in this field, new resins and solutions have been well established in the market, covering applications such as fruit juices (eg. apple, orange, pear , pineapple , lemon, grape and pomegranate), and sugar industries. More than 5000M³ of resins have been supplied to domestic and overseas customers with tens of production lines scoping from 5t/hr to 100t/hr.

Projects in Food Industry by Application



Projects in Food Industry

Turkey Juice treatment line



Amino acid treatment line in Dalian, China(1.17t/h)



VOCs

Thanks to the government policies to tackle emission of VOCs, Sunresin has successfully carried out **100+** sets of VOCs treatment projects using our proprietary adsorbent resins. Sunresin's adsorption solution with macroporous resins is especially effective in technical and commercial terms for the separation and recycling of VOCs such as alkanes, halogenated hydrocarbons, aromatic hydrocarbons, low-carbon alcohols, ketones , esters,and other organic matters.

Toluene treatment project, Zhejiang (10000m³/h)



Chlorobenzene waste gas treatment project, Jiangsu



Water treatment

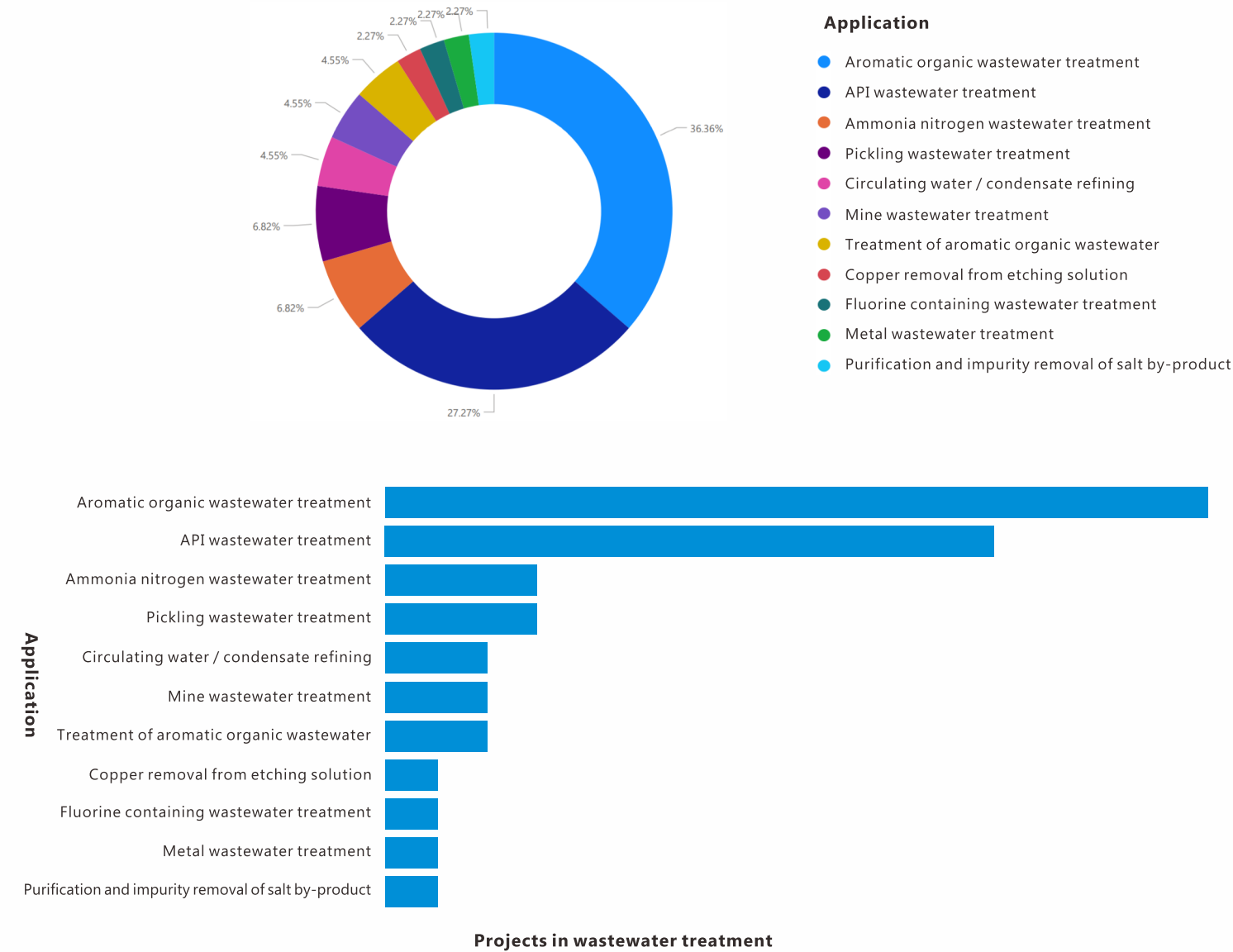
Water supply is of critical importance for all industries. Sunresin invests significantly in the R&D of water treatment technologies.

Water treatment is a complex process as there are different kinds of substances from different industries, such as the potable water industry, petrochemical industry, coal chemical industry, dye chemical, pesticides industry, pharmaceutical industry, electroplate industry, electronic industry, hydrometallurgy industry, etc.

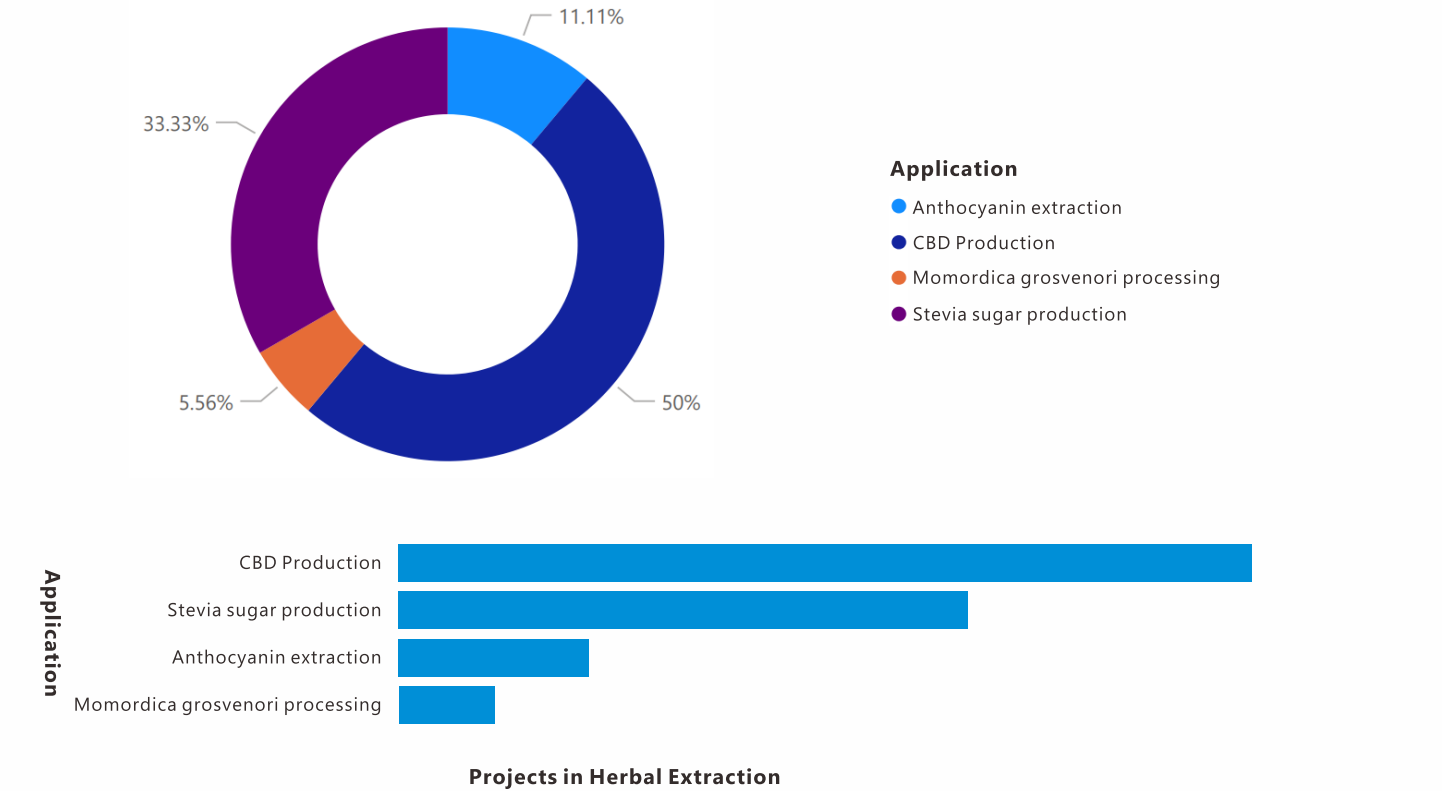
As one of the few integrated water treatment solution providers in China, Sunresin has successfully carried out a great number of EPC projects both in China and around the world, providing customized solutions from resin selection, resin supply, process evaluation, design, to equipment processing, installation, project commissioning, training and technical support.



Projects in waste water treatment by Application



Projects in Herbal Extraction by Application



Stevia sugar line in Guatemala(800tpa)



CBD production line in Qujing, China



Healthcare

• Herbal Extraction

With the development of resin technology, more and more adsorbents are successfully used in plant extraction. Sunresin's technology simplifies the process, raises the production efficiency, and improves the quality of the target compound.

Over the years, Sunresin has not only developed a range of resins for plant extraction, but has also been an integrated purification solution provider and has carried out EPC projects around the world.

• Pharmaceutical

Sunresin has been committed to the research and development of devices for medical care, such as Iodixanol production, Lodopanol production, Pyridine recovery. With tens of successful cases, Sunresin has been improving the techniques, and is ready to contribute to help pharmaceutical factories to achieve their targets



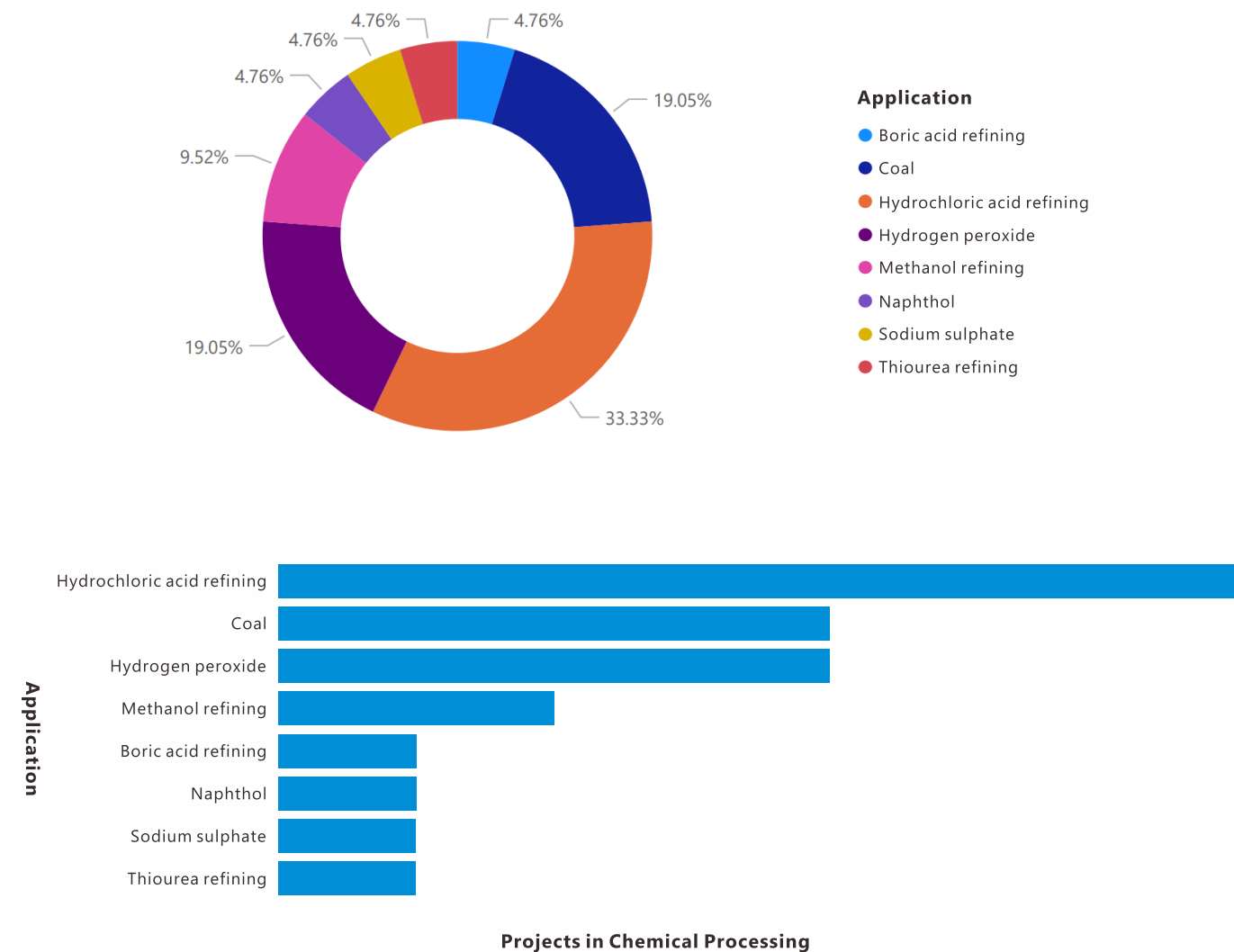
Lohexol treatment line in Zhejiang(11.25m³/h)

Chemical Processing

Purification of chemical compounds has become a vital part of most industrial processes. Ion exchange resins become the leading methodology to remove trace contaminants thanks to their selectivity, efficiency and flexibility.

Over the years, Sunresin's has provided resins of high quality for the chemical industries including secondary brine purification, chemical catalyst, H₂O₂ purification, Biodiesel purification, etc, while at the same time successfully carried EPC projects in these areas with supporting equipment and system.

Projects in Chemical Processing by Application



System Engineering Services

• Since its establishment more than 10 years ago, the System Engineering Department has independently designed and applied for dozens of patents, and completed the construction and commissioning of hundreds of system projects in various applications at home and abroad. It now has more than 100 experienced engineers and experts, covers technology, equipment, electrical, pipeline, automatic control and so on. With excellent organizational structure and management experience, we have built a number of high-quality projects for customers worldwide. While completing the construction with good design concepts, we have also greatly improved the economic benefits for customers.

We Can Deliver:

- Feasibility studies
- Optimized Process Design & Simulation
- Assessment of resin process section towards material balance of the whole plant
- Optimized Design of complete installation engineering
- Remote commissioning and installation guidance
- Technical support
- EPC project

