South-South Cooperation on Science and Technology to Address Climate Change

Applicable Technology Manual Water Resource and Environmental Protection























China Science and Technology Exchange Center



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South-South Cooperation on Science and Technology to Address Climate Change

Applicable Technology Manual
Water Resource and Environmental Protection

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Introduction

This Manual provides the information of applicable technologies to address climate change, aiming at facilitating cooperation among developing countries in addressing climate change through joint research and development, technology transfer and dissemination, training, building indigenous technological capability.

The editorial board released 1st edition of the Manual at UNFCCC COP16/CMP6 in Cancun, 2010, and released the 2nd edition at UNFCCC COP17/CMP7 in Durban, 2011. The released editions are the comprehensive volume, consisting of about 140 technologies in different areas. According to users feedback, the editorial board has revised the 3rd edition and released the compact disc instead of paper. The 3rd edition consists of three volumes in the field of renewable energy, agriculture and forestry, water resources and environmental protection respectively. Each volume covers about 100 technologies.

Hard copies, either CD or printed brochures, could be distributed only to limited readers, while it is made more accessible to wider audience by be published on the network/website. In order to contribute to further improving the capacity of developing countries in addressing climate change and promoting sustainable development, Ministry of Science and Technology, China has launched the Network/Platform for International Science and Technology Cooperation: Address Climate Change and Achieve Sustainable Development. With the goal of promoting knowledge diffusion, technology development and transfer, information sharing, the Network/Platform is an open, non-profit Platform to facilitate international science and technology cooperation for the benefit of all users from the world. The PDF version of the Manuals is available for download from the website (http://www.actc.org.cn) of the Network/Platform.

Partners from developing and developing countries, international organization and other stakeholders are warmly welcome to join us in building up this Network/Platform.

More information, please visit http://www.actc.org.cn.

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Disclaimer

Technology providers are responsible for factuality and accuracy of respective technological descriptions outlined in the Manual. MOST, UNDP, UNEP, UNESCO, the South Center, the Third World Network, CSTEC and the Editorial Board does not hold any responsibility for the factuality or accuracy of materials in the manual.

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Water Resource and Environmental Protection

Water resources technologies

Nothing can live without water, but the water resource on earth is scarce. Climate change and the growth of population are exacerbating the shortage of fresh water. It is estimated that half of the world's population will live in water-stressed conditions by 2030. The key for water management is to protect water sources and use them appropriately. In addition, the technologies on drinking water safety, rain collection, sewage recycling, water efficiency and seawater desalinization are important tools to adapt to climate change and ease water crisis.

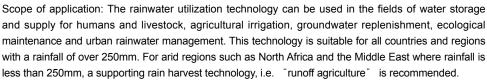
Technology for the reuse of rainwater and floodwater

South-South Cooperation on Science and Technology to Address Climate Change Applicable Technology Manual Water Resource and Environmental Protection

1. Rainwater collection, storage and utilization technology

Technology Overview

Functions and use: With growing population, deteriorating water shortage and increasingly limited cross-basin water transfer and groundwater development, rainwater collection, storage and utilization technology is again starting to play a unique role. Using modern construction technologies and materials to innovate and reconstruct traditional rainwater harvesting and storage facilities and opening up wider application fields for supplementary agricultural irrigation and ecological reconstruction has an important role to play in solving the problem of drinking water supply and supplementary agricultural irrigation in semi-arid and arid mountainous regions. The China Rural Rainwater Utilization Project won the First Prize in the World Water Action Competition at the 2003 World Water Forum, topping over 700 competing projects from around the globe.



Technological features: Rainwater collection, storage and utilization works are characterized by small investment, fast returns and convenient participation and management by rural households. The technology is an environmentally friendly and resources-saving technology and an effective means for water scare regions to achieve sustainable development and address climate change. The integrated use of rainwater utilization technology and such technologies as water-saving irrigation and ground film-based moisture preservation offers a technical guarantee for arid and water-scare regions to develop agriculture, optimize plantation structure, improve land productivity and reduce poverty.

Status of application

The technology has been promoted and applied; can be put into industrial production in developing countries; has developed mature products; ready for use after simple training, inexpensive to use, and easy to maintain. The technology is now used in 700 counties in 25 provinces in China. Over 12 million water storage pits have been built, meeting the domestic water needs of 36 million people and the supplementary irrigation needs of 40 million mu of farmland. The technology provider has offered training to over 250 technical









personnel from more than 70 countries and rainwater utilization pilot bases in Nigeria, Algeria and other countries. Saudi Arabia and the Caribbean region are currently promoting and using this technology. With support from the Ministry of Science and Technology, the technology provider is cooperating with the United Nations Environment Program to provide training and technical guidance to Africa.

Technology Provider

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Technology for the reuse of rainwater and floodwater

2. Water-deficient aquifer exploitation and integrated rain and flood water utilization technology



Technology Overview

Functions and use: In some regions which lack clean and safe drinking water or many regions where fine-grained rocks are distributed, shallow groundwater is often the most effective means to provide local drinking water. However, due to the low water output of a single well, it can hardly meet local needs. This technology mainly adopts a siphon cluster well form to double well water output. To a certain extent, it can meet pump extraction needs and solve the problem of water supply. In addition, it can take full advantage of the conditions of the local terrain and gather rain and flood water to replenish groundwater, purify water quality and enhance sustainable water supply capacities.

Technical information: can double single well water output, and meet the water supply needs of a certain scale.

Scope of application: Suitable for use in plain regions with certain rainfall and runoff-generating areas and shallow areas of fine sand. Regions with seasonal rivers make an ideal application for this technology. Applicable to dispersed water supply in vast rural and pastoral regions and some cities.

Technological features: Low well construction cost, small land occupancy, and can provide water supply in water-scarce regions. Meanwhile, it offers the advantages of improving land and greatly enhancing the potential for development of resources and the environment.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; ready for use after special training; low user cost; and users can perform their own maintenance.

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3. Water treatment agent poly ferric sulphate



Technology Overview

Functions and uses: PFS (Poly Ferric Sulphate) is a widely used polymer coagulant, which has been put into growing use in the past 20 years, especially in the reclaimed water reuse technology in the recent years. Moreover, PFS offers certain advantages in the in-depth processing of wastewater. Since its performance is superior to that of Al2(SO4)3 in many aspects, for instance, low dosage and strong adaptability to the changes in the temperature and ph value of the raw water. It has been widely used in water and wastewater treatment. PFS offers many advantages, such as no toxicity, wide applicable range of ph values, large alum, and rapid settling and has very good removal effects for COD, colors and heavy metal ions; it is cheap and used in small dosage; PFS has unique effects for the treatment of low temperature, low turbidity water and is widely used in the treatment of industrial wastewater and urban wastewater.

There are many methods to prepare the Poly Ferric Sulphate and so far the most practical one of which is the direct oxidation method, which is simple and highly efficient.

Technical indicators: density g/cm3 (20° C) \geq 1. 45; total iron content (by Fe3+) \geq 11%; reducing substances (by Fe2+) \leq 0. 10%; basicity: 9-14%; water-insoluble substances :< 0.3%.

Application scope: drinking water and wastewater treatment.

Features: simple production technology, high efficiency, and unique technology of China.

Status of application

The technology has been put into use, may be industrialized in the developing countries and is mature. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

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4. Water treatment agent polyaluminum chloride

Technology Overview

Functions and uses: PAC (polyaluminum chloride) is a high-efficiency inorganic polymer multicore coagulant containing different amounts of hydroxyl. As its performance is superior to that of Al2(SO4)3 in many aspects, for instance, low dosage and strong adaptability to the changes in the temperature and ph value of the raw water, it has been widely used in the treatment of water and wastewater. China started to carry out research on this technology in 1980s and the main raw materials are aluminum ore, aluminum hydroxide, and hydrochloric acid. Over the years, China has carried out research on a variety of raw materials and preparation processes. Using a unique process and production system, PAC can meet the requirements for the development of treatment of drinking water and wastewater.

Technical indicators: Aluminum content: Liquid products: Greater than 10%; solid products: Greater than 29%; basicity: 45-90%; insoluble substance content: Less than 1%.

Application scope: drinking water and wastewater treatment Features: the production technology is simple, but efficient, and is China's unique technology.

Status of application

The technology has been put into use, may be industrialized in



the developing countries and is mature. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

This technology has been used in Iran and Malaysia to replace conventional aluminum sulfate water treatment agent for the treatment of drinking water, industrial water and oilfield wastewater treatment.

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5. Water and wastewater treatment technology

Technology Overview

Functions and uses: treatment of raw water with low temperature and low turbidity or high turbidity, removal of algae from water, enhanced coagulation treatment for micro-polluted raw water, and fast sludge dewatering technology for waterworks and wastewater treatment plant, domestic wastewater treatment and industrial sewage treatment, such as Paper mill wastewater treatment and steel plant circulating cooling water treatment..

Technical indicators: Drinking water treatment: effluent turbidity<1 NTU, chemical consumer<30%; algae removal>99%; water content in dewatered sludge<30% in 2 days; For enhanced coagulation of wastewater, BOD removal> 60%, SS removal >80%; paper mill effluent: COD<100 mg/L,SS<50 mg/L.

Application scope: drinking water and wastewater treatment Features: the production technology is simple, but efficient.

Status of application

The technology has been put into use, may be industrialized in the developing countries and is mature. Simple training is needed. The use cost is low. Maintenance by the customers is possible.

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6. High-efficiency arsenic and fluorine removal technology using diverse composite oxide

Technology Overview

Functions and uses: can be a cost-effective solution to arsenic. fluorine pollution of the drinking water of rural, town and urban water plant s(stations), solve the problem of arsenic pollution of large water bodies (such as lakes, rivers, reservoirs, etc in a rapid and cost-effective manner to ensure the safety of quality of drinking water of the residents.

Technical indicators: For rural, urban drinking water projects. the project estimates are as follows (excluding water intake and pipeline transmission and distribution works, civil engineering costs): (1) arsenic removal: i. Size: 400 m3 / d (rural water plant), equipment Investment: 280,000 Yuan, operating expenses: 0.04 Yuan / ton; ii. Fluoride removal. Size: 5000 m3 / d (town water plant), equipment investment 1.8 million, operating expenses: 0.05 Yuan / ton; iii. Size: 100,000 m3 / d (urban water plant), project investment: 15 million, operating expenses: 0. 03 Yuan / ton. (2) Fluorine removal: i. Size: 250 m3 / d (rural water plant), equipment investment: 300,000Yuan, operating expenses: 0.5/t; ii.Size: 1000 m3 / d (town water plant), equipment Investment: 2 million, operating expenses: 0. 4 Yuan / ton; the service life of the main equipment is 15 years; the operating cost is the chemical cost, excluding electricity, staff costs, equipment depreciation and other expenses.

Application scope: safe drinking water projects in rural areas (arsenic/fluorine removal), arsenic/fluorine removal projects of town water plants, and projects of repair of arsenic pollution of water bodies.

Features: This technology can be used for new water plant

(station) construction, but also for existing plant (station) to strengthen the renovation of arsenic (fluorine) removal projects, the investment/operation cost is low, the regeneration cycle may be 2~5 times that of the existing technology. This technology can not only remove arsenic and fluorine effectively in a cost-effective manner, but also remove such pollutants as iron and manganese in the water.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; simple training is needed; low use cost, and users can carry out their own maintenance.

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7. Mobile drinking water treatment system

Technology Overview

unctions and uses: the mobile drinking water treatment system is composed of the container and transport tool.





Inside the container is the whole set of drinking water treatment system with the UV disinfection technology and membrane technology at the core which can transport provide the customers with drinking water or purified water that meets the hygiene standards at the freshwater and seawater sources accessible to the transport tools.

Technical indicators: (1) water production: 50-250 tons / day (tap water), 5 - 25 tons / day (purified water) (2) selfowned 3-phase diesel generating sets. (3) water quality after treatment: meet the national domestic drinking water standards

Application scope: can be used in a variety of camping operations, field operations, disaster relief and provide a variety of emergency water supplies in case of emergency.

Features: the performance of the mobile drinking water support system reaches the advanced level of similar products in China and it offers such advantages as rapid transport and delivery to the water supply points, wide range of applicable water quality, high treatment efficiency, easy



reliability.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; simple training is needed; high initial input cost but low subsequent use cost; users can carry out their own maintenance.

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8. Rapid shaft forming device in soft soil layers









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Technology Overview

Functions and uses: quick, one-time completion of shaft forming work in soft soil layers 6m below the burial depth of the underground water level

Technical indicators: two operators may finish the 6m shaft forming work within 30 minutes.

Application scope: soft soil layer areas that abound in underground water resources

In comparison with existing drilling and manual excavation, this technology avoids the cumbersome steps to form the shaft, produces savings on the labor and material input, may increase the work efficiency significantly, and may prevent shaft collapse. Using Multi-section drill rig that serves as the shaft wall after the shaft is formed, the drill rig need not be taken out but remains as the shaft wall; after the hole is formed, the filter cartridge is lowered through the hollow drill rig to be clamped to the bottom of the bit to extract underground water directly; the extraction of underground water will not be affected by the increase in the depth and wall deformation due to increase in pressure. The porosity above the filter cartridge is reasonable, which ensures successful extraction of underground water. The setup of the settlement chamber at the lower end of the filter cartridge allows storage of deposits to prevent clogging of the filter holes.

Status of application

Has been promoted and applied; no training is needed; low use cost, and users can carry out their own maintenance.

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Sewage Treatment and Reuse Technology

9. Integrated technology and equipment for domestic sewage treatment

Technology overview

Functions and use: This equipment Introduces modern film separation technology into sewage treatment, combines fill cell and traditional biological treatment technology to replace the dual sink basin in traditional sewage treatment, and directly puts hollow fibrous films into the biological basin. Uses ultrafilter or microfilter to separate the biomass in the bioreactor and maintain the high biomass concentrator in the reactor, intercepts big molecular solutes and fully degrades the organic matter in water.

Technical information: Processing capacity: 2.5 -50,000m³/d. In accordance with user requirements, the domestic sewage treated by the MBR system can reach the Grade I level of China´s Integrated wastewater discharge standard (GB8978-1996) and the water quality level specified in China´s Reuse of Urban Recycling Water--Water quality standard for urban miscellaneous water consumption (GB/T18920-2002) and Reuse of Urban Recycling Water--Water quality standard for scenic environment (GB/T18921-2002).

Scope of application: Upgrade of existing urban sewage treatment plants; treatment and reuse of domestic sewage from hotels, restaurants and living quarters; reuse of domestic sewage from industrial and mining enterprises, remote rural regions, outposts and scenic spots. Various kinds of industrial waste of a similar nature to that of domestic sewage (such as hospital waste water, pharmaceutical waste water, washing waste water, food waste water, cigarette waste water and so on).

Technological features: 1. Good output water quality, and various indicators better than those specified in China´s Water quality standard for miscellaneous domestic water consumption, and no apparent difference from tap water; 2. possess the denitrification function and there is no problem

of eutrophication in the output water; 3. compact structure, takes up minimal space, flexible layout, and can be above or under ground; 4. less remaining sludge; and reduces sludge disposal expenses; 5. fully automatic PLC control, and convenient management; 6. adopts converter technology, low operating cost; 7. has selfmaintenance and cleaning functions and a long service life; and 8. modular design and easy to expand.

Status of application

Has been promoted and applied; ready for use after simple training; low cost of use; and users can carry out their own maintenance.

Technology Provider

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10. Rural domestic sewage treatment equipment and technology

Technology overview

Functions and use: The main function of this technology is to comprehensively treat rural domestic sewage and bring it up to the specified discharge standard, thus improving the rural living environment and helping the building of new countryside. It includes the following three main processes: (1) sewage treatment through a "solar aeration contact oxidation plus land filtration basin system". The first part adopts biological contact oxidation technology and can reduce the pollution load by over 50%, while the land filtration basin in the latter part can double its hydraulic load. This can reduce the existing land filtration basin area by half, thus saving agricultural land; (2) anaerobic and aerobic (solar aeration contact oxidation). The whole system forms an anaerobic and aerobic combination and effectively removes COD, BOD, total nitrogen and total phosphor; (3) high load anaerobic biological filtration basin. The system consists of several PE basins and is suitable for use by 4~8 households.

Technical information: The technology reaches the national discharge standard of Level 1B, with COD ≤60 mg/l; ammonia ≤8 mg/l; total nitrogen ≤20 mg/l; and total phosphor ≤1 mg/l. Scope of application: Rural regions with scattered settlements, instability and lack of sewage pipe systems.

Technological features: (1) The technology uses solar aeration to solve the problem of oxygen supply for biological contact oxidation treatment, avoids the use of civilian electricity and lowers operating cost; (2) The technology combines biological contact oxidation with land filtering and can save land resources by over 50% over land filtration technology under the same output water quality; (3) A large number of modular systems are used as a treatment structure, which helps standardized construction, operations and management; (4) The new technology is particularly applicable to rural regions with a shortage of land resources, scattered household settlements and low terrain.



The technology can be put into commercial production in developing countries; simple training is needed; low use cost; and users can perform their own maintenance.



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11. EWS high-efficiency wastewater treatment machine series equipment

Technology overview



Functions and uses: used for the treatment of domestic wastewater. The EWS high efficiency wastewater treatment equipment has also won the national key new product certificate awarded by the 4 ministries/commissions including the Ministry of Environmental Protection and Ministry of Commerce.

Technical indicators: the EWS-1 / 2 high-efficiency wastewater treatment machine: this product consists of the biological treatment unit, solid-liquid separation unit, disinfection unit and automatic control unit, the outlet water can reach the Class 2 and above criteria in the integrated discharge standards (GB8978-1996). For less than 80 tons per day wastewater treatment, the power consumption is only 1/2-1/4 of that of similar equipment, and the operating costs decreases by about 1 / 3. As a high-efficiency wastewater treatment machine, the EWS-3 is mainly is mainly used for direct disinfection of wastewater discharged by small hospitals, small clinics, epidemic prevention stations and other units whose daily wastewater volume is about 50t, the treated wastewater meets the Class III criteria in the integrated discharge standards (GB8978-1996) , and the disinfection indicator meets the SARS-proof requirements. The operating power of the equipment is less than 30W, only 1/20 of the chlorine dioxide generator and the operating cost is reduced by about 1/3.

Application scope: The series equipment is mainly applied to small hospitals, disease prevention and control centers, shopping malls, schools, nursing homes, hotels and residential quarters and other areas where the wastewater treatment volume is small.

Features: the EWS high-efficiency wastewater treatment machine is a new type of high-efficiency, energy-saving wastewater treatment equipment, which may be adjusted according to different water quality, water quantity, discharge requirements of the equipment. Adopting the metal building



block structure, the equipment features a small footprint, offers greater flexibility than civil construction, is easy to install and use. The whole set of equipment adopts automatic control, low-power consumption design, can run automatically according to the water volume and shut down automatically when there is no wastewater.

Status of application

Has been promoted and applied; mature product; simple training is needed. low use cost, and users can carry out their own maintenance.

Technology Provider

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12. Removal of nitrogen and phosphorus from urban wastewater by the composite artificial wetland method

Technology overview

Functions and uses: the horizontal flow artificial wetland and the vertical flow artificial wetland are connected in series to form the composite artificial wetland, the wastewater first passes through the horizontal flow artificial wetland to have most of the SS, COD, BOD5 and some ammonia removed; then, the continuous operation mode is adopted to distribute water to the vertical flow artificial wetland for thorough removal of the oxygen consuming organic matters and the remaining ammonia, and return the water from nitration of the vertical flow artificial wetland according to back flow ratio of 50%-100% to the horizontal flow artificial wetland for an-nitration nitrogen removal treatment.

Application scope: wastewater treatment

Features: the horizontal flow artificial wetland abounds in calciumrich dolomite and marble or limestone while the vertical flow artificial wetland abounds in iron, calcium, silicon and aluminum oxide-rich furnace slag or artificial substrate prepared by mixing them with grass carbon and soil. The aquatic plants planted on the horizontal flow artificial wetland are umbrella palm and softstem bulrush while the terrestrial plants planted on the vertical flow artificial wetland are Canna lily and Cyperus malaccensis.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; simple training is needed; high initial input cost but low subsequent use cost; users can carry out their own maintenance.



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13. Low-energy consumption membrane bioreactor (MBR)

Technology overview



used for wastewater treatment. Technical indicators: new technologies such as gas impulse and mechanical cleaning are integrated into the membrane unit; a variety of techniques controlling the filterability of the mixed liquor enable the extension of the membrane operation cycle by 2-4 folds; online chemical cleaning modes are suitable

Functions and uses: MBR is

for membrane units with different sizes and degrees of automation; the development of a variety of combined processes contributes to the reclamation of water resource from wastewater.

Application scope: the characteristics of the MBR enable it to exhibit enormous potential in the treatment and reuse of a wide variety of wastewater. It is possible to develop new combined processes such as: enhanced nutrient removal A2/O-MBR processes corresponding to influents with different C/N ratios, anaerobic hydrolysis/acidification-MBR processes and MBR-RO processes.

Features: Development of the novel and energy-efficient technology, MBR, for wastewater treatment and reclamation. The project carries out systematic research, with innovative achievements, on: membrane unit configuration, membrane fouling control technology, new combined processes and large-scale engineering applications.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; simple training is needed; high initial input cost but low subsequent use cost; users can carry out their own maintenance.





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14. Centralized treatment of rural domestic waste

Technology overview

Functions and use: Sorting and recycling waste from domestic garbage, the technology can degrade waste and turn it into harmless and effective composting. Technical information: (1) For a daily treatment volume of 15t, cost: RMB225 Yuan/d; (2) environmental benefit; harmless waste treatment ratio: 100%; resource recycling; composting: 3 t/d; pollution emission reductions; COD: 120kg/d; NH₄⁺-N: 4kg/d; and (3) social benefits; landfill reduction: 8 t/d. Saves 600m² of land annually; no stench generated at landfill sites; and environmental improvement for nearby residents. Scope of application: Mixed domestic waste collected from rural town settlements and surrounding settlements; sorted waste (organic waste) collected from marketplaces, the catering industry and canteens (organic waste); and plant processing waste. Technological features: Adopts windrow composting as the main technology and directly composts collected mixed domestic wastes after bag breaking and screening. Recyclable resources, thorough harmless treatment and low cost.

Status of application

The technology has been promoted and applied; can be put into commercial production in developing countries; simple training is needed; low use cost; and users can perform their own maintenance.

Technology Provider

Organization: Institute of Solid Waste Treatment & Reclamation, Tongji University

Contact: He Pinjing Tel: +86-21-65986104

E-mail: solidwaste@tongji.edu.cn

Address: 1239 Siping Road, Shanghai, P.R.C.

15. Seawater or brackish water desalination film technology





Technology overview

Functions and use: Uses NF and RO film technology to desalinize seawater or brackish water.

Technical information: Desalination ratio: 99%; recovery ratio: 10-40%

Scope of application: The mobile device is applicable to supplying water to organizations which carry out on-board or ship-use mobile operations, such as ocean merchant ships, drilling platforms and field explorations. The industrial-scale seawater desalination installation is suitable for islands, residential sites, high-salinity regions and seawater intrusion regions.

Technological features: Adopts NF for pretreatment, i.e. the NF-RO system. NF removes part of the salinity and TDS, thus improving RO´s water recovery efficiency. It can reduce energy consumption by 25% and water making cost by 30%.

Status of application

Has been promoted and applied; ready for use after simple training; low cost of use; and users can carry out their own maintenance.

Technology Provider

Organization: Sichuan Engineering Research Centre for Water Treatment

and Reuse

Contact: Xiangyu Deng Tel: +86-816-2489791 E-mail: dxydm@163.com

Address: No. 64, Mianshan Road (inside the Computer Application Institute

of CAEP), Mianyang, Sichuan, P.R.C.



Seawater desalination

RO and distillation seawater desalination device

Technology overview

Functions and uses: seawater desalination means production of freshwater through seawater desalination to provide domestic water such as drinking water and washing water that conform to the WTO domestic water hygiene standards. It can address the needs of regional water supply of domestic water and industrial waster of ships, rig platforms, islands and coastal cities. The device mainly consists of the RO and distillation seawater desalination devices.

Technical indicators: 1. Reverse osmosis desalination plant: seawater salinity \leq 50000mg / I; freshwater Yield: 1-1000m3 / d; total dissolved solids (TDS) in freshwater \leq 700mg / I; total power of unit: 1.1-160kW. 2 distillation seawater desalination unit: seawater salinity \leq 36000mg / I; distilled water yield: 1-1000m3 / d; total dissolved solids (TDS) in distilled water \leq 5mg / I; gained output ratio \geq 2. 4; total power of the unit: 1. 5-250kW.

Application scope can be widely used on various types of ships, drilling platforms, islands, coastal cities, etc., to provide the crew and residents with domestic water.

Features: System, complete system, compact structure, low noise, modular structure, high reliability. a) High degree of automation and ability to adjusting the operating conditions automatically according to seawater temperature and salinity changes. b) Modular structure, allowing for easy installation, maintenance and operations management. c) extensive application to meet the requirements of the oceangoing vessels for the freedom from restrictions on navigation

zones and able to convert seawater with a salt content up to 50000mg / I into freshwater that meets the drinking water hygiene standards through desalination d) low energy consumption of the unit, a minimum of 3.83.8kWh per ton of water.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; simple training is needed; low use cost, and users can carry out their own maintenance.

Technology Provider

Institution: Shanghai Marine Diesel Engine Research Institute

Contact: Pan Xuhui Tel: +86-21-31310617

E-mail: guihuabu@csic711.com

Add: 3111 Huaning Road, Minhang District, Shanghai, P.R.C.

Water conservancy project

South-South Cooperation on Science and Technology to Address Climate Change Applicable Technology Manual Water Resource and Environmental Protection

17. Rubber dam technology

Technology overview

Functions and use: Rubber dams can rise to block water or fall to let water flow. Dam height can be freely adjusted, while overflow depth is controllable. Such dams can play the role of sluices, overflow dams and active dams. They have the same operating conditions as a sluice and are used in flow control, irrigation, power generation, water supply, shipping, tide buffering, groundwater refill and urban gardening and beautification.

Technical information: Dam height is usually less than 5m, while dam length is in line with the width of the local river. Dam bags usually have a service life of 20 years. After replacement, dam bags can continue to be used.

Scope of application: Rubber dams are suitable for farmland irrigation, small hydropower, urban gardening and beautification, urban and rural water supply, costal tide gates and wave dams, shipping locks, construction embankments or active dykes, and other low hydraulic head, wide span sluice and dam projects.

Technological features: Low construction cost; wide span and no water blockage after dam collapse; anti-seismic performance; good water stop effect; simple structure, and short construction cycle; and flexible operations and low maintenance cost.

Status of application

The technology can be put into industrial production in developing countries; ready for use after simple training; inexpensive to use, and users can carry out their own maintenance.

The technology provider has designed and built over 20 rubber dams for Bangladesh, 6 for Thailand, 1 for Indonesia, 3 for Viet Nam, 2 for Iran, 6 for South Korea and 1 for Italy.

Technology Provider

Organization: China Institute of Water Resources and Hydropower Research

Contact: Gao Benhu Tel: +86-10-68786522 E-mail: gaobenhu@iwhr.com

Address: 20 West Chegongzhuang Road, Haidian District, Beijing, P.R.C.











Equipment

18. Multifunctional Intelligent Flow Meter

Technology overview

Functions and uses: a portable compact flow meter that is capable of wireless communication with the computer in the central control room through the wireless receiver/ transmitter module on the machine. The computer in the central control room may control simultaneous data collection and processing of one or multiple multi-functional intelligent flow meters remotely.

Technical indicators: Flow measuring range: 1-300 cm / s, starting velocity ≤ 1cm / s; the equipment is versatile, offers high measurement accuracy, is easy to use (AC and DC); can be used for laboratory measurements, field measurements, and long-distance wireless measurement and control.

Application scope: used for various hydraulic engineering, harbor engineering tests and accurate measurement of water resources, and may also be used for velocity and flow measurement of transportation, water conservancy and other sectors.

Features: advanced and practical water conservancy technologies.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; no training is needed; low use cost, and users can carry out their own maintenance.



Technology Provider

Institution: Nanjing Hydraulic Research

Institute

Contact: Dai Jiqun Tel: +86-25-85828128 E-mail: jqdai@nhri.cn

Add: 223 Guangzhou Road, Nanjing,

Jiangsu, P.R.C. Postal Code: 210029

19. Small gas chromatograph



Technology overview

Functions and uses: Rapid separation and analysis of gas components.

Technical indicators: (1) High reliability: 365 days around the clock maintenance-free operation, power –grid interference resistance; power cutoff protection, trouble-free run-time> 7000 hours; (2) High stability: samples can be analyzed one hour after start-up , the long-term stability of the sensitivity remains unchanged; (3) High repeatability: High repetition accuracy, error <0.

Application scope: Suitable for product quality inspection and work-inprocess quality control of factories, workshops and laboratories, gas analysis of industrial refinery, and gas analysis carried out in teaching and scientific research activities of the higher learning institutions (such as TPD, TRP and the activity test experiments in the catalytic laboratory)

Features: Simple, fool-operation, which may be learned within 5 minutes; weight: whole machine weigh: 8 Kg; dual use: packed column / capillary column.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; no training is needed; low use cost, and users can carry out their own maintenance.

Technology Provider

Institution: Dalian Institute of Chemical Physics, Chinese Academy of Sciences

Contact: Guan Yafeng Tel: +86-411-84379570 E-mail: dpwu@dicp.ac.cn

Add: Unit 105, 457 Zhongshan Road, Dalian, P.R.C.



Equipment

20. Total hydrocarbon analyzer

Technology overview

Functions and uses: Measuring the total hydrocarbon content in gas.

Technical indicators: The instrument can analyze the total hydrocarbon content in volatile gas at room temperature, the minimum value is 0. 1 ppm, and maximum value is 20000 ppm.

Application scope: used in petrochemicals, steel and gas industries for determination of total hydrocarbon content in gas as the process testing and control instrument.

Features: designed and manufactured based on flame ionization detector principle featuring unattended operation, high sensitivity, good stability.

Status of application

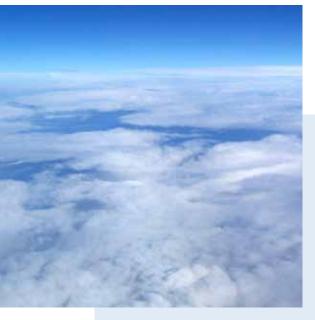
The technology has been put into use, may be industrialized in the developing countries. Simple training is needed. The use cost is low. Maintenance by the customers is permitted.

Technology Provider

Institution: Dalian Institute of Chemical Physics, Chinese Academy of Sciences

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Resources and environment technologies

For developing countries undergoing industrialization and urbanization, it is important to think about ways for rational use of resources, protecting the environment, avoiding unsystematic development and preventing ecological damage. Technologies for resource utilization, environmental protection and remote sensing are important tools to realize the above goals and achieve sustainable economic growth in developing countries.



Environmental monitoring

21. Water environment monitoring technology

Technology overview

Functions and use: Comprehensive planning for water environment monitoring systems of lakes; Consultation and training of field and laboratory water monitoring technologies; Through dynamic monitoring of water environmental quality and analysis of its trend of changes and the influencing factors, it can provide information for the decision making facilitating both regional development and environment protection.

Scope of application: can be used in long term water environment monitoring and comprehensive survey of lakes, environmental impact assessment of regional development, and water environment monitoring of other water areas.



Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; ready for use after simple training; high initial input cost but low subsequent use cost; and users can perform their own maintenance.

The technologies have been applied in the water environment monitoring and ecological protection of Lake Tanganyika in Africa.

Technology Provider

Organization: Nanjing Institute of Geography and Limnology,

Chinese Academy of Sciences

Contact: Chen Shuang Tel: 0086-13912979801 E-mail: schens@niglas.ac.cn

Address: No.73 East Beijing Road, Nanjing, Jiangsu Province, P.R.C.



Ecosystem restoration

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22. Grassland conservation and restoration technology

Technology overview

Functions and use: (1) Introduction and domestication of wild grass and forage crop varieties; (2) establishment of dryland artificial grasslands mainly of Xerophytic grass; (3) grassland animal husbandry development technology, which can improve forage production and the ecological environment, promote large-scale production of fine forage



varieties and enrich ecological grass resources.

Technical information: (1) Fodder corn yield in regions with few hours of sunshine in Mongolia has reached 7500kg/h·m² and an average fresh forage yield of 6000 kg/h·m²; (2) applies comprehensive technologies to improve degraded grassland, increasing vegetation cover rate by 10-15% and yield by 20-30% and bringing superior quality forage ratio to >60%.

Scope of application: Semi-arid and arid regions; natural grasslands and mountainous areas; and

degraded grasslands.

Technological features: Improves the ecological environment; establishes dryland artificial grasslands mainly of Xerophytic grass; and zero tillage and supplementary sowing on degraded grasslands.

Status of application

The technology has been promoted and applied; can be put into commercial production in developing countries; ready for use after simple training; low user cost; and users can perform their own maintenance.

Cooperation agreement has been reached with Mongolia to provide zero tillage supplementary planters and set up local grassland animal husbandry research and experimental bases.

Technology Provider

Organization: The Inner Mongolia S&T and Society Development Institute

Contact: Yang Baojun Tel: +86-471-6280332

E-mail: YangBaoJun@sina.com

Address: 70 Zhaowuda Road, Saihan District, Hohhot city, Inner Mongolia, P.R.C.



Resource

23. Non-metallic minerals (industrial minerals) mining, dressing and deep processing technology and complete equipment

A brief introduction to the technology

Functions and use: The technology and equipment can be used in the development and utilization of various non-metallic mineral (industrial minerals) resources (Kaolin, graphite, feldspar, silica sand, bentonite and so on) and produce high-performance non-metallic mineral products for use in the paper making, coating, ceramics, household chemicals, plastics and rubber industrial fields.

Scope of application: Various non-metallic minerals (industrial minerals) resources, such as Kaolin, graphite, feldspar, silica sand, bentonite and Technology Provider so on).

Technological features: Wide applicability, high practicality, high price/ performance ratio, and particularly suitable for developing countries. Based on local mineral resources and market demand for products, the technology can provide engineering consultancy, engineering design and construction services.

Status of application

The technology has been promoted and applied; can be put into industrial production in developing countries; ready for use after simple training; inexpensive to use; and users can carry out their own maintenance.

The technology has been used in the 100,000t/a Kaolin mining and dressing project at Middle East Mining Corporation, Egypt. The project has now entered the equipment installation and adjustment stage. With highly costeffective technology and equipment, the project has won recognition from the Egyptian construction side.



Organization: Suzhou Sinoma Design & Research Institute of Non-metallic Minerals

Industry Co.,Ltd Contact: Hu Runhua Tel: 0086-512-68274788 E-mail: szsinomatech@163.com

Address: 999 Sanxiang Road, Suzhou,

Jiangsu, P.R.C. Postcode: 215004

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24. Technology of remote sensing monitoring for the mineral resource development environment

A brief introduction to the technology

Functions and purposes: Surveying and monitoring of the mineral resources development environment.

Technical specifications: (1) the surveys on the scale of 1:250,000 are conducted to investigate mine environment, mine geologic background and the implementation of the mineral resource plans by remote sensing technology. (2) The surveys on the scale of 1:50,000 are conducted to investigate and monitoring the mineral resource exploitation status, mine environment and implementation of the mineral resource plan. (3) And the surveys on the scale of 1:10,000 are conducted to investigate and monitoring the mineral resource exploitation status and mine environment.

Application scope: survey and monitoring of the mineral resources development status to provide related government departments with supports for decision-making.

Features: Fast, multi-scale environmental survey, monitoring and management of mineral resources development.

Status of application

The product and technologies have been put into surveying, with training needed. Large initial investment lead to a low use-cost later. Training of the maintenance personnel or establishing maintenance station is required.

Technology Provider

Institution: China Aero Geophysical Survey & Remote Sensing Center for Land and Resources (AGRS)

Contact: Yang Rihong Tel: +86-10-62060055

E-mail: yangrihong@sina.com Add: 31 Xueyuan Road, Beijing, P.R.C.

Desertification combating and prevention

25. Clay sand barrier setup technology

A brief introduction to the technology

Functions and use: Sand dune fixation

Scope of application: Regions with sand dune hazards.

Technological features: Low cost, simple setup, and good control effect. The sand barriers are perpendicular to the predominant wind direction. They adopt a parallel row pattern in places where the wind is predominantly from one direction, and a grid or "品"-shaped pattern in places where there are more side winds. Fishbone-shaped or "非"-shaped barriers are often adopted in ridge terrains. Sand dunes with complicated shapes are usually protected with fishbone-shaped barriers. Barrier ridge spacing is determined by inter-barrier sand erosion/deposition conditions.

Status of application

Has been promoted and applied; ready for use after simple training; low cost of use; and users can carry out their own maintenance.







Technology Provider

Organization: Gansu Desert Control Research Institute

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Desertification combating and prevention

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26. Sandy field plantation technology

Technology overview

Functions and use: Water-saving farming in semi-arid regions.

Technical information: Sandy fields adopt no-till plantation. When crops are harvested from a sandy field, they are completely uprooted, with no residue left. Sandy fields have a long service life. 20-year-old sand fields are called new sandy fields, 20-40-year-old ones are called middle-aged while those 40~60-year-old are called old sandy field. Water sandy fields have a rather short life span, only at 5~6 years.

Scope of application: Semi-arid region rich in sand and pebble resources

Technological features: Water-saving, droughtresistant, high yield and superior quality. Sandy fields









should be selected from flat land or sloping land with fertile soil, to be covered with fine sand and pebbles or with a sand/pebble ratio of 70:30~50:50. The land should be leveled and harrowed before sand is spread over. After the soil is leveled and compacted, spread fertilizers on the surface but do not mix it with the soil. Lay sand after fertilizer has been applied. In the winter season, spread sand after the soil has become frozen. The sand layer is usually around 10cm thick. Sowing is spaced according to plant interval. Sand is opened for bunch sowing.

Status of application

Has been promoted and applied; ready for use after simple training; high up-front cost but low cost of use, and users can carry out their own maintenance.

Technology Provider

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Desertification combating and prevention

27. Shelterbelt projects in deserts

A brief introduction to the technology

Functions and use: In accordance with blown sand activities and the type, Has been promoted and applied; ready for use intensity and engineering characteristics of sand hazards in desert construction areas, to design the structure and layout of a sand control system for different long-term cost of use; and maintenance personnel topographic situations including the selection of suitable tree species and their layout as well as accessory sand control configurations. And, based on the rainfall and evaporation intensity, soil type, plant species and irrigation water 's physical and chemical properties in desert construction areas, to formulate the mode of irrigation, the irrigation water quota and irrigation system for sand highway shelter belt bioengineering construction shelters.

Technical information: This technology develops and uses high salinity groundwater resources and highly-resistant plant species in deserts to build an integrated engineering and biological sand protection system and can ensure have produced good results. the lasting and safe operation of engineering works.

Scope of application: Arid regions, desert regions and ecological engineering Technology Provider construction regions.

Technological features: The technology can bring engineering sand hazards under long-term effective control and promote the sustainable development of shelter belt systems. It achieves the development and utilization of poor quality water resources, saves freshwater resources and maintains the balanced extraction of ground water resources. The technology can produce notable ecological effects; enhance bioengineering development through engineering protection systems and increase economic returns.

Status of application

after simple training; high initial input cost but low need to be trained or a maintenance station needs to be established.

The technology provider has promoted and set up successful technologies and examples of desert on the desert highway, as well as an operation area and living settlement greening projects on the west banks of Amu Darya in Turkmenistan which

Organization: Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences

Contact: Liu Wenjiang Tel: 0086-991-7885317 E-mail: wjliu@ms.xjb.ac.cn

Address: 818 South Beijing Road, Urumqi,

Xinjiang, P.R.C. Postcode: 830011



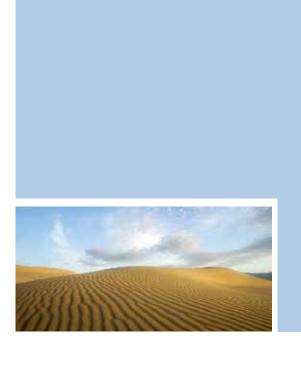




Desertification combating and prevention

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28. Desert sand-fixing and plant growth technology



Technology overview

Functions and use: Uses inorganic materials to effectively

fix sand for plant growth.

Technical information: Plant survival rate: >80%.

Scope of application: Desert regions.

Technological features: Low sand fixation cost, and mature

technology.

Status of application

Can be put into commercial production in developing countries; simple training is needed; low cost of use; and maintenance personnel need to be trained or a maintenance station needs to be established.

Technology Provider

Organization: Qinghai University

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Energy-saving technologies for buildings

The building sector is one of the three major sources of global GHG emissions, in particular the production of building materials and the use of buildings. The industry holds enormous potential for emissions reduction over an extended period of time. The R&D and promotion of energy-saving materials and green building technologies are the key to reducing GHG emissions in the sector.

29. Autoclaved (sand lime) brick production line

Technology overview

Functions and use: Wall material products. The products made by this technology and equipment are characterized by low specific weight, high strength, low heat conductivity and fast construction speed. They can be adapted to different levels of automation and investment conditions and requirements.

Scope of application: The technology and equipment can be used in the construction material industry and investors with other investment requirements. With less investment and fast returns, their products can be adapted for different climate conditions and architectural structural requirements.

Technological features: The technology uses fly ash or (quartz) sand, lime and other materials as the raw material and through grinding, stirring, compression and autoclaved maintenance, eventually form wall material products of various specifications, requiring no fuel. This can avoid the environmental impact of smoke generated in the sintering process.



The technology has been promoted and applied; can be put into industrial production in developing countries; ready for use after simple training, inexpensive to use and maintenance personnel need to be trained or a maintenance station needs to be established.

We have signed a Letter of Intent with a South African firm in talks over a general contract for a sand lime brick production line with an annual output of 40 million bricks.

Technology Provider

Organization: China National Building Materials Group Corporation (CNBM)

Contact: Zhi Xiao Tel: +86-10-88423159 E-mail: zhx@cnbm.com.cn

Address: 2 South Zizhuvuan Road, Haidian District, Beijing, P.R.C. Postcode: 100048



30. Expanded and vitrified small ball, heat-insulated and fire-proof mortar

Technology overview

Functions and use: This technology is designed to develop a kind of new inorganic light mortar material. It can be widely used in the masonry, heat insulation, plastering and other architectural sections of buildings. It can not only meet the national and industrial energy conservation requirements of buildings but also achieve fire-proof and convenient construction, cost reduction, integrated resource utilization and other social and economic benefits.

Technical information: Uniformity: ≤5%; stratification: ≤20 mm; dry apparent density: ≤300kg/m³; thermal conductivity: ≤0.070 W/(m•K); heat storage coefficient: ≥1.5 W/(m²•K); linear shrinkage: ≤0.3%; (with concrete mortar block) original strength: ≥0.050; tensile strength:≥0.10 MPa; compressive strength:≥0.20 MPa for wall body use and ≥0.30 MPa for floor and roof use; and softening coefficient: ≥0.

Scope of application: The technology and product are mainly used as a heat insulation and fire-resistant material in the building energy conservation field.

Technological features: Production equipment for the completely new inorganic light aggregate--expanded and vitrified small ball; unique production process for expanded and vitrified small ball; production of expanded and vitrified small ball light mortar; and heat-insulated mortar is essentially fire-resistant.

Status of application

The technology has been promoted and applied; can be put into industrial production in developing countries; mature product; ready for use after simple training, low use cost, and users can carry out their own maintenance.

The technology provider has successfully transferred set equipment and technology to Romania, Mongolia and other countries.

Technology Provider

Organization: BeiJing HuaWeiJia Technology Co., ltd.

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E-mail: bjhwj@sohu.com

Address: 2 Xingsheng Road, Jiuwang Village, Nancai Town, Shunyi District, Beijing, P.R.C.

31. Fired brick production technology and equipment

Technology overview

Functions and use: Excellent new wall material

Technical information: The products include porous bricks and hollow bricks, with a strength class of no lower than Mu15 and a compressive strength of ≥10.0MPa.



Scope of application: The technology and equipment are applicable to building material enterprises or construction enterprises. Their fired products can be used in buildings, squares, roads and other places.

Technological features: The technology and equipment use clay, shale, gangue and fly ash as raw materials and adopt soft plastic, semi-hard plastic and hard plastic extrusion forming technologies. From raw material processing to forming, kiln car stacking and drying & sintering, the set equipment of the production line can fully achieve automatic or manual/semi-automatic operations. It can make products to various specifications, lower work intensity and improve the work environment. Because fly ash or gangue itself contains a certain amount of heat or adopts an internal burning model with added coal ash it can save fuel or coal consumption and offers such notable advantages as safety, durability, energy conservation, environmental friendliness and fire resistance. It is a new wall material of superior quality.

Status of application

The technology has been promoted and applied; can be put into

industrial production in developing countries; ready for use after simple training, inexpensive to use and maintenance personnel need to be trained or a maintenance station needs to be established.

The technology provider has built several clay fired brick factories in Bangladesh, earning around \$300,000 in foreign exchange each year. It has also built several fired brick plans in Cambodia and Malaysia. All these enterprises are now performing well.

Technology Provider

Organization: China National Building Materials

Group Corporation (CNBM)

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Address: 2 South Zizhuyuan Road, Haidian District,

Beijing, P.R.C. Postcode: 100048

Integrated solar building technology see the Chapter of Renewable energy technologies.



32. low-carbon production technology of cement and wall material with cinder





Technology overview

Functions and use: (1) Low-carbon masonry-type cement, which can replace Portland cement in the masonry and surface mortar, concrete cushion and construction fields; (2) weight-bearing bricks and hollow blocks, which replace sintered solid bricks and can be used in civilian buildings and walled low-rise buildings.

Technical information: (1) Masonry cement meets the 12.5 strength grade in GB/T 3183-2003Masonry Cement; (2) load-bearing bricks meet the MU10 grade in JC 239-2001 Fly Ash Brick; and (3) hollow blocks meet the >3.5 grade in GB/T 15229-2002 Light Aggregate Concrete Small Hollow Blocks.

Scope of application: This technology uses volcanic ash as the main raw material to make masonry cement to replace Portland cement for use in the masonry and surface mortar, concrete cushion and other construction fields. After being crushed, porous volcanic rocks can serve as a light aggregate to make, along with cinder-based cementitious material, wall materials like load-bearing bricks and blocs and decorative materials like decorative bricks and stat bricks.

Technological features: As it is formed, volcanic ash goes through a high temperature stage and naturally forms an inorganic material with potential hydraulic reactivity. Compared with conventional silicate cementitious material and resultant wall material technologies, this technology is mainly characterized by reuse of waste, energy conservation and reduction of carbon dioxide emissions in the production process. It is an environment-friendly material. In addition, it has low production cost and good economic benefits.

Status of application

The technology can be put into industrial production in developing countries; special training is required before use; and inexpensive to use.

The technology provider has reached a cooperation agreement with an Ethiopian company. The two sides have set up a joint venture to produce green construction materials (standard bricks and blocks).

Technology Provider

Organization: Hebei University of Science and Technology

Contact: Yan Cuiying Tel: +86-311-81668199 E-mail: cyyan199@126.com

Address: 70 East Yuhua Road, Shijiazhuang Hebei, P.R.C. Postcode: 050018

33. Manufacturing of porous or hollow bricks through sintering of shales

Technology overview

Functions and uses: to make porous or hollow bricks through the sintering of shales to reduce loss of clay, enhance wall insulation, reduce the energy consumption of production, achieve the objective of energy conservation & emission reduction, and building energy conservation, and replace the clay bricks as the new wall materials.

Technical indicators: porosity greater than 26%, strength greater than 5MPa, heat loss less than 950 kcal / ten thousand standard bricks.

Applicable scope: wall materials

Features: easiness of sintering, high strength, small investment and use of inferior resources





Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; special training is needed; low use cost, and users can carry out their own maintenance.

Technology Provider

Institution: Guangxi Institute of Construction Materials

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Postal Code: 530022



34. Complete technology and application of multi-ribbed slab struture energy-saving housing

Technology overview

Functions and uses: the multi-ribbed slab structure is an ecofriendly, energy-saving insulation, energy dissipation, rapidly built, economical and practical new system of residential structure.

Technical indicators: 1) eco-wall materials that may be manufactured according to local conditions, are energy saving and environmental friendly. For construction of 10,000 square meters of housing, 2600-3000 cubic meters of industrial and agricultural waste will be consumed, and destroying of 800 to 1000 square meters of farmland for excavation of clay to make bricks can be avoided; 2) under the same average thermal resistance of the wall body, the thickness of the multi-ribbed wall is 1/3 that of the clay brick wall and 60-90t of standard coal may be saved per year per 10000 square meters of housing; 3) the self-weight decreases by 35%, 30%, 33% in comparison with the brick, frame, shear wall structure; 4) the loading property of the structure lies between 1.6-1.8 folds, and the deformation capacity increases by more than 2 folds in comparison with the brick structure; 5) compared to the traditional construction technology of the residential structure, the construction period is shortened by 1/4-1/3 and the volume of construction wastes on the site decreases by more than 2/3; 6) the construction cost of the multi-ribbed slab structure decreases by more than 4-6%, 10-12% and 15% than the brick, frame and shear walls.

Application scope: applicable to multi-storey and medium-to-high residential buildings.

Features: the structure is filled with eco-friendly materials that can are obtained locally and processed according to local conditions, energy-saving and environment friendly and replace the traditional

clay bricks, enabling rapid construction and industrialization of the residential structure.

Status of application

Has been promoted and applied; special training is needed; the use cost is low and it is maintenance-free.

Technology Provider

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35. Complete technology and equipment of the western tile production line





Technology overview

Functions and uses:The products have very good roof decoration effects, and may improve roof drainage and water-proof system significantly. Technical indicators: The production capacity ranges between 2 million-20 million pieces. The main size is $400 \times 250 \times 12$ mm or $410 \times 255 \times 12$ mm. The fuel is light diesel (heat value: 41800KJ/kg) or natural gas, coal gas, etc.

Application scope: The technology and equipment may be used in the building materials industry and by the investors who have investment needs. The investment is small, may generate returns rapidly. And the product can adapt to different climate conditions and building structure requirements.

Features: The raw material is high quality shale; the process adopted is the oscillating milling-dry raw material processing technique to achieve the objective of fine processing. The product is matured in the maturing kiln, moulded at high vacuum, dried by the artificial drying car and kiln car, tunnel drying chamber, sintered through the fuel oil/gas tunnel kiln and unloaded mechanically.

Status of application

The product has been put into use and may be industrialized in the developing countries. Simple training is needed. The use cost is low. Maintenance personnel need to be trained or a maintenance station needs to be established..

Technology Provider

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36. Completion production technology and equipment of concrete products

Technology overview

Functions and uses: Use construction waste to manufacture ecoconcrete products .

Technical indicators: The scale of the production line can reach 50000 -300000 m3 cubic meters per year, and the strength of the concrete products can reach more than Mu5. 0, the size of the concrete block







and brick, brick of sidewalks and other products may range from $240\times115\times53$ to $390\times390\times240$ mm, and the porosity may reach 50% above.

Application scope: The product can be used in the buildings, roads and bridges, and can also be used in the roads along, sidewalks and other municipal projects.

Features: The construction wastes or natural stones of suitable hardness are turned into good performance aggregates after crushing, cleaning and removal of hazardous substances, mixed with cementitious materials such as cement and lime after optimal allocation by gradation and cast into shape after full and even mixing to manufacture high-performance eco-concrete products. The rate of the aggregates manufactured through recycling of construction wastes replacing the natural sand and gravel can reach 50%.

Status of application

The technology have been put into use and may be industrialized in the developing countries. Simple training is needed. The use cost is low. Maintenance personnel need to be trained or a maintenance station needs to be established.

Technology Provider

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37. Panel - Column - lightweight steel constructionbuilding system





Technology overview

Functions and uses: A technology of new-type building structure system, good antiseismic performance; atlas of antiseismic design standards, construction method and technical construction specification are available.

Technical indicator: Buildings of the structure system meet the requirements for magnitude 8 earthquake protection, and building energy-saving meets the index requirement of 65%.

Application scope: This housing structure systemis used for reconstruction of the Earthquake-stricken areas and construction of new urban areas; a complete set of key technologies are provided.

Features: The product has good antiseismic performance, energy saving, utilization of wastes and good economic benefits, etc.

Status of application

The product has been put into use and may be industrialized in the developing countries. Simple training is needed. The use cost is low. The customers may maintain the products themselves.

The product has been put into demonstrative use in Changzhi (Shanxi), Shunyi, Pinggu, Huairou, Changping (Beijing), Dujiangyan (Sichuan), Shouguang (Shandong) and Ningguo (Anhui) and the feedback is very good.

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38. Heat-reflective insulation multi-function building coatings

Technology overview

Functions and uses: This technology is a thin, environmentally friendly exterior roof building coating with thermal insulation properties. The coating is applied to the exterior walls or roofs to enhance the building's thermal insulation properties and offer the decoration and heat-reflective insulation benefits.

Technical indicator: pilot production has begun and the annual average production is above 20t.

Applicable scope: applicable to surface coating of the exterior walls and roofs of buildings in the areas with "hot summer and cold winter" and "hot summer and warm winter".

Features: With heat-reflective insulation performance, the product is convenient to apply, versatile, and cost-effective. It can replace the polystyrene board of a certain thickness (EPS and XPS), polystyrene insulation mortar and other materials used as insulation materials, reducing air conditioning costs and energy consumption.

Status of application

The product has been put into use and may be industrialized in the developing countries. Simple training is needed, the use cost is low, and maintenance by the customers is permitted. The product has been put into use in Jiangxi, Jiangsu, Guangzhou and Chongqing.

Technology Provider

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Beijing, P.R.C. Postal Code: 100048 South-South Cooperation on S&T to Address Climate Change
Applicable Technology Manual
Water Resource and Environmental Protection

Energy conservation and emissions reducing technologies for industrial production

The secondary industry is the pillar of national economy, and has contributed 80% of global CO_2 emissions (developed countries in particular) over the past 200 years. It has led to environmental pollution and aggravated climate change. To foster a modern and green industry, it is necessary to develop environment-friendly, energy-saving and emissions reduction technologies. The R&D and application of green technologies in manufacturing, chemical and other industrial sectors will effectively reduce GHG emissions, and promote sustainable industrial development and economic growth.





39. Large float glass production line

Technology overview



Functions and use: This technology is mainly used on 500-1,200ton-level large float glass production lines. It reduces energy consumption in glass production, accurately controls process parameters for big tonnage glass production lines and stabilizes glass quality.

Technical information: Lowers glass furnace heat consumption to 300-1,500kcal/kg glass liquid. Scope of application: Building glass, automobile

glass and mirror-making glass.

Technological features: With stable glass quality and effective energy consumption in glass production, the technology has reached the internationally advanced level.

Status of application

The technology has been promoted and applied; can be put into industrial production in developing countries; special training is required before use; inexpensive to use and maintenance personnel need to be trained or a maintenance station needs to be established.

The Indonesian project was put into operation in March 2007. It has been in normal operation for 3 years, reaching the design requirements. The project has generated good economic benefits for users and won high praises from the owner.

Technology Provider

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South-South Gooperation on Science and Technology to Address Olimate Change Applicable Technology Manual

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40. High-efficiency, energy-saving and low NOx emission lime kiln



Technology overview

Functions and use: Used for the sintering of lime, dolomite, magnesite, bauxite and other bulk materials.

Technical information: Heat consumption is <4180kj/kg-lime.

Scope of application: Applicable to the sintering of lime, dolomite, magnesite, bauxite and other bulk materials.

Technological features: With simple structure and easy operation, the technology saves investment by 40~60% and heat consumption by 10~25%.

Status of application

The technology can be put into industrial production in developing countries; ready for use after simple training, inexpensive to use, and users can carry out their own maintenance.

A 100tpd lime production line EPC in Kazakhstan; and a 100tpd lime production line EPC in Kyrgyzstan.



Technology Provider

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41. High voltage and high power frequency converter (HVC)

Technology overview

Functions and use: A high-voltage, energy-saving motor inverter series which is made by adopting the state-of-the-art IGBT power cell series multilevel technology, digital control technology, SPWM technology, superconducting heat pipe cooling technology, voltage multiple cell series technology and vector control technology. HVC offers such features as high efficiency, energy saving, high power factor, high reliability and four-quadrant operation. It can automatically set frequency and operation mode, control mode, automatically display and record operational data, aside from the sound protection functions. It can achieve 30~70% energy conservation and consumption reduction.

Technical information: Rated input voltage/permissible change range: ≤10kV±15; system′s input voltage: 3kV, 6kV and 10kV; inverter′s output voltage/change range: 0-10kV; inverter′s rated output current range: ≤6000A; input power factor: >96; inverter efficiency: 98%; rated input frequency/ permissible change range: 50Hz±5; output frequency range: 0-50Hz; and rated power: ≤72MW.

Scope of application: The product is suitable for blower fans, water pumps and other one-quadrant operation loads as well as for hoists, rolling mills, paper machines, rolling stock traction and other four-quadrant operation loads in the thermal power, petrochemical, coal mining, metallurgical, water supply and sewage treatment industries. It can regulate high voltage motor runs and optimize their control and save energy consumption by 30-70% of energy, thus playing the role of a large-scale energy conservation and consumption reducer.

Technological features: The technology achieves "perfect non-harmonic" output for motors and "zero harmonic" input for grids; adopts a high voltage, changeable current chain modular design and through combinations, can easily change 18MVA, 36MVA, 54MVA and 72MVA to ultra high voltage inverter system of higher power classes; adopt high-voltage water cooling technology; can drive both asynchronous motors and synchronous motors; and, can be used as both the soft start and the continuous speed regulation of ultra power motors.

Status of application

The technology has been promoted and applied; ready for use after simple training; high initial input cost but low subsequent use cost, and users can carry



out their own maintenance.

The technology and product have been widely used in European countries, such as Germany and Italy; Asian countries such as India, Turkey, Viet Nam, Thailand and Myanmar; African countries such as Nigeria and Sudan, and South American countries such as Brazil.

Technology Provider

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South-South Cooperation on Science and Technology to Address Climate Change Applicable Technology Manual Water Resource and Environmental Protection

42. Static Var Compensator (SVC)





Technology overview

Functions and use: A kind of high voltage dynamic var compensator which is based on high-reliability thyristor (electromagnetic trigger, photoelectric trigger or optical trigger) converter technology, and compensates system var, with a maximum compensation capacity of \pm 300MVar. The device can improve the power factor, reduce line loss, raise grid transmission power, filter out harmonic, remove negative sequence, effectively solve the problem of subsynchronous

resonance, inhibit voltage fluctuations and flicker, balance three-phase grids and save electricity by an average of over 30%. SVC possesses reactive power, voltage, current and various regulatory functions. With simple structure, it can achieve self-cooling, maintenance-free operation, real time and remote monitoring.

Technical information: Grid voltage: ≤66kV; TCR´s rated power: ≤300Mvar; thyristor type: electricity-triggered thyristor (ETT) or light-triggered thyristor (LTT); triggering mode: photoelectric triggering or light triggering; control system: DSP total digital control system; control mode: reactive power or voltage; var regulation range: -100-+100; regulation model phase-specific regulation; regulatory system´s response time: <10ms; noise level: cold without noise; and, accessory grid´s power supply voltage: 80V+15. Scope of application: The product can be widely used in the modern metallurgical, power, electric rail track and coal mining industries.

Technological features: Corrects the power factor of dynamic var load; improves voltage regulation efficiency; raises power systems' static and dynamic stability and dampens power oscillation; lowers overvoltage; reduces voltage flicker; inhibits subsynchronous resonance; reduces voltage and current imbalance; and inhibits negative sequence current.

Status of application

The technology has been promoted and applied; ready for use after simple training; high initial input cost but low subsequent use cost, and users can carry out their own maintenance.

The SVC technology and product have been widely used in countries such as Viet Nam, Thailand, Myanmar, Turkey, Nigeria, Sudan and Brazil. The technology provider has also provided SVC subcontracting services to the Italian company Danieli and other international engineering contractors. For 5 consecutive years from 2005 to 2009, it has installed the largest number of SVCs, more than ABB and Siemens. The company now has over 840 SVCs in operation.

Technology Provider

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43. New dense-phase, high-density fluidized bed dry method separator and indeterminate large vibrating screen

Technology overview

Functions and use: Solves key scientific problems of coal separation and purification technologies in cold, arid and water-scare regions, and achieves higherfliciency dry method coal separation and in-depth wet particulate material screening.

Technical information: Processing volume: 50t/h; Ep value: 0.05-0.07; separation efficiency: >95%; and media loss: < 0.5kg/t of coal, reaching an internationally advanced level. The indeterminate large vibrating screen has a width of over 3m and vibration amplitude of around 9mm and achieves a screening efficiency of over 85%.

Scope of application: The dense-phase, highdensity fluidized bed separator can be used for separating and processing coal in cold and arid regions. The indeterminate large vibrating screen has a large surface area and high screening efficiency and can be used in medium-sized and large coal separation plants.

Technological features: Fluidized bed dry method coal separation technology offers advantages such as: no use of water, zero pollution, low investment and operating costs. It is especially suitable for coal separation in cold and arid regions. The indeterminate large vibrating screen fully adopts an indeterminate beam structure combination and solves the problem of the reliability of large vibrating screens.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; ready for use without training; inexpensive to use; high initial input cost but low subsequent use cost, and users can carry out their own maintenance.

A 10t coal sample selectivity test and a new dense-phase, high-density fluidized bed semi-industrial separation test have been conducted in South Africa, respectively achieving a clean coal and gangue output ratio of 87.45% and 12.55% and an ash output ratio of $\upbeta 12.40\%$ and 88.84%. Clean coal output rate is high, and output gangue is of high purity. A cooperation agreement has been signed with a company in South Africa to transfer this technology.

Technology Provider

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South-South Cooperation on Science and Technology to Address Climate Change Applicable Technology Manual Water Resource and Environmental Protection

44. Near zero emission dimethyl ether production technology

Technology overview

Functions and use: This new technology for producing alternative energy "dimethyl annual production capacity ether", encompassing the near zero emission dimethyl ether production process, a new highly active catalyst with high selectivity, a new reactor with an environment-friendly, energy-saving system, produces new zero emission dimethyl ether. The technology has has also been successfully been successfully put into production.

Technical information: Methanol consumption (t/t): 1.40; power consumption (KWH.t): 16.5; 200,000t/a dimethyl ether water consumption (t/t): 0.1; steam consumption (t/t): 0.70; process water 's COD value (mg/L): 9~20 (total wastewater recycling and use); and exhaust emission (Nm³/h): 2.5 (total recovery). Scope of application: Use of this technology is not dependent on geographic or climatic conditions.

Technological features: (1) Energy conservation efficiency: > 40%; (2) new dimethyl ether catalyst selectivity: >99.85%, and one-way conversion rate: >80%; (3) low temperature at the entrance of the new dimethyl ether reactor, even bed temperature distribution, few side reactions and large processing volume; and (4) dimethyl ether sewage treatment process and high-efficiency reactor processing unit technology have been developed.

Status of application

Has been promoted and applied; can be put into industrial production in developing countries; mature product; ready for use after special training, inexpensive to use, and users can carry out their own maintenance.

This technology has been used in 3 dimethyl ether production installations in China, with an

of 210.000 tons. 200.000 tons and 100,000 tons. It applied and used in a project in Egypt.

Technology Provider

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Improved and alternative production technology

45. Rolling Press Series

Technology overview





Functions and use: Rolling Press adopts the principle of high pressure material layer smashing. It squeezes materials which enter the squeeze zone and thus smashes materials and improves their grindability. Rolling presses are widely used in the breaking

up of brittle materials in the cement, chemical, metallurgical, mining and other industries

Technical information: (1) Rolling Press Series have a production capacity of over 170t/h (42.5# ordinary Portland cement) per set, and can fully meet the needs of 5000t/d and higher large-scale new dry method cement production lines and 1 million t/a single production line cement powder grinding stations; (2) Roll wear-resistant surfacing layer service life: ≥8,000h, allowing automatic, on-site, roll surface repair of the roll surface; (3) The powder grinding system of the rolling press has a unit power consumption (42.5# ordinary Portland cement, specific surface area: 340 ± 10m²/kg, including ball mill) of ≤28kWh/t, which is more than 10kWh/t less than that of traditional ball mill systems. System operation rate reaches 90%; and, (4)

The rolling press control system has an MTBF of 50,000h.

Scope of application: The product series have been widely used in the preparation of raw materials and cement for new dry method cement production lines as well as the smashing of brittle materials in the mechanical, metallurgical and mining industries.

Technological features: Effectively improves the grindability of materials, and has wide applications.

Status of application

The technology has been promoted and applied; special training is required before use; high initial input cost but low subsequent use cost and maintenance personnel need to be trained or a maintenance station needs to be established.

It has been promoted and applied in Pakistan, Viet Nam, Saudi Arabia, the Philippines, Indonesia and other developing countries.

Technology Provider

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Improved and alternative production technology

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46. Diaphragm electrolysis of metal

Technology overview

Functions and use: The main raw material of the chloralkali industry is industrial salt from which, by means of electrolysis, it produces such products as caustic soda and, chlorine. All its main products are basic chemical raw materials and are widely used in the light industry, chemical, textile, building material, national defense and metallurgical fields.

Scope of application: The technology can be applied in any region where water, electricity and gas resources are readily available. In addition, local salt reserves or salt transportation capacity also needs to be taken into account.

Technological features: Unlike the mercury electrolyzer, the diaphragm electrolyzer with its metal anodes does not produce mercury contamination. It does not require pollution treatment and can reduce direct current consumption by 750kWh per ton and total energy consumption (converted to alternate current) by 190kWh/t.. Unlike the ion film electrolyzer, the technology does not have strict requirements for the SO₄²⁻,Ca²⁺,Mg²⁺ content of the salt water entering the electrolyzer. The diaphragm electrolyzer with metal anodes is easy to manufacture and assemble, and requires minimal daily maintenance. It is an mature energy-saving technology which is suitable for use in

developing countries and can improve the operating environment.

Status of application

The technology has been promoted and applied; can be put into industrial production in developing countries; ready for use after simple training; high initial input cost but low subsequent use cost, and users can carry out their own maintenance.

It has been promoted and applied in Vietnam, including basic design, detailed design technical services and set equipment transfer.

Technology Provider

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Improved and alternative production technology

47. Vacuum heat treatment technology and equipment

Technology overview

Functions and use: Vacuum heat treatment can handle almost all heat treatment processes, such as quenching, annealing, tempering, carburizing and nitriding. In the quenching process, gas quenching, oil quenching, nitrate quenching and water quenching as well as vacuum brazing, sintering and surface treatment can be performed. Vacuum heat treatment offers high furnace heat efficiency and fast temperature rise and fall. It can achieve zero oxidation, zero decarburization and zero carburization and remove phosphorus debris from workplace surfaces. It also has the role of degreasing and gas removal.

Technical information: In accordance with customer requirements, provides various vacuum furnaces with various functions (quenching, annealing, tempering, carburizing, nitriding, brazing and sintering) and specifications.

Scope of application: This technology is used in the quenching, solid solution, ageing treatment and surface treatment of metal materials, stainless steel and various precision alloys, the sintering of diamonds and the brazing of different materials.

Technological features: The vacuum heat treatment process offers good stability, repeatability and less power consumption. It only consumes 80% of the electricity consumed by conventional heat treatment, thus carrying low production costs. Vacuum heat treatment is safe to operate and highly automated. With a good working environment and no pollution, it meets the clean production and sustainable development demands of industrial enterprises in China.



The technology has been promoted and applied; can be put into industrial production in developing countries; ready for use after simple training; inexpensive to use; high initial input cost but low subsequent use cost, and users can carry out their own maintenance.









The vacuum heat treatment technology has been promoted and applied in Southeast Asia. More than 30 sets of equipment have been transferred, all producing good application effect.

Technology Provider

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South-South Cooperation on S&T to Address Climate Change

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South-South Cooperation on Science and Technology to Address Climate Change Applicable Technology Manual Water Resource and Environmental Protection

China Science and Technology Exchange Center (CSTEC)

Founded in 1982, CSTEC is a national independent legal entity in China. Through international science and technology exchanges, CSTEC aims to push forward cooperation between China and the world and propel China's socio-economic progress. It has already established partnership with more than 130 organizations and famous enterprises in about 30 countries and regions worldwide. It is playing an important role in scientific communication with countries in America, Oceania, Europe, Asia and Africa, and regions like Hong Kong, Macao and Taiwan. One of CSTEC's major tasks is to push forward South-South S&T cooperation on climate change, and support technology R&D, transfer and training activities among developing countries in this aspect.

www.cstec.org.cn





Gansu Research Institute for Water Conservancy(GRIWC)





Gansu Research Institute for Water Conservancy is mainly engaged on academic research, engineering design, consultancy, training and extension service on the field of water resources management, environmental conservancy, agricultural irrigation, rainwater harvesting, hydropower infrastructure, rural water supply. It shares strong professional advantage on water resources management, irrigation and global leading position on rainwater harvesting and utilization, The institute has supported Africa to build 2 pilot projects on rainwater harvesting in Nigeria and Algeria respectively, provided consultancy service for 9 countries in Africa, Middle East and Caribbean on water resources management, irrigation and rainwater harvesting, over 500 participants from 75 countries has participated training conducted by GRIWC. The institute acts as Secretariat of National Rainwater Harvesting Committee of China Hydrological Society.

Technologies from have been used in Nigeria, Algeria, Saudi Arabia, Kenya, Uganda, South Africa, North Sudan, Jamaica, Grenada etc.

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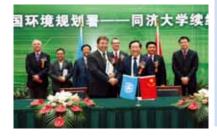


Tongji University

We provide water treatment agent including poly ferric sulphate (PFS) and polyaluminum chloride(PAC). PFS offers many advantages, such as no toxicity, wide applicable range of pH values, large alum, and rapid settling and has very good removal effects for COD, colors and heavy metal ions; it is cheap and used in small dosage; PFS has unique effects for the treatment of low temperature, low turbidity water and is widely used in the treatment of industrial wastewater and urban wastewater. It can be used for drinking water and wastewater treatment. In addition, we also provide comprehensive technologies for the treatment of drinking water and wastewater. With a systematic biological and chemical treatment processes, the pollutants such as heavy metals, nutrients and organic matter can be removed effectively.







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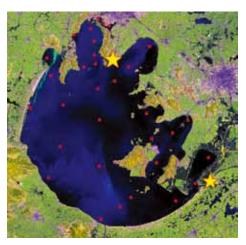
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Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences (NIGLAS)



NIGLAS is an institute specializing in the research of lake-basin system. NIGLAS can provide technical consulting service on water monitoring network design and monitoring practices include three main functions, the first is the comprehensive planning for water monitoring and management network in the lake or lake basin; the second is the technical consulting with field and laboratory practices and training; the third is the technology used for analyzing variation trend of water quality and the influencing factors, and providing information for the decision making facilitating both regional

development and environment protection. It can be used in long term lake monitoring or water monitoring of lake basin, integrated survey of lake basin, strategic environment impact assessment, and other types of monitoring targeting special parameters.

Application: The technologies are matured, low cost, and can be maintained easily. The NIGLAS has provided the report on water









quality and monitoring needs to the Lake Tanganyika Authority. Also the NIGLAS helps the Kigoma Center of Tanzania Fishery Research Institute to upgrade the water monitoring and analyzing laboratory.

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Institute of Botany, Chinese Academy of Sciences(IOB)

IOB is a comprehensive research institution for basic scientific research for plants in China. Up to now, IOB has won three awards of the first prize of National Natural Science Award, as well as about 160 awards of national, Chinese Academy of Sciences and provincial level scientific research awards.

During the "12th Five-Year Plan, with the aim to building an international first-class institute, IOB focuses on the following five key research areas: systematic and evolutionary botany, vegetation and environmental change, molecular physiology and development, photosynthesis and renewable usage of plant resources. It is positioned as "integrative plant biology" and closely related to national strategy demand. IOB strives to achieve key breakthroughs on three aspects: the research of important plant resources and its industrialization, biodiversity and carbon function in the ecological system under global climate change and the mechanism of the transformation of light energy in photosynthesis, to lead and promote the development of integrative plant biology in China.

IOB obtained many technical achievements in applied research except for contributions in basic scientific research. Main technological achievements include in the following.

(1) Technologies in plant resources field: new

grape varieties, seawater vegetables cultivation, postharvest preservation of fruits and vegetables, new flower variety cultivation (lavender, peony for medicinal and oil, safflower).

- (2) Technologies in vegetation and environmental change field: production and preservation of plant specimens, digital herbarium construction, ecological grassland restoration, new variety breeding and promotion of high-quality forage, ecosystem long-term monitoring and assessment, field station construction and management.
- (3) Technologies in bioenergy field: development of new energy plants, bio-oil production, biological photocell, biological hydrogen production. In addition, new screen kit with SNP marker.

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Gansu Desert Control Research Institute(GDCRI)

Founded in 1959, GDCRI has been engaged in the research of theory and technologies on prevention and control of land degradation and sand encroachment, integrated desert control, eco-restoration, sustainable development of resources and oasis. Over 300 research results have been applied in practical work, which has offered scientific and technological supports to the development of the arid areas in China. GDCRI is maintaining a good scientific & technological cooperation with more than 40 countries/international organizations, and has trained over 700 scholars/ officials/technicians from 69 countries all over the world, which are a great devotion to the desertification combating in the world.

Main technologies: Mechanical and biological measures for desert control; Introduction, domestication and reproduction of desert plants; Controlling of windblown sand-related harms; Integrated rehabilitation of desert area; Establishment of windbreak system; Eco-restoration; Integrated ecosystem management; Water-saving in desert area; Ecosystem monitoring; Development and utilization of the economic crops in desert area and their high-yield cultivation; Sustainable development of oasis; Deserticulture; Protection of bio-diversity; City greening in desert area; Restoration and management of desertified rangeland.

Products available: mechanical sand-barrier with diversified dimensions and materials; equipments/ instruments for sand-driven wind observation and eco-









environment monitoring; seeds/seedlings for sand-fixation afforestation, windbreak establishment and city greening; equipments/instruments for lysimeter and for sand and dust monitoring; soil water-conservation agent, sand-fixation agent, etc.

Services available: Services for applied technologies, products and equipments/instruments; designing and construction of engineering projects; technological cooperation, research and development; international training courses on desertification combating, ecorestoration and exploitation/utilization of desert resources can be conducted.

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Xinjiang Institute of Ecology and Geography(XIEG), Chinese Academy of Sciences



Focusing on the strategic objectives of the western development and under the guidance of the strategic thinking of creating innovative base by the CAS, the XIEG implements the strategies of resource development & utilization, ecological security and sustainable development in arid areas to carry out prospective, strategic and basic researches on "Oasis System Evolution and Oasis Ecological Agriculture", "Restoration of Fragile and Damaged Ecosystem and Prevention of Desertification", "Development and Utilization of Resources and Regional Sustainable Development", "Conservation and Utilization of Special Biodiversity", and "Resources and

Environmental Monitoring and Decision-making in Arid Areas".

Main technologies: Mechanical and biological measures for desert control aforestation technique irrigated with high saline water in drift sandy area, afforestation and restoration techniques without irrigation in sandy area,, biological improvement techniques at alkaline land, breeding techniques of desert plants with stress resistances, optimal configuration techniques for shelter forest system, plantation techniques for high and stable yield in Cistanche deserticola Ma, plantation restoration technique with catchment, protection technique for





desert-oasis ecosystem, restoration technique for degraded ecologyl , matching techniques for ecological restoration in desert area.

Products available: Sand control network with high duration, seed and seed belt of Cistanche deserticola Ma, Cistanche deserticola Ma health protection tea, various tree seeds and seedlings available for afforestation and landscaping, seeds and seedlings of desert economic plant, biochemical composite sand fixation materials.

Services available: Services for ecological applied technologies, products and equipments /instruments; designing and construction of engineering projects; technological cooperation, research and development; international training courses on desertification combating, eco-restoration and exploitation/utilization of desert resources.

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Review of Applicable Technologies for Environment Engineering Professor Fengting Li

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It has been more than 30 years since China initiated Reforming and Opening up policy. Remarkable achievement in economic development has been reached, while at the heavy cost of environment pollution. Recently, Chinese government has been increasing investment in environment protection, environment researchers in China make great progress and developed many applicable technology, chemicals and equipment, which are widely applied in drinking water treatment, wastewater treatment and solid waste treatment, etc. Most of the technologies are economical and highly effective, which can be a good reference to other developing countries. Some of the technology and products have been successfully applied in some developing countries, contributing to improve the local environment quality. We hope that those economical, effective and environmental friendly technologies and products can be promoted and applied to more developing countries, to improve the safe water supply and enhance the environment quality.

Safe water supply technology

"Coagulation-Sedimentation-Filtration-Disinfection" are the main processes in conventional drinking water treatment, targeting on the removal of suspend solid, colloid impurity and bacteria, etc. Modern treatment technologies include the enhanced conventional treatment, raw water pretreatment and advanced treatment. The enhanced conventional treatment includes new chemicals, materials and processes for water treatment. China have made a series of breakthrough in developing highly effective coagulants, flocculants, coagulant aids and filter aids, such as Polyaluminum Chloride (PAC), Polyaluminum Sulfate, Poly Ferric Sulfate (PFS), Polymerization of ferric chloride and Polyacrylamide (PAM), etc. which having great performances in treating characterized raw water, like low turbidity and low

temperature, high turbidity, and high colority. Those new chemicals are characterized with less coagulant usage, less sludge and better effluent water quality, coming into great economic and social benefits. China has become one of the biggest water treatment chemical manufacturers and export countries. Recently, the new chemicals supplied by China and applied in some African drinking water treatment plant have turned out to be more effective and cost-saving than the existing chemicals. As to the Eutrophication, we develop the effective coagulant compound characterized with instant separation of algae, inhibition of algal toxins, and effective removal of Chlorophyll and turbidity.

Raw water pretreatment technologies are mainly used in emergency treatment of drinking water, typically oxidation and adsorption. Oxidation includes chemical and biological oxidation. Chemical oxidation pretreatment is to add chemical oxidants to micro-polluted raw water to oxidize the organic matters. Typical chemical oxidant includes Ozone and Potassium permanganate, etc. Raw water pretreatment can reduce the organic matter content, and turn the organic matters to be biodegradable, with better coagulation performance, algae removal and less chemical usage. Biological pretreatment technologies are mainly used in high NH3-N raw water, typical processes such as Biological Fluidized Bed, Biological Contact Oxidation and Bio-ceramic Filter. Adsorption pretreatment is to absorb and exchange pollutants in water, typical adsorbents such as Activated Carbon, Diatomaceous Earth, Zeolite, etc.

Currently the advanced treatment technologies applied in drinking water treatment includes: Ozone Activated Carbon, Biological Activated Carbon and Membrane Separation Technology, etc. Ozone Activated Carbon treatment is to use the ozonation and adsorption to remove the pollutants. Membrane Separation Technology is mainly applied in desalination. With the development of new membrane materials, the cost of membrane treatment has been gradually decreased, possibly to

be further promoted in drinking water treatment.

In addition, China has gained many successful experiences in safe water supply, water quality standard system and water quality monitoring, which can be widely applied in other developing countries.

Wastewater treatment technology

Wastewater treatment technology can be divided into primary treatment, secondary treatment and tertiary treatment. Primary treatment is to remove the suspended solid, which is the pretreatment for secondary treatment. Secondary treatment is to remove the colloidal and dissolved organic matters. Tertiary treatment is to further remove the remaining organic matters, and the inorganic matters like nitrogen and phosphorus, which can result in eutrophication. Currently, the typical wastewater treatment technologies are the enhanced primary treatment, biological treatment and tertiary treatment, etc.

The enhanced primary treatment can be divided into the Chemical Enhanced Primary Treatment (CEPT) and the Biological Enhanced Primary Treatment. CEPT is to optimize the coagulant performance by the addition of new coagulant, flocculant compound, which can greatly improve the removal of pollutant, 90% SS removal rate, 50-70% BOD removal rate, 80-90% bacteria removal and 80-90% TP removal rate, greatly superior to conventional primary treatment.

Biological treatment technology is to use Aerobic, Facultative Anaerobic and Anaerobic bacteria digesting the organic matters, nitrogen and phosphorus in the sewage. Typical processes include AB (Adsorption Biodegradation), SBR (Sequencing Batch Reactor), Oxidation ditch and AO (Anaerobic/Oxic), etc. In domestic sewage treatment, we developed many applicable treatment devices and technologies, such as the water reclamation technology and small integrated sewage treatment plant.

The effluent water can be used in those occasions with no strict requirements for water quality, such as toilet flushing and landscape water. The integrated sewage treatment plant combines the membrane treatment with conventional biological process and skips the secondary sedimentation tank, with further Ultrafiltration and Microfiltration process for organic matter removal and denitrification, which can be the an option for the existing waterworks upgrade. As to the rural domestic waste, the humic filler filter technology can remove the organic matters nitrogen and phosphorus within the structures, to achieve waste treats waste. As to the industrial sewage, the effective anaerobic or anaerobic/aerobic plant can treat the concentrated organic sewage, such as effluent from alcohol plants, sugar mills, livestock farms. The new effective reactor can run in high load with

great performance. Besides, the Biological treatment coupled with chemical advanced treatment have great performance in treating paper mills sewage, which characterized with high level organic matters and chroma. The effluent water after treatment can be used for landscape water.

In addition, Bio-membrane reactor is another effective process for domestic and industrial sewage, having better performance in settling separation than conventional sedimentation tank, with less land cover, less sludge and cost saving.

Tertiary treatment can further remove the remaining organic matters, nitrogen and phosphorus. For instance, the combined-flow constructed wetland treats the domestic sewage with 40-85% TN removal, 30-75% TP removal, 60-85% COD removal and 85-95% BOD removal and cost saving. As to the scattered rural areas with unstable or no sewage networks, we use the Biological Contact Oxidation process, powered by solar energy, with further land percolation pond system, characterized with higher treatment load and less land cover.

Solid waste disposal

The effective sludge curing agent is featured by fast curing. The water content in sludge can be decreased to 20% within 2 days. The cured sludge can be resource utilization. The addition of curing agent results in instant coagulation, obvious granulation can be observed after adding the curing agent aid. The sludge curing can be operated on-site.

Waste is a misplaced resource. In the solid waste disposal, China, following the rule "Reduce, Recycle, Reuse", developed a set of technics to dispose the sludge, crop waste and other solid waste.

For example, the crop waste through compaction and crush, etc. can be used to produce artificial density board. The urban solid waste integrated treatment plant and energy saving technology can utilize sanitary landfill system, incineration power system and composting system. The bio-gas produced by the sanitary landfill system, composting system can be used for power generation. Low-energy leachate treatment system and aerobic fermentation technology can be used to harmlessly treat leachate and livestock waste, further made to fertilizer for agricultural use.

Those solid waste disposal technologies are often combined in application. For instance, the rural domestic waste centralized processing technology integrates sorting, recycling and reuse, composition treatment, then utilizing the bio-energy and fertilizer.



Ecosystem Monitoring Technology

Technology Overview

Ecosystem monitoring refers to long-term networking observation on typical ecosystems in certain regions, with the objective to obtain long time serial data which is essential for the ecosystem research and its adaptive management.

Chinese Academy of Sciences founded Chinese Ecosystem Research Network (CERN) in 1988 to conduct long-term networking observation and study on typical ecosystems all over China. Based on many years of monitoring experiences on ecosystems, CERN has not only accumulated large amount of data but also formed a series of related technologies, which mainly include the following:

- (1) Network planning and site selection for ecosystem monitoring
- (2) Formulation of ecosystem monitoring variable set
- (3) Establishment and management of field stations
- (4) Permanent plot establishment and management
- (5) Methods and protocols for biological observation in ecosystems
- (6) Vegetation investigation and vegetation mapping
- (7) Methods and protocols for soil, water, atmospheric environment observation in ecosystems
- (8) Protocols for ecological data recording and reporting
- (9) Protocols for ecological data quality control and assessment
- (10) Designing and construction of database and data sharing system

Application Field

This series of technologies is ready for use after short-term training. Subsequent use cost is low and users can perform their own maintenance. It is applicable for developing countries. This series of technologies can be applied in the fields of eco-environmental monitoring, ecosystem observation and

research, ecological data quality control and assessment, construction of ecological data sharing system, vegetation investigation and vegetation mapping, natural resources inventory, global change research.

Application Status

This series of technologies is mature and has been promoted and applied in CERN for 14 years, some of which even has been applied more than 50 years in some individual stations. And this series of technologies played an important role in the establishment and management of Chinese National Ecosystem Observation and Research Network since 2005, Institute of Botany, Chinese Academy of Sciences held three times of international training courses on ecosystem monitoring technology to Asian and African developing countries in 2008, 2009, and 2012, respectively. These training courses promoted the application of this series of technologies being used in some Asian and African developing countries.

Technology Provider

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