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IN THIS ISSUE

INTERNATIONAL COOPERATION

China-Swiss Improve Gas-Solid System

Chinese scientists reconstructed and improved a gas-solid two-phase flow system imported from Switzerland, through a project to establish a research and data platform for the gas-solid two-phase flow system, jointly initiated by China and Switzerland. Taking full advantage of the cooperative efforts and supplemented strength between the two sides, Chinese researchers collected a huge amount of experimental data from the unit, and established an experimental database for the system. A comprehensive data platform is also established for the research and development part of the gas-solid two-phase reactor, using the EMMS based software that has been tested online.

The platform has found successful applications in optimized design of slurry-bed hydrocracking reactor, and catalyzing and cracking reactors for the China National Petroleum Corporation. The project produced 7 invention patent applications, from which 3 have been granted. The efforts also resulted in 3 monographs, 5 papers delivered at international academic meetings, and 2 papers at domestic meetings. A workshop is organized to invite experts from both home and abroad to discuss circulating fluidized bed and associated database. Also derived from the project are 24 papers published in journals, of which 19 are collected by SCI, and 21 by EI. In addition, the project nurtured 1 postdoctoral student, 4 doctoral students, and 2 master's students.

RESEARCH AND DEVELOPMENT

Automatic Battery Sorting System

Not long ago, China has successfully rolled out an automatic battery sorting system with parallel mechanical arms, under the financing of the National 863 Program. The system integrated the data concerning the production and testing equipment on the battery production line, using database technology, and realized data sharing across the entire production line, through the computer network. The system guarantees a safe, reliable, and fast data transmission, using duplicated hot standby mode and optic-fiber telecommunication. The system is so designed that it allows operator to define a desired manner for battery sorting, in line with user requirements. The database management software would automatically give out information on battery sorting, and direct the speedy mechanical arms to work on batteries, either in serial or in parallel mode.

At present, the developer has rolled out a prototype, and made a demonstration at Tianjin Lishen Battery Co. Ltd. The prototype system is compatible with two lithium cell trays with the specifications of 150 and 256 for LR1865. The system divides each tray into 12 categories, and is working at a sorting speed exceeding 200p/min. The technology will eventually free the battery maker from manual calculating and sorting that has existed for so long a time.

Progress for Drug Target Screening

It takes three years for Dr. WU Jun and his team to establish a world-class drug target screening platform, with the support of the National 863 Program. The efforts has led to the establishment of a well-functioned screening platform for new drug development, and broken up the bottleneck of time consuming and low-accuracy drug target screening process, in a shortest possible time.

Aiming at a range of major diseases threatening people's health, including malignant tumors, inflammations, and immunity diseases, researchers launched an extensive drug target screening and analyzing. They screened out a series of original drug target genes that can be used to treat the above-mentioned diseases. The study team has so far applied for a worldwide protection of its findings and subsequent new drug development. They work hard to converse the findings into a possible new drug. The project has resulted in the first technical platform for fast, extensive, and high flux drug target screening in the country, in addition to the successful development of a range of drug target products.

China Launches Offshore Environment Survey

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On July 14, 2006, China kicked off its first survey of offshore environment, starting from the China South Sea. It is reported that the survey makes a top baseline investigation with a largest scale, most disciplines involved, and most advanced equipment. It covers an offshore area of 1.02 million square kilometers, which will be broken down into 9 parts for simultaneous operations. The survey is scheduled for completion in two years.

The survey is designed to investigate a range of indictors, including physical oceans, marine meteorology, marine biology and ecology, marine chemistry, marine optics, and marine bioresources for pharmaceutical applications, across inland waters, territorial waters and extraterritorial waters. The survey is supposed to work out a basic map for China's offshore environment, upgrading the existing basic data and maps, and deepening people's understanding of a range of marine environment elements, including spatial and temporal distribution, variations, formation, and constraints. The efforts will provide basic evidences for the healthy and fast development of marine economy, comprehensive assessment of marine environment, marine resources development and utilization, marine disaster prevention and preparedness, marine management, and environmental protection. The survey starts from the summer mission, jointly implemented by 11 costal provinces, autonomous regions, and municipalities, and some 40 government agencies, including the Ministry of Communications, the Ministry of Agriculture, the Ministry of Education, the Chinese Academy of Sciences, and the State Oceanography Bureau. The 45-day survey will involve 50 small and large boats, and some 3,000 person/time.

Platform for Water Saving Products

Not long ago, Chinese researchers rolled out an integrated technical platform, made up of a high accuracy laser forming equipment, and supported by micro irrigator flow design plan and associated software. The innovative water saving product system allows numerous fasts, including fast design, fast manufacturing, fast testing, fast modification, and fast finalizing. The platform noticeably shortens the development cycle, and reduces the development cost. It helps to raise the accuracy of components and parts processed for high accuracy water saving products from±0.1mm to±0.01mm. One can work on diverse irrigators on the platform, including the one having a 3-D structure. A special program containing irrigator parameters can complete the design and modification of irrigator structures in a fast manner. The platform also allows an integrated design combing both irrigators and water pipelines, from which a prototype irrigator can be directly rolled out for testing. This solves the problem that it is difficult to perform hydraulic test on built-in irrigators. The upgraded design program enhances the success of injection mode design for irrigators, extends the service life, shortens processing duration, and lowers down mode costs, through improving structural design and processing techniques.

Derived from the project are some 20 innovative irrigator products using the technologies provided by the platform. The design cycle, from structural design to hydraulic performance test, is shortened from 100-150 days to current 3-5 days. The development cost also comes down from RMB 30,000-50,000 to less than RMB 2,000. Two irrigator products have entered demonstration applications. One is a block resistant dripping pipe with built-in dripping plates. Its single dripping nozzle is designed for a flow at 3l/h. Another product is a block resistant stick-in irrigator, with an allowed flow at 6L/h. The two products have been put into trial applications at the Yangling Agricultural High-Tech Demonstration Park, and over the croplands in the Hongshan District, Wuhan Municipality, with fine results. In addition, 4 products have entered pilot experiments, and 6 others are finalized for production.

Rainwater Resources Utilized

Three advanced environment friendly materials having the function of rainwater collection are rolled out from the rainwater utilization initiative under the National 863 Program. They are: the material of becoming earth in (MBER), organic silicon for surface spray, and lichen biostabilizer, all enjoying a low development cost and high flow gathering capacity. Three new products are defined with high technical performance and have gone through field tests, working under a strict operating procedure. Compared with traditional rainwater collectors made of concrete, MBER has a reduced investment by 30%-40%, but enjoying a rainwater gathering efficiency and long service life close to that of concrete collectors.

Organic silicon for surface spray has a unit cost ranging from RMB 1 to 3/m^2, with a rainwater gathering efficiency above 60%. The lichen biostabilizer allows no infiltration of water at a level as deep as 0.5cm above it, for 6 consecutive hours. Researchers have also developed nutritional recipes for fast growth of lichens and mosses, in addition to a new technique to build rainwater collecting surface using biological means. The above-mentioned technologies can noticeably increase the surface runoffs by 40%, with a mean runoff coefficient at 60.86%. In the meanwhile, lichen based rainwater collecting surface can noticeably reduce soil erosions.

Researchers also developed flexible water vaults made of rubber-plastic mix, which can be shaped in an instant manner, with fine performance and easiness for shipping. Compared with traditional water vaults made of concrete, its cubage cost comes down by 20%. The field rainwater collecting technique, also derived from the project, may increase the crop yield by 10% or more, and moisture utilization by 0.2kg/m^3. The project team developed a technical system for efficient rainwater collecting, storing, and utilizing at the Taihangshan Mount. Area. The system enhances rainwater utilization from 20% to 40%, and cuts down rainwater collecting and storing costs from RMB 60/m^3 to RMB 20/m^3. Basin based demonstration has increased the runoff gathering capacity of the project area by 20,000 cubic meters, with a doubled irrigated area, per mu water saving amounting to 50m^3, and rainwater collecting and storing rate as high as 80%.

Researchers have established an evaluation model, using GIS technology and Surfer software, in an attempt to evaluate rainwater collecting potentials on a quantitative basis. Based on the model, a distribution map is prepared to show the rainwater utilization potentials at the Loess Plateau. Frequency analysis has resulted in 11 indicators in 3 categories, which are turned into an indicator system suitable for rainwater utilization evaluation and associated dynamic monitoring. An intelligent decision making system is also established for rainwater utilization. It calculates out regional rainwater resources, through analyzing natural features, meteorological data, topographic data, and land data, based on which, a rational rainwater resources

utilization plan is worked out. The system can also be used to predict and evaluate environmental effects brought up by rainwater utilization, satisfying diverse water needs from production, daily life, and ecological system in a maximum possible way.

Deficit Irrigation Technology for Crops

Under the National 863 Program, there is an initiative to study crops' water needs, in terms of crops' physiological needs and environmental information. Based on extensive indoor and field experiments, researchers proposed four deficit irrigation indicator systems, made up of regulated deficit irrigation indicator for major crops under a water saving irrigation system, sensitivity indicator for moisture shortage, crop coefficients under a water saving irrigation system, and crop water needs under a water saving irrigation system. They also developed three key technologies involving physiological water saving and deficit irrigation, including deficit irrigation decision making technology, limited and even irrigation technology, and physiological readjusting technology. Also derived from the project are five products: design software for deficit irrigation network, digital crop water needs chart in isoline and associated searching system, deficit irrigation predictor, local irrigation system, and crop growth modulator. The project team established an irrigation model, and an operating procedure for regulated deficit irrigation.

Researchers conducted a range of experiments to test physiological water control technology, and alternative irrigation technologies for different crops, including wheat, corn, cotton, water melon, apple, pearl, and date, from which regulated deficit irrigation indicators were obtained. They proposed new approaches for efficient physiological water control, and new recipes for modulating crop growth. The project team also developed a controlled groundwater irrigation technology and associated field techniques and equipment. They made the advanced irrigation technology adaptable to major crops, established functional models for crop moisture production, established an optimized distribution model for limited water use in the crop growth period, under different hydrological years, and rolled out technologies corresponding to regulated deficit irrigation system. The other accomplishments include software design for water consumption management under a deficit irrigation system, and the database, model, and decision making system for the regulated deficit irrigation predictor.

Brackish Water Utilization

With the support of the National 863 Program, Chinese researchers have constructed a new model to utilize brackish water along the costal semi-arid regions, at a small scale. Aiming at multiple water resources based cyclic utilization, the model makes salty water agriculture as the core, supported by water and salt dispatching efforts. The combined use of a range of advanced technologies, including efficient utilization of water, land, and biological resources, has brought down the mineralization of local groundwater along the Laizhou Wanghe coastal area, from 4.226‰ to 3.649‰, and from 1.526‰ to 1.061‰ respectively, with a descending margin ranging between 13.65%~30.47%. Under a comparison, the untreated groundwater registers a decline of only 10%. As a result, the safe upper limit for brackish water irrigation is raised from traditional 0.3% to current 0.5%.

Irrigation, using the bitter and salty groundwater with a mineralization large than 0.3%, has increased grain yield by 30%~60%, compared with the non-irrigated. In 2004, researchers made an experiment over a winter wheat growing area of 10,000 mu(1 mu= 0.0667 hectare), using groundwater at a scale of 3~5g/L . The winter wheat yield was 265.99 kg in 2004, and it went up to 428 kg in 2005. Researchers obtained a curve indicating the correlation between water consumption and mineralization, based on a safe brackish water dripping irrigation system designed for semi-arid areas, and using proprietary high resolution electronic weighing lysimeter. The technology results in a technical system combining brackish water processing, salinity readjustment, dripping irrigation, and farming techniques, which is better and more complete, compared with its overseas counterparts. Researchers developed a technology to simulate the movement of nitrogen in a contaminated water irrigation system, and established a basic equation and solution to address such movement. They also improved the rotating irrigation system that uses recycled water.

Comments or inquiries on editorial matters or Newsletter content should be directed to:

Mr. Mao Zhongying, Department of International Cooperation, MOST 15B, Fuxing Road Beijing 100862, PR China Tel: (8610)58881360 Fax: (8610) 58881364

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