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中核集团 CNNC

中国辐射防护研究院

CHINA INSTITUTE FOR RADIATION PROTECTION

CATALOG

PRODUCTS & TECHNICAL SERVICES

TAIYUAN • CHINA
2022

Safeguard of Nuclear Energy Development
Pioneer of Radiation Safety and Protection Technology

（Inscribed by Zhang Aiping, former Vice Premier of the State Council, in celebrating 30th anniversary of CIRP）

China Institute for Radiation Protection (CIRP) is the only comprehensive scientific research institution solely dedicated to the research and application of radiation protection in China. CIRP was established in 1962 with the approval of Nie Rongzhen, Vice Premier of the State Council then. Over the past six decades, as a leading, fundamental and forward-looking scientific research base of radiation protection in China, CIRP serves as an important scientific think tank, technical reserve and talent training base in this field and has made critical contributions to the development of the nuclear industry in China. CIRP has been engaged in several major fields, including radiation protection and radiological medicine, nuclear emergency and safety, nuclear environmental science, nuclear decommissioning and radioactive waste management, as well as non-nuclear business. CIRP has also developed a series of high-tech technologies and products.

Liu Qun
Chairman of the Board, CIRP

In the new era, aiming to further improve the commercialization mechanism of technical achievements, and establish the market-oriented sci-tech innovation mode, CIRP is carrying out a comprehensive reform, committed to realize the optimized integration of “one institute & two systems”. Based on the radiation protection technologies developed in the past 60 years, taking the CIRP Technology Co., Ltd. as the platform, CIRP is capable of providing nuclear safety and radiation protection related products, services and overall solutions for customers, so as to obtain the new development momentum of industry originating from scientific research and in turn serving scientific research.

We will focus on the nuclear power, nuclear fuel cycle, and the application of nuclear technology to carry out scientific research, ensure product supply, and provide technical services. We are always confident to rise up to any challenges. In the context of the vigorous development of nuclear power, CIRP is determined to strive for the goal of building itself into a world-class research institute.

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CONTENTS

RADIATION PROTECTION

PERSONAL DOSE MONITORING

01 Personal Dose Monitoring of External Exposure

CIRP supplies a complete set of personal dose monitoring solutions of external exposure for nuclear industry and nuclear technology companies, including monitoring management system, active/passive external exposure personal dose monitoring equipment and services, etc.

Electronic Personal Dosimeter

β type

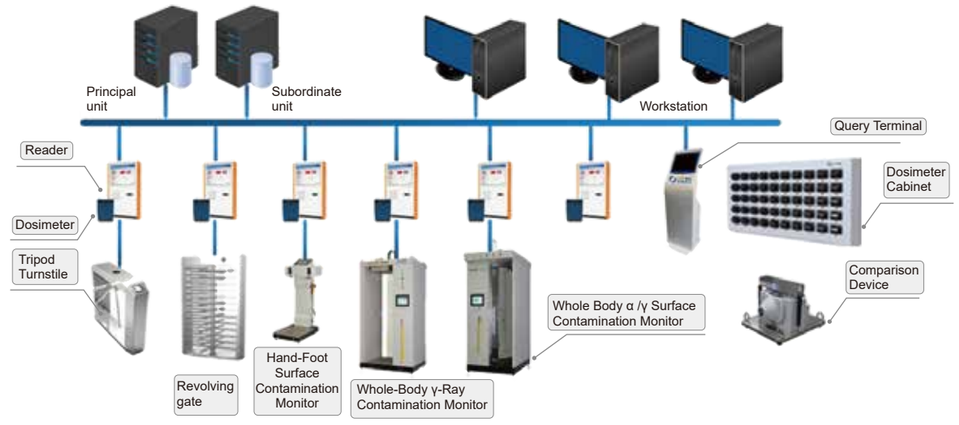
γ type

Neutron type

Thermoluminescence Personal Dosimeter (TLD)

Astronaut Personal Dosimeter

Personal Dose Monitoring Management System



The electronic dosimeters in conjunction with data readers and computer management software can form a real-time personal dose management system for X, γ, β and neutron rays. The system can be widely used in the monitoring of personal cumulative dose and dose rate at nuclear power plants, scientific research institutes, hospitals, environmental protection administration, and customs to protect the health of workers engaged in nuclear and radiological industry.

02 Personal Dose Monitoring of Internal Exposure

In response to the needs of personal dose monitoring of internal exposure in normal or emergency scenarios, CIRP provides internal exposure in-vivo measurement, dose assessment systems and monitoring services. In addition, CIRP is able to conduct calibration and performance testing on internal exposure in-vivo measuring systems with human phantom. In terms of the analysis of radionuclides such as uranium, plutonium and tritium, corresponding testing capabilities have obtained the national CMA certification and CNAS laboratory accreditation.

Mobile In-Vivo Measurement System

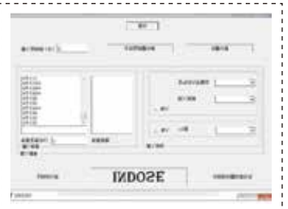
Chair-Type Whole Body Counter

Lung Counter

Calibration Service Of Vertical Whole Body Counter

Thyroid Counter

Physical Models



Dose Estimation Software

RADIATION MONITORING SYSTEM

CIRP is capable of a variety of radiation monitoring, including dose equivalent rate measurement of different rays, surface contamination monitoring, continuous monitoring of radioactive effluent, environmental cumulative dose monitoring, and radiation source term investigation.

01 Dose Rate Measurement Products

CIRP supplies fixed and portable personnel/equipment/vehicle monitoring systems (including PRM series pedestrian radiation monitors and VRM series vehicle radiation monitors, etc.) and supporting central data management server.

MPR200 Series PEG-PS

MPR200 Series PG-GM10

MPR200 Series PG-TELE

MPR200 Series Host

MPR200M

MPR500

PRM100 Fixed Pedestrian Radiation Monitor

VRM100 Fixed Vehicle Radiation Monitor

MPM100 Mobile Pedestrian Radiation Monitor

02 Surface Contamination Monitoring Products

CIRP supplies fixed and portable surface contamination monitoring systems (including WCM series whole body γ contamination monitor system, WBM series whole body surface contamination monitor system, HFM series hand-foot surface contamination monitor system, LCM series laundry system, and STM series small article contamination monitor system) and supporting central data management server.

WCM1000
Whole Body Contamination Monitor For γ Detection

WBM-IIS
Whole Body Surface Contamination Monitor

HFM100TS
Hand-Foot Surface Contamination Monitor

HFM100
Hand-Foot Surface Contamination Monitor

ZF-102S
Tool Contamination Monitor

GFM100
Large-Area Floor Contamination Monitor

STM100
Safety Helmet Contamination Monitor

- MPR200 Multi-Probe Radiation Survey Meter PAB-ZP15
- MPR200 Multi-Probe Radiation Survey Meter PEG-Nal
- MPR200 Multi-Probe Radiation Survey Meter PABG-GM30
- MPR200 Multi-Probe Radiation Survey Meter PABG-GM75
- PCM170 Surface Contamination Meter
- Survey Meter Stand

MPR200 Multi-Probe Radiation Survey Meter

- PAB-ZP100 PAB-ZP170
- PAB-ZP15II
- PAB-ZP40
- PABG-GM06

03 Environment, Workplace and Effluent Monitoring

CIRP supplies stationary γ and neutron radiation field monitoring instrument and portable X, γ, and neutron monitoring instrument for the environment and workplace, gaseous effluent (aerosol, iodine, inert gas, tritium, carbon, etc.) monitoring instrument, liquid effluent monitoring, and various sampling devices, etc.

Environment, Workplace and Effluent Monitoring

Airborne radioactivity monitoring


General Type


High Radon Type


Emergency Type


Wall-mounted Type


Explosion-proof Type


Contamination-isolated Type

CAM-2 Series Radioactive Aerosol Monitor (for workplace)

CAM-1 Series Radioactive Aerosol Monitor (for effluent, stack/pipe)

PING-50 Series Airborne Effluent Monitoring System

Liquid Effluent Radioactivity Monitoring

Low-level water and seawater radioactivity monitoring system

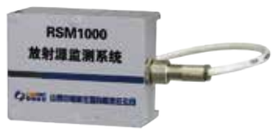
Workplace/Area Radiation Monitoring


Neutron Probe of ARM100 Area Radiation Monitor


Area γ and Neutron Detection Device


Area γ and Neutron Detection Device


ARM100 Area Radiation Monitor (host & probe)



RSM1000 Radioactive Source Monitor (host & probe)

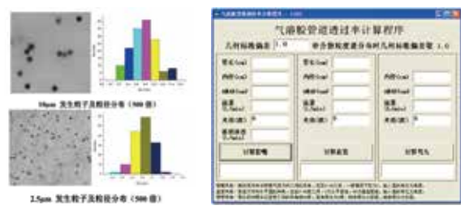

HM100 Hand Contamination Monitor

Radiation Monitoring Network System

Representativeness Assessment of Effluent Sampling

Standard Aerosol Particle Generation and Testing

Calculation and Assessment of Aerosol Loss of Stack Effluent Sampling System



Aerosol, Iodine, Tritium, Carbon Sampling Device (for workplace and effluent)

04 Investigation of Radiation Source Term and Weakly-Penetrating Radiation

CIRP performs on-site non-destructive measurement of radiation source terms deposited inside nuclear facilities, equipment and pipelines to obtain information such as nuclide type, activity, dose rate contribution, and γ radiation field dose rate level, in an effort to provide data for source term control and protection. CIRP investigates and measures the spectral characteristics, directional dose equivalent rate and personal dose equivalent (eye lens, skin, acra) of weakly penetrating radiation, to evaluate the performance of protective equipment, systematically understand the level of weakly penetrating radiation and its hazard, so as to improve on-site radiation protection management.

Portable source term investigation

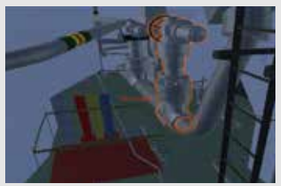
Weakly penetrating radiation survey

On-site source term investigation

05 Digital Radiation Protection Management System

CIRP, based on the industrial digital technology, transforms and develops digital radiation monitor to collect various radiation monitoring data. In the meantime, CIRP is able to achieve more comprehensive information than conventional radiation protection by utilizing integrated storage and analysis of time and space information, thereby laying the foundation for intelligent data analysis and prediction to promote the intelligentization of radiation protection. By providing three-dimensional radiation field measurement, calculation and visualization system development, customized intelligent radiation monitoring equipment transformation and construction of digital radiation protection management system, CIRP is able to improve the ALARA management of nuclear facilities.

Function Menu

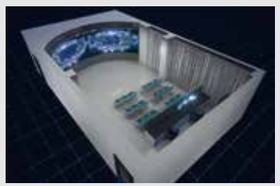


Radiation Work Procedure Guide

Radiation Field Visualization System

Radiation Dose Simulation

Digital Nuclear Island



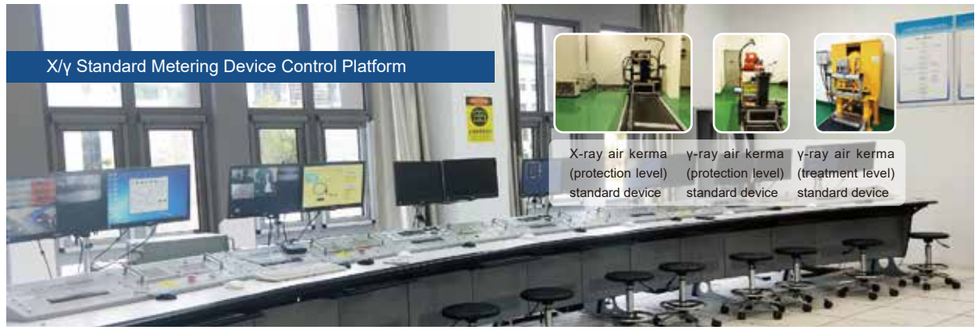
VR Training

NUCLEAR INSTRUMENT VERIFICATION, CALIBRATION, AND TESTING SERVICES

The Radioactivity Measurement Laboratory of CIRP currently has 14 sets of standard measuring systems, which are divided into three categories of dose, activity and neutron. These systems can be applied to carry out the verification, calibration and testing of X, γ, α, β and neutron radiation monitoring instruments. Online calibrating services can be provided for some radiation monitoring instruments, and high or low-temperature environmental adaptability testing can be conducted under conditions with radiation fields.

01 Dose Measuring Instrument Verification, Calibration and Testing Services

CIRP provides verification, calibration and testing services for a variety of instruments, including portable X/γ dose equivalent (rate) meter, direct-reading electronic personal dose rate meter, X/γ dose (rate) meter for environmental monitoring, X/γ radiation alarm for workplace monitoring, thermoluminescence reader and personal dosimeter, finger ring dosimeter and eye lens dosimeter, direct-reading β personal dose (rate) meter, directional β dose equivalent (rate) meter, β ray applicator, stationary workplace γ dose (rate) meter, ionization chamber dosimeter, diagnostic dosimeter, CT dosimeter, pulsed dose rate meter, X/γ ray defect detector, medical X-ray radiation source, X, γ and β radiation shielding materials, and irradiation resistant device.



02 Activity Testing Equipment Verification, Calibration and Testing Services

CIRP provides verification, calibration and testing services for α/β surface contamination monitor, hand-foot contamination monitor, whole body surface contamination monitor, low background (weak) α/β measuring instrument, α plane source, β plane source, γ source, radioactivity meter, tritium monitor, pedestrian and luggage radioactivity monitoring device, vehicle radiation monitor, γ spectrometer, liquid scintillation counter, standard radionuclide solution, liquid scintillation activity meter, gas and liquid effluent monitor, radioactive waste drum monitoring device, nuclear-grade electronic components, and radiation shielding materials.

03 Neutron-related Equipment Verification, Calibration and Testing Services

CIRP provides verification, calibration and testing services for direct-reading neutron personal dose equivalent meter, thermoluminescence albedo neutron measuring equipment for personal monitoring, neutron peripheral dose equivalent (rate) meter, and neutron shielding materials.

Thermal Neutron Standard Radiation Field

Neutron Flux Rate Standard Radiation Field

04 Radiation Resistance Performance Test of Electronic Equipment

By providing radiation resistance performance test services for electronic devices, CIRP is able to carry out total dose effect and single event effect tests, assessing the radiation resistance performance of the tested object in the γ/neutron radiation field.

Single Event Effect Test

Co-60 Irradiation Laboratory

Total Dose Effect Test

INTEGRATED SOLUTIONS TO RADIATION HOTSPOT AND PERSONAL PROTECTIVE EQUIPMENT

01 Integrated Solutions to Radiation Hotspot

CIRP conducts on-site hotspot shielding design and development of modular shielding devices. Starting with source term information survey, CIRP provides systematic solutions from shielding design, seismic/stability/reliability design, product design to installation & follow-up services, and technical achievement planning.

Non-Toxic Flexible Shielding Material

Temporary Shielding Device for Radiation Hotspot

02 Personal Radiation Protective Equipment

CIRP develops a series of personal protective products, such as air-supplied and filtered radioactive aerosol protective air-fed suits, and corresponding laboratory performance testing and assessment.

Air-fed Suit Performance Test

Personal Protective Air-fed Suit

Tungsten Protective Gloves

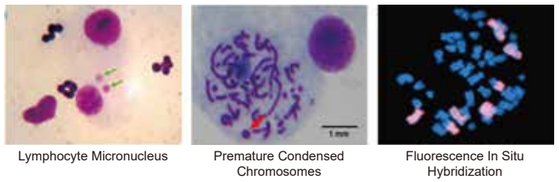
Tungsten Protective Clothing

RADIATION MEDICINE AND ENVIRONMENTAL MEDICINE

RADIATION EFFECT ASSESSMENT AND TREATMENT OF RADIATION INJURY

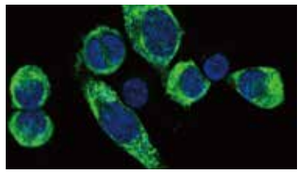
01 Research on Biological Effect of Radiation

CIRP studies the effects and mechanisms of ionizing radiation on organisms at various levels such as collectives, individuals, tissues, cells, and molecules. CIRP has performed radiation damage effect tests with different LET ionizing radiations such as X-rays, γ-rays, α particles, heavy ions, and neutrons successively. On this basis, three technologies have been established, including the biological technology of occupational health monitoring of radiation worker, the rapid screening and classification technology of irradiated personnel in nuclear and radiation accidents, and the radio-biological dose estimation.



Lymphocyte Micronucleus | Premature Condensed Chromosomes | Fluorescence In Situ Hybridization

Radiation Biological Dose Estimation



Biological Effect of Radiation

02 Radiation Epidemiology Research

The following studies are carried out with focus on the main radiation hazards factors at the front and back ends of the nuclear industry chain:

Radiation epidemiological investigation, dose reconstruction	Screening research on radiation and non-radiation exchange effect
Establishment of attribution technology for radiation carcinogenesis	Occupational health management and application software development

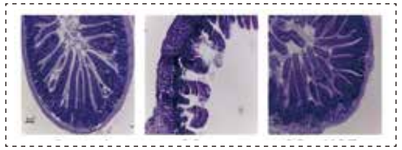
Radiation epidemiological investigation

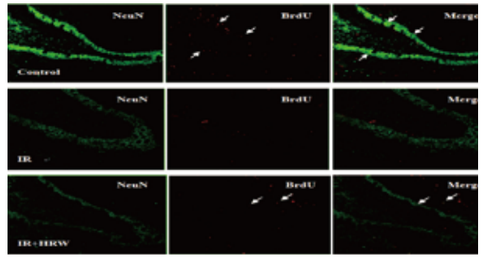
Biological sample collection and health examination

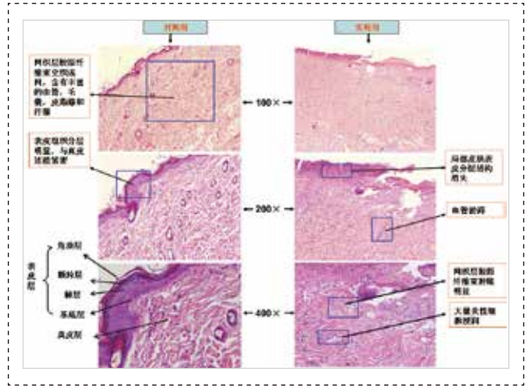
Radiation epidemiological hazard assessment

03 Radiation Injury Treatment Technology

CIRP carries out medical treatment technology research for ionizing radiation injury. Currently, medicine for the decorporation of transuranic nuclides has been obtained, the peptide-based radiation-induced skin damage treatment technology, and radiation damage treatment technology based on sub-low temperature and hydrogen-rich water have been primarily established.







Radiation Injury Treatment

OCCUPATIONAL HEALTH ASSESSMENT

01 Occupational Health

CIRP is certified with the sole Class-A qualification for occupational health technical services in Chinese nuclear industry.

Mining industry | Chemical, petrochemical and pharmaceutical industry | Metallurgy and construction materials | Mechanical manufacture, electricity, textile, building and transportation | Nuclear facilities | Industrial application of nuclear technology

Obtained qualification certificates, having undertaken **116** testing items

A Occupational hazard assessment and detection

CIRP, certified with the sole Class-A qualification of occupational health technical services in the nuclear industry, is able to carry out pre-assessment of occupational hazards in construction projects, assessment of occupational hazard control effects, regular inspections on occupational hazards and current status assessments. The occupational health technical services have been included in the advantageous product catalog (first batch) for internal procurement of CNNC.

B Occupational hazard project management and technical consultation

In view of the concentration or intensity of occupational disease hazards in the workplace exceeding the occupational health limit, the occupational health project management and technical consulting services are provided, offering one-stop service from consultation, investigation, design, model selection to non-standard design, construction plan, construction, commissioning, effect verification, and maintenance. With a strong technical force, CIRP has five state-level leading experts, rated as the "National Technical Support Center for Radioactive Occupational Disease Hazards" and "Ionizing Radiation Prevention Technical Guidance Center of Shanxi Province".

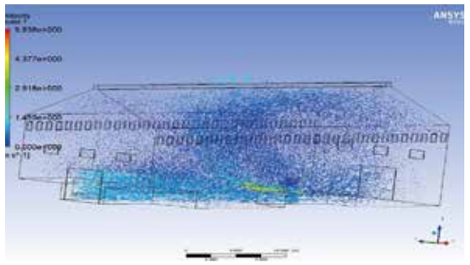
C Occupational health management of employers

CIRP carries out occupational health customized services such as occupational health training for employers, establishment of occupational health files, and protective equipment effect assessment.

D Environmental pollutant detection and health assessment

Detection of pollutants (polycyclic aromatic hydrocarbons, benzene series, heavy metals) and their body load in various environmental media (water, gas, soil, dust, food, etc.), environmental and health risk assessment technical service, and assessment of soil risk of contaminated land plot.

Occupational and Environmental Hygiene Analysis and Testing Center



Simulation of the regular pattern of radioactive aerosol diffusion in factory buildings and optimization of ventilation system

02 Radiological Health

The CIRP Quality Control and Protection Testing Center for Radiotherapy is certified with Radiation Health Technical Service Institute Qualification (Class-A), enabling to carry out radiological occupational hazard assessment, radiation health protection testing and medical equipment quality control testing. CIRP has completed quality control testing on radiodiagnosis and radiotherapy equipment and site protection testing for a total of more than 1,000 medical institutions and assessments on radiological occupational hazards for radiological diagnosis and treatment construction projects of over 300 medical institutions.

01 **Radiological Occupational Hazard Assessment of Radiological Diagnosis and Treatment Construction Project (Class A)**

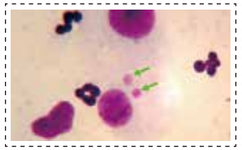
02 **Radiological health protection inspection (status quo inspection, acceptance inspection)**

Radiological health protection testing for workplaces of radiological diagnosis, interventional radiology, radiotherapy and nuclear medicine.

03 **Quality Control Testing for Radiological Diagnosis and Treatment Equipment (status quo test, acceptance test and stability test)**

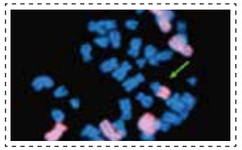
Quality control testing of equipment for radiological diagnosis, interventional radiology and radiotherapy and nuclear medicine equipment.

04 **Detection and analysis of chromosome aberrations in peripheral blood of radiation workers**



Lymphocyte micronucleus examination

Chromosome examination



OCCUPATIONAL SAFETY ASSESSMENT

01 Occupational Safety

CIRP possesses the safety assessment qualification certificate, is able to conduct a wide range of technical services for industries including petroleum processing, chemical raw materials, chemicals and pharmaceutical manufacturing.

- A: Occupational safety assessment of construction projects
- B: Quantitative risk assessment of hazardous sources
- C: Safety consulting, potential risk investigation and management
- D: Work safety standardization and safety training
- E: Planning of work safety information system

NON-CLINICAL ASSESSMENT OF PHARMACEUTICAL

The CIRP Pharmaceutical Safety Assessment Center is the first domestic institution that has attained the GLP certification of radiopharmaceutical by National Medical Products Administration (NMPA). Capable technical services include:

Non-clinical safety assessment of pharmaceutical	CIRP is able to carry out non-clinical safety assessment on both non-radioactive pharmaceuticals and radiopharmaceuticals, including single-dose and multiple-dose toxicity testing, local toxicity testing, genetic toxicity testing, reproductive toxicity testing, safety pharmacology testing, and toxicokinetics testing, etc.
Radiopharmaceutical pre-screening	CIRP is able to carry out a variety of radiopharmaceutical labeling and screening experiments at the cell/molecular level, tissue/organ level, and animal level.
Pharmacodynamical research	CIRP is able to carry out the efficacy research on radiation injury treatment pharmaceuticals, adjuvant pharmaceuticals for radiotherapy and radiopharmaceuticals.
Pharmacokinetic study of isotope tracer	CIRP is able to carry out isotope tracer pharmacokinetics and accelerator mass spectrometry-based micro-dose pharmacokinetic researches.

Liquid scintillation counter

Solid scintillation counter

Biological oxidation combustor instrument

Gamma counter

LC-MS and radiochemical purity analysis laboratory

NUCLEAR EMERGENCY AND NUCLEAR SAFETY

NUCLEAR EMERGENCY SYSTEM PLANNING AND PREPARATION OF RESPONSE PLAN

CIRP provides radiation accident risk analysis and evaluation, nuclear and radiological emergency system planning, emergency plan preparation and other related technical support for the governments, nuclear and radiological activity organizers and nuclear facility operators.

Emergency plan preparation agreement signed with Jilin provincial government department

Radiation emergency response textbook for nuclear security accidents

Emergency plan preparation agreement signed with an equipment manufacturing company

Qinshan Nuclear Power Plant Phase I Emergency Plan (Edition 1990)

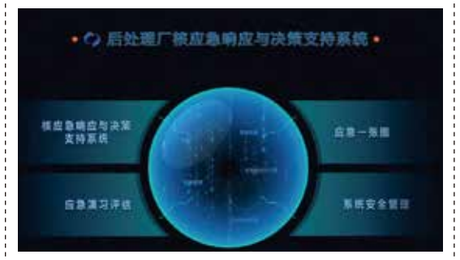
Strategic cooperation agreement signed with Beijing fire rescue organization

OPERATING CONDITION ASSESSMENT AND DECISION-MAKING SUPPORT

01 Emergency Condition Assessment and Decision-making Support

CIRP can provide nuclear emergency assessment and decision-making support technical services and system development for reactors (nuclear power plants, research reactors, nuclear power equipment) and nuclear fuel cycle facilities (uranium conversion and purification facilities, uranium enrichment facilities and nuclear fuel reprocessing facilities). The main functions of the system consist of nuclear emergency response and data management, core damage assessment, source term release estimation, emergency action level (EAL) formulation, operational intervention level (OIL) formulation, and decision-making support functions based on EAL and OIL.

Nuclear Emergency Assessment and Decision-making Support System



Nuclear Emergency Assessment and Decision-making Support System for Reprocessing Plant

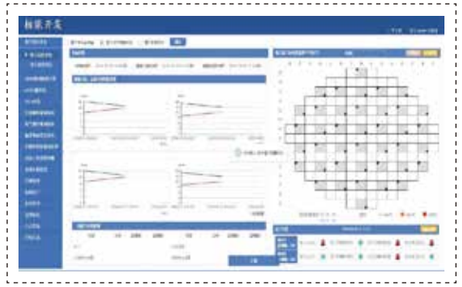
Reactor Core Damage Assessment and Source Term Release Estimation System for Hualong One (HPR 1000)

Emergency Assessment System for UF_6 Leakage Accident at Uranium Enrichment Facilities

Emergency Assessment System for Criticality Accidents of Nuclear Fuel Cycle Facilities

Research Reactor Emergency Condition Assessment System

Safety assessment of UF_6 leakage accident



M310 core damage assessment and source term release estimation system

Operational Intervention Level (OIL)-based Emergency Decision-making System

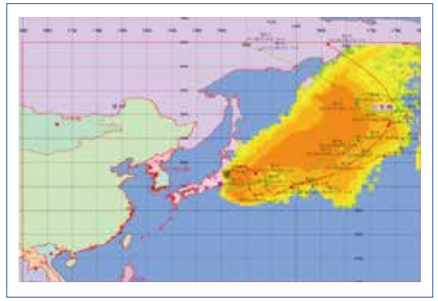
Emergency Action Level (EAL) Software for Reprocessing Plant

02 Consequence Assessment and Decision-Making Support

CIRP is capable of technologies including source term estimation, radioactive material migration and diffusion assessment, and dynamic food chain and dose estimation, being able to provide protective action suggestion, decision-making optimization models, and geographic information platform, to which CIRP has exclusive intellectual property rights. CIRP possesses a series of product systems for the consequence assessment and decision-making support of different types of atmospheric and water environmental accidents/events, with the release point at any location worldwide in different ranges (few kilometers to thousands of kilometers), providing technical support for the real-time prediction and assessment of the consequences of nuclear and radiological emergency, as well as for implementation of decision making on emergency action plans.

2D&3D integrated nuclear accident consequence assessment and decision-making support system

Local-scale nuclear accident consequence assessment and decision-making support system



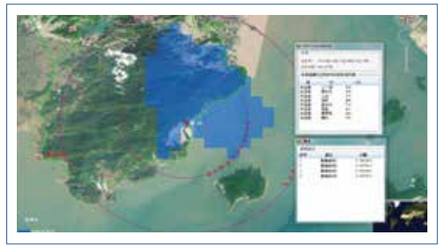
Long-distance radiation consequence assessment system

Small and medium-scale nuclear accident consequence assessment and decision-making support system

Consequence assessment and decision-making support system for water environment

Consequence assessment and decision-making support system for inland water environment

Decision-making optimization through combination of prediction results and monitoring results



Dynamic optimization of evacuation routes and protective action recommendations

INTELLIGENT EQUIPMENT FOR NUCLEAR EMERGENCY RESPONSE

CIRP can provide intelligent robots and special vehicles required for emergency response, and customizing the radiation data communication system for emergency response according to the needs of the emergency team.

Data communication system for nuclear and radiation emergency response

Nuclear and radiation emergency monitoring vehicle

Radiation assessment vehicle

Quick measuring and imaging system for large-area contamination

Long-distance strong radiation field operating robot

Small-sized strong radiation field nuclear emergency detection robot

Medium-sized strong radiation field nuclear emergency detection robot

TECHNICAL SERVICES OF NUCLEAR AND RADIATION EMERGENCY RESPONSE

As the National Nuclear Emergency Radiation Protection Technical Support Center, the National Technical Support Team for Radiation Protection, and the host of IAEA Capability Building Center for Emergency Preparedness and Response (CBC-EPR) in China, CIRP can provide corresponding technical support for the state, local governments, operators, and radioactive source users.

CBC-EPR in China

Outstanding Contribution to Lunar Exploration Project Chang'e-3 Mission

Nuclear and Radiation Emergency Exercise

"Safe Taiyuan" Radiation Accident Emergency Exercise

Preparedness and response support to emergency

Shendun-2015 National Nuclear Emergency Joint Exercise

NUCLEAR FACILITIES AND NUCLEAR SAFETY

The safety of nuclear fuel cycle facilities mainly refers to fire accident research, explosion event research, leakage research, safety assessment methods and related safety software development. CIRP is primarily engaged in scientific research programs such as national key tasks, nuclear energy development, and special large-scale reprocessing projects.

01 Nuclear Facilities and Nuclear Safety

Equipped with explosion accident, fire accident and leakage accident, etc. simulation platforms, CIRP is able to carry out parameter testing, simulation analysis, engineering verification and safety evaluation of fire, explosion and leakage accident, etc. of nuclear fuel cycle facilities.

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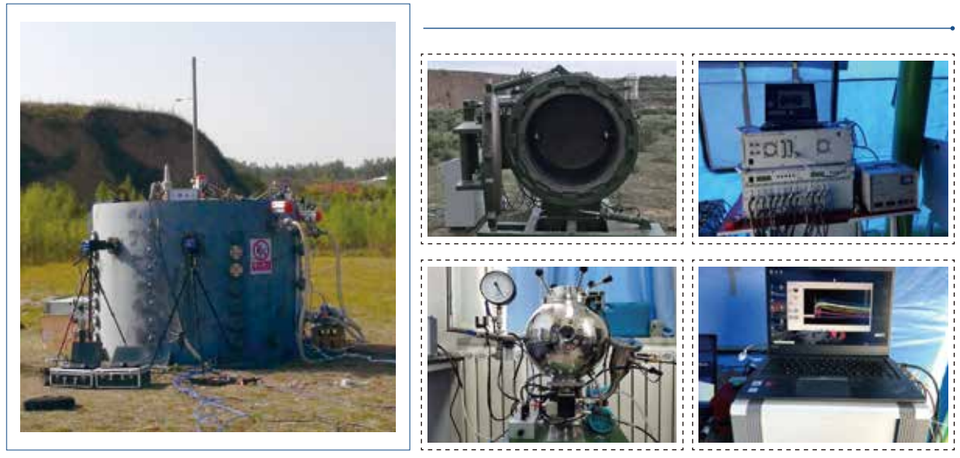


Testing facility of explosion accident

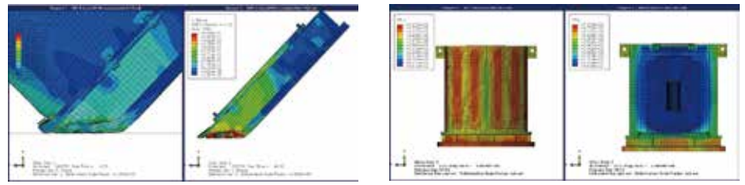
Testing system of fire accident

Testing capability for fire accident

TRANSPORT SAFETY OF RADIOACTIVE MATERIALS

01 Design, Simulation Analysis, Experimental Verification and Safety Assessment of Radioactive Material Transport Container

Equipped with the only large safety test facility for radioactive material transport containers in China, CIRP is able to undertake the design, simulation analysis, testing, safety evaluation, certificate application, regular performance evaluation of radioactive material transport containers and development of the tether system , as well as the engineering test and verification tasks related to earthquake, shock, fire and other accidents. CIRP has undertaken the research and development of more than 50 types of radioactive material transport containers, and the business covers the whole industrial chain of nuclear fuel cycle system and the field of nuclear technology application.



Computational Analysis for Radioactive Material Transport Container

Experimental Verification of Radioactive Material Transport Container

02 Radioactive Material Transport Safety Assessment Service

CIRP is able to conduct nuclear and radioactive material transport safety assessment, compilation of assessment reports, and planning of radioactive material transport safety system. CIRP is the first in China to carry out safety analysis and assessment of radioactive material transportation with assessment subjects covering highway, railway and seaway transportation domestically and internationally, involving the content types of UF_6 , pellets, new fuel assemblies, spent fuel assemblies, α wastes and decommissioned radioactive sources.

Highway transport assessment

Railway transport assessment

Seaway transport assessment

UF_6 transport safety assessment system

Emergency assessment system of radioactive material transportation accident

Analysis on nuclear and radiation safety of radioactive material transportation

NUCLEAR ENVIRONMENTAL SCIENCE

RADIATION ENVIRONMENTAL MONITORING AND PROFICIENCY TESTING

The radiation monitoring capability of CIRP has passed the national CMA certification, CNAS laboratory accreditation and DILAC accreditation, and the proficiency testing provider has been accredited by CNAS. The testing capabilities recognized of CIRP include 10 categories including water, soil and other solids (sediments, fallout, etc.), aerosols, ambient air, building materials and industrial waste, biological and organic matters, surface contamination, accumulative dose, and electromagnetic radiation, covering a total of 83 testing parameters such as γ nuclide, strontium-90, plutonium isotope, uranium isotope, tritium, carbon-14, polonium-210, iron-55, Eu-63, total alpha and total Beta, etc.

CIRP is mainly responsible for radiation environment monitoring, advanced analytical technology research, monitoring related equipment development and proficiency testing. Radiation monitoring can be carried out at all stages from the pre-commissioning environmental background survey of nuclear facilities, environmental protection acceptance of the project completion, commissioning and operation to decommissioning and treatment. Possessing the ultra-sensitive measurement facilities such as small multi-nuclide accelerator mass spectrometer (AMS) and multiple tandem inductively coupled plasma mass spectrometer (ICP-QQQ), CIRP can carry out ultra-low level (as low as 10^{-17}g) analysis on radionuclide in all ambient medium samples. CIRP has developed and manufactured a variety of equipment for sample collection, pre-processing, nuclide separation, purification and monitoring. Proficiency testing, measurement calibration and inter-laboratory comparison of radionuclide monitoring in water, soil, air, biological and other environmental samples can be provided.

High efficiency sampler

ICP-QQQ

Ultra-low background liquid scintillation counter & scintillation solution

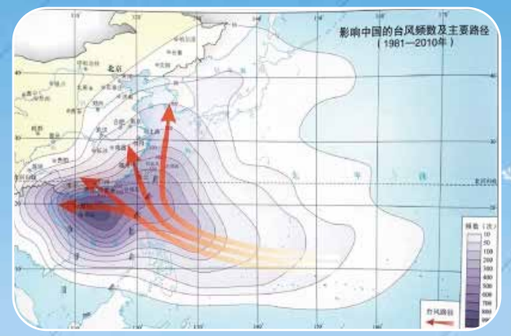
Accelerator mass spectrometry facility and supporting radiochemical laboratory

SIMULATION OF MIGRATION AND DIFFUSION OF RADIONUCLIDES IN ATMOSPHERIC ENVIRONMENT

Conduct on-site meteorological observation and assessment, field test of atmospheric diffusion, physical simulation of wind tunnel and water tank, and numerical simulation service based on high-performance computing environment, with complementary and complete research methods of atmospheric migration and diffusion.

01 Meteorological Observation and Assessment

Carry out routine meteorological observation and analysis in nuclear facilities area, including the construction, operation and maintenance of meteorological gradient tower, statistical analysis of observation data, meteorological condition assessment, like regular weather, extreme weather and engineering meteorological data survey, statistical analysis and design basis assessment.



Extreme meteorological analysis

Meteorological station construction

02 Atmospheric Diffusion Experiment

Solving the problem caused by the influence of complex terrain and buildings on the migration and diffusion of radioactive materials, so as to understand the mechanism and pattern of its migration and diffusion.

A Field tracer experiment

B Atmospheric boundary layer detection and turbulence observation

C Migration pattern, diffusion characteristics research and diffusion parameter calculation

03 Physical Simulation of Wind Tunnel and Water Tank

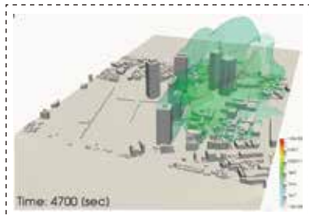
The No. 1 Atmospheric Boundary Layer Wind Tunnel of CIRP is the only facility in China to simulate atmospheric boundary layer flow, pollutant migration and diffusion under different temperature stratification conditions. The No. 2 wind tunnel is currently the one with the largest testing section in Asia characterized with dry and wet deposition simulation functions.

No. 2 Atmospheric Boundary Layer Wind Tunnel

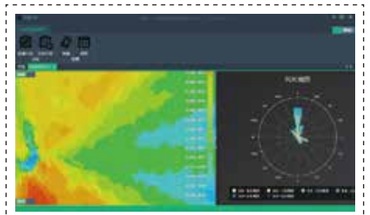
Towing water tank

04 Numerical Simulation of Pollutant Migration and Diffusion in the Environment

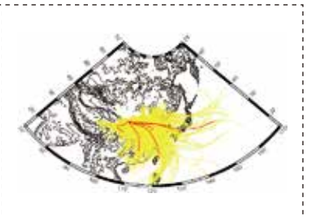
CIRP conducts assessment of wind fields and diffusion laws in complex environments, assessment of the probability of pollutants migrating to areas concerned via atmospheric pathways, identification of environmental risks, and assessment of risk consequences, with high-performance computing and R&D environment built with large-scale software system integration and R&D capabilities.



Simulation of 3d concentration field of radioactive material



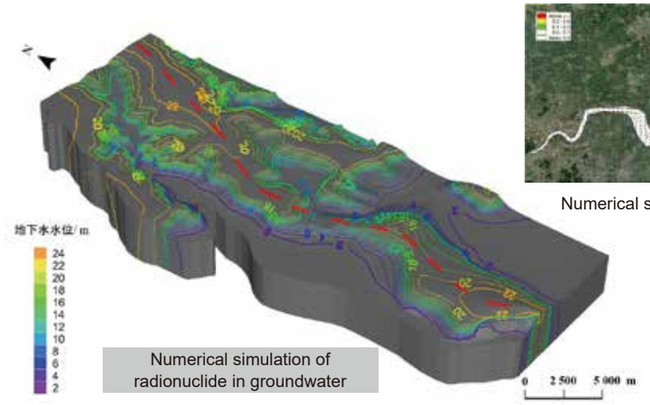
Numerical simulation of annual radiation impact assessment



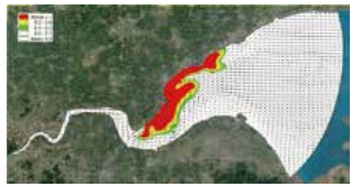
Cluster analysis of long-distance atmospheric migration pathways of radionuclides

SIMULATION OF DILUTION AND DIFFUSION OF LIQUID EFFLUENTS IN WATER ENVIRONMENT

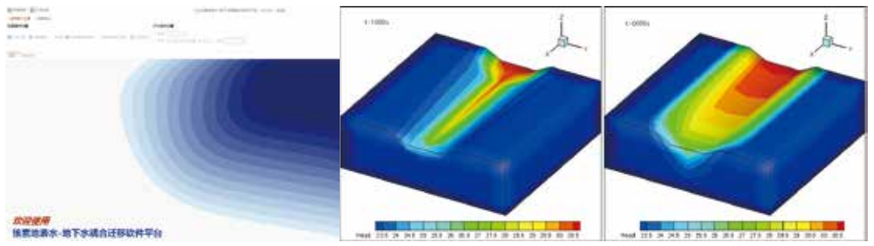
CIRP carries out simulation of migration and diffusion behavior of liquid effluent in water environment for various nuclear facility systems, by combining the field tracer experiments, indoor physical models and numerical simulations from the aspects of source term release mode, migration path description and distribution range prediction, aiming to conduct comprehensive research on the temporal and spatial distribution of various liquid effluents in water environment and its environmental impact. CIRP is capable of conducting studies on the adsorption, accumulation, migration and diffusion behavior of radionuclides in soil and groundwater environments, studies on the adsorption, accumulation, migration and diffusion behavior of radioactive wastewater in surface water (rivers, lakes and seas) environments, studies on the dilution and diffusion behaviors of warm drainage in surface water (rivers, lakes and seas) environment as well as field tracer experiment, indoor physical modeling and numerical simulation for coupled simulation project of radionuclide migration in surface water-ground water environment.



Numerical simulation of radionuclide in groundwater



Numerical simulation of radionuclide in surface water



Surface water-groundwater coupling migration simulation

Indoor physical model experiment of groundwater

Indoor physical model experiment of surface water

Field tracer experiment of groundwater

MIGRATION SIMULATION OF RADIONUCLIDES IN ECOLOGICAL ENVIRONMENT

CIRP carries out migration simulation of radionuclides in the ecological environment, mainly including the migration and biological transfer process of nuclides discharged from nuclear facilities in different ecological environments (land, freshwater and ocean) and parameter simulation studies, estimation methods of radiation dose rate of non-human species, R&D of bioremediation technology for radioactive contaminated sites, to provide technical support for the ecological environmental impact assessment of nuclear facilities and the environmental remediation of radioactively contaminated sites. By carrying out investigation and analysis on terrestrial ecological environment around nuclear facility sites as well as biological screening reference and recommendations, CIRP is able to provide support for the preparation of environmental impact assessment report of nuclear facilities .

Radioactive aquatic ecology laboratory

Radioactive aerosol deposition experiment

Climate chamber (simulated rainfall experiment)

Solar climate chamber (transfer parameter experiment)

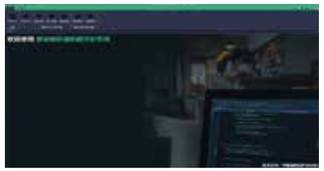
Climate chamber (simulated snowfall experiment)

RADIATION ENVIRONMENTAL IMPACT ASSESSMENT

CIRP is certified with Class-A qualification for environmental impact assessment of nuclear industry construction projects. Equipped with multiple sets of simulation software for migration of nuclides in the atmosphere, surface water and groundwater as well as personal dose assessment software, CIRP is competent in conducting various types of radiation environmental impact assessment of nuclear facilities and environmental protection acceptance upon project completion, source term investigation of polluted site and environmental risk assessment, whole-process systematic analysis of waste disposal facility safety (safety case), providing overall environmental protection management solutions for nuclear facility site selection, construction, operation, decommissioning, waste treatment and disposal.

01 Environmental Impact Assessment and Environmental Protection Acceptance upon Project Completion

CIRP is able to carry out environmental impact assessment work at different stages of nuclear facility site selection, construction, operation and decommissioning. Meanwhile CIRP can provide technical services for the environmental protection acceptance upon completion of nuclear facility project.



Nuclear Facility Environmental Impact Assessment System

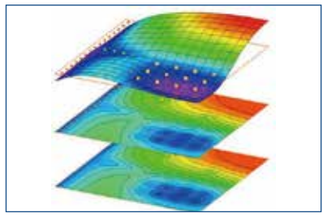
02 Environmental Radiation Monitoring System of Nuclear Facility

The nuclear facility environmental radiation monitoring system consists of nuclear facility environmental characteristic database, effluent monitoring and management module, radiation environment monitoring and management module, radiation environment assessment module and other modules, being capable of building a nuclear facility radiation environmental safety monitoring platform based on big data statistics, analysis and assessment.

Environmental Radiation Monitoring System

03 Source Term Investigation and Environmental Risk Assessment of Contaminated Sites

CIRP develops source term investigation plans for contaminated sites, carries out source term investigation, determines soil residue levels, maps out pollution distribution and calculates the amount of contaminated soil, conducts environmental risk assessment of contaminated sites and provides support for environmental remediation and restoration of contaminated site.



Visual display of deep soil pollution distribution in contaminated sites

04 Safety Case of Waste Disposal Facility

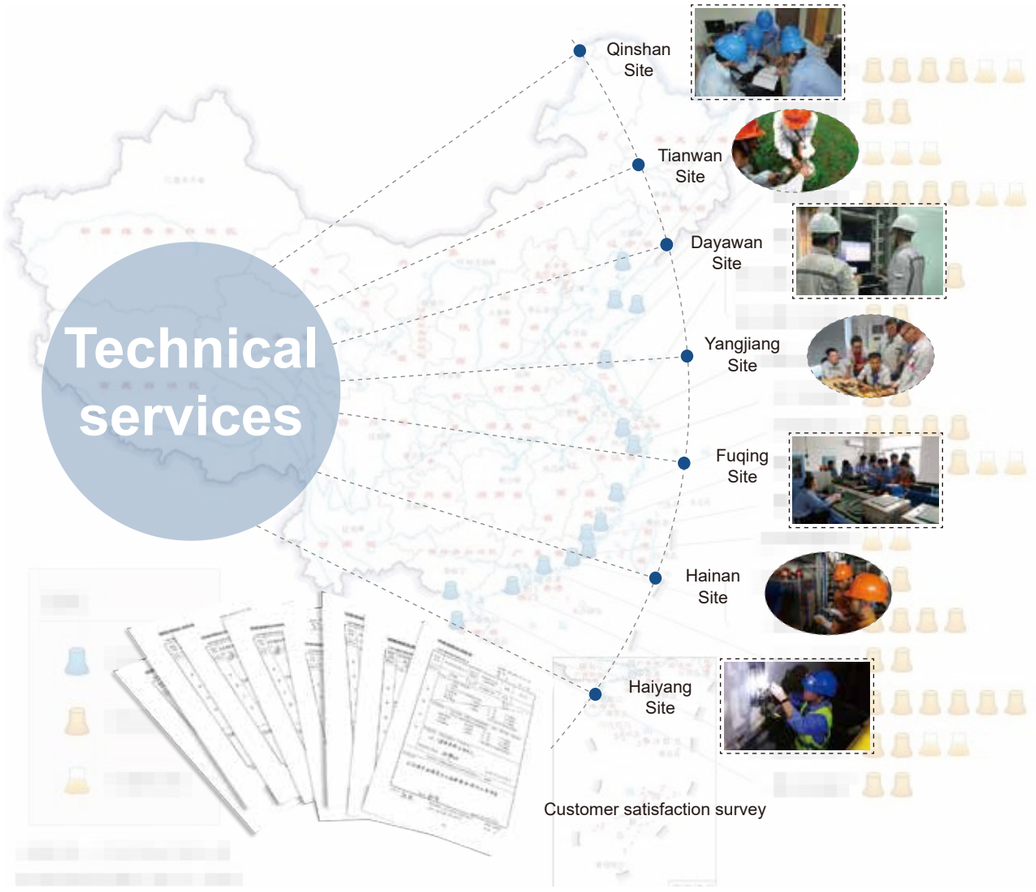
CIRP is capable of carrying out safety case of various types of radioactive waste disposal facilities, establishing the list of features, events and processes (FEPs) after disposal facilities closed, and far-field environmental impact assessment of reference biosphere.

Far-field environmental impact simulation of waste repository

NUCLEAR FACILITY OPERATION AND MAINTENANCE SERVICES

MAINTENANCE OF RADIATION MEASUREMENT SYSTEM OF NUCLEAR FACILITIES

Since undertaking the maintenance project of the radiation monitoring system for the phase II of Qinshan NPP Project in 2001, CIRP has always been focusing on the double harvest in credibility and economic benefits, building brand and continuously improving technical service levels and problem solving capacity. After two decades of strenuous efforts, our businesses have been gradually expanding and covering most of the nuclear power bases throughout the country. The business cover the KRT online radiation monitoring system, KZC access radiation monitoring system, KRS environmental radiation monitoring system, portable radiation measuring instrument, NPP peripheral environment monitoring instrument, and radioactive source management, among others. In recent years, CIRP has also undertaken increasing technological transformation projects and localization projects of radiation measuring systems.



RADIATION PROTECTION SERVICES OF NUCLEAR FACILITIES

Radiation Safety Supervision and Measurement in Routine and Overhaul Situations

CIRP is able to provide sanitary access management, radiation monitoring system operation and maintenance, radiation controlled area/supervision area regular inspection and measurement, management of radiation controlled area of radioactive material access, radioactive material in-plant transportation, radiographic inspection and safety supervision program preparation of high radiation risk operation, the radiation safety supervision for field inspection and repair, and the segmented validation in radiation control area.

Technical Support in Case of Radiation Emergency

CIRP is able to develop emergency radiation protection programme, conduct radiation measurement and operation dose estimation in high-radiation field with automation technologies such as robots and three-dimensional visualization of radiation fields, carry out source term calculations, offer off-site protection action recommendations, accident consequences assessment and atmospheric release simulation assessment.

ON-SITE MAINTENANCE OF NUCLEAR POWER PLANTS

CIRP is provided with the ability to perform overhaul/inspection and maintenance on SPV/CCI equipment (main pump, steam generator and main steam valve manifold, etc.)

CIRP is capable of performing preventive maintenance and corrective maintenance on conventional electromechanical instrument systems and equipment.

There are more than 300 professional technicians including fitters, low-voltage and high-voltage electricians, instrument calibrating personnel, welding and thermal cutting personnel, refrigeration and air-conditioning maintenance personnel, and lifting operators.

PERFORMANCE TESTING OF VENTILATION AND PURIFICATION SYSTEM OF NUCLEAR FACILITIES

As the only domestic institution that can conduct field tests of iodine adsorber and high efficiency particulate air (HEPA) filters using various methods, CIRP undertakes the commissioning test and regular test services for the HEPA filters and iodine adsorber of ventilation systems at all nuclear power plants and other nuclear facilities in China.

DOP cold aerosol generator

Methyl iodide generator

DOP hot aerosol generator

Glove box

Sodium fluorescein generator

Activated carbon performance test device under accident conditions

Pulsed cyclohexane gas generator

Halogen gas generator

Iodine source storage cabinet

Double-station glove box

Halogen gas detector

DOP detector

Efficiency test on HEPA filter at a nuclear facility

Field test of HEPA filter at Chashma Nuclear Power Plant

Field test of HEPA filter at Qinshan No. 2 Nuclear Power Plant

NUCLEAR CLEANING OF RADIATION CONTROLLED AREAS

CIRP is able to undertake the cleaning and maintenance of the radiation controlled area, radioactive contamination removal, site layout, shield setup, tools and instruments decontamination, and collection of radioactive wastes as well as collection and transportation of basic protective equipment in the controlled area, clothing laundry and cleaning.

NUCLEAR FUEL OPERATION RELATED SERVICES

01 Nuclear Fuel Operations

CIRP is capable of undertaking the refueling support project for the demonstration fast reactor, the nuclear fuel operation and equipment maintenance project of nuclear power plants, and nuclear fuel related auxiliary support services. Experienced in professional VVER reactor and sodium-cooled fast reactor nuclear fuel operations, CIRP is competent to tasks such as core shuffling, control rod placement. In addition, many team members have obtained FH2 level authorization for fuel operation and have garnered accolades from customers.

02 Dry Storage of Spent Fuel

CIRP has achieved the building of whole-process service capacity in dry storage process of spent fuel with experience in equipment reception, commissioning, assembly, drills, program optimization, skill training and technological upgrading. In 2019, the first domestic project of dry storage of spent fuel was completed. At present, the dry storage of spent fuel has been completed for 7 times which are highly recognized by the customers. Preparations are being made for dry storage of spent fuel in Tianwan Nuclear Power Plant, and the technical support of dry storage of spent fuel is being provided for the Qinshan Nuclear Power Plant. CIRP is the only one in China with technical capability of dry storage of spent fuel supported with actual operating performances.

RADIOACTIVE WASTE MANAGEMENT AND NUCLEAR FACILITY DECOMMISSIONING

CHARACTERIZATION OF RADIOACTIVE WASTE

Since 2006, the clearance and characterization technical services have been provided for more than 20 nuclear power plants at home and abroad, being in a leading position domestically and having established complete methods and procedures of sampling, measurement, classification, disintegration and sorting with special equipment.

01 Radioactive Materials Clearance Service

CIRP is capable of offering technical services for very low level radioactive materials clearance. The clearance process for different types of materials such as ventilation filters, metal scrap, APG resin and radiation protective products are established with special tools available for unique sample collection method and sample representative assessment method, providing technical services in related fields for many domestic nuclear power plants and uranium enrichment plants.

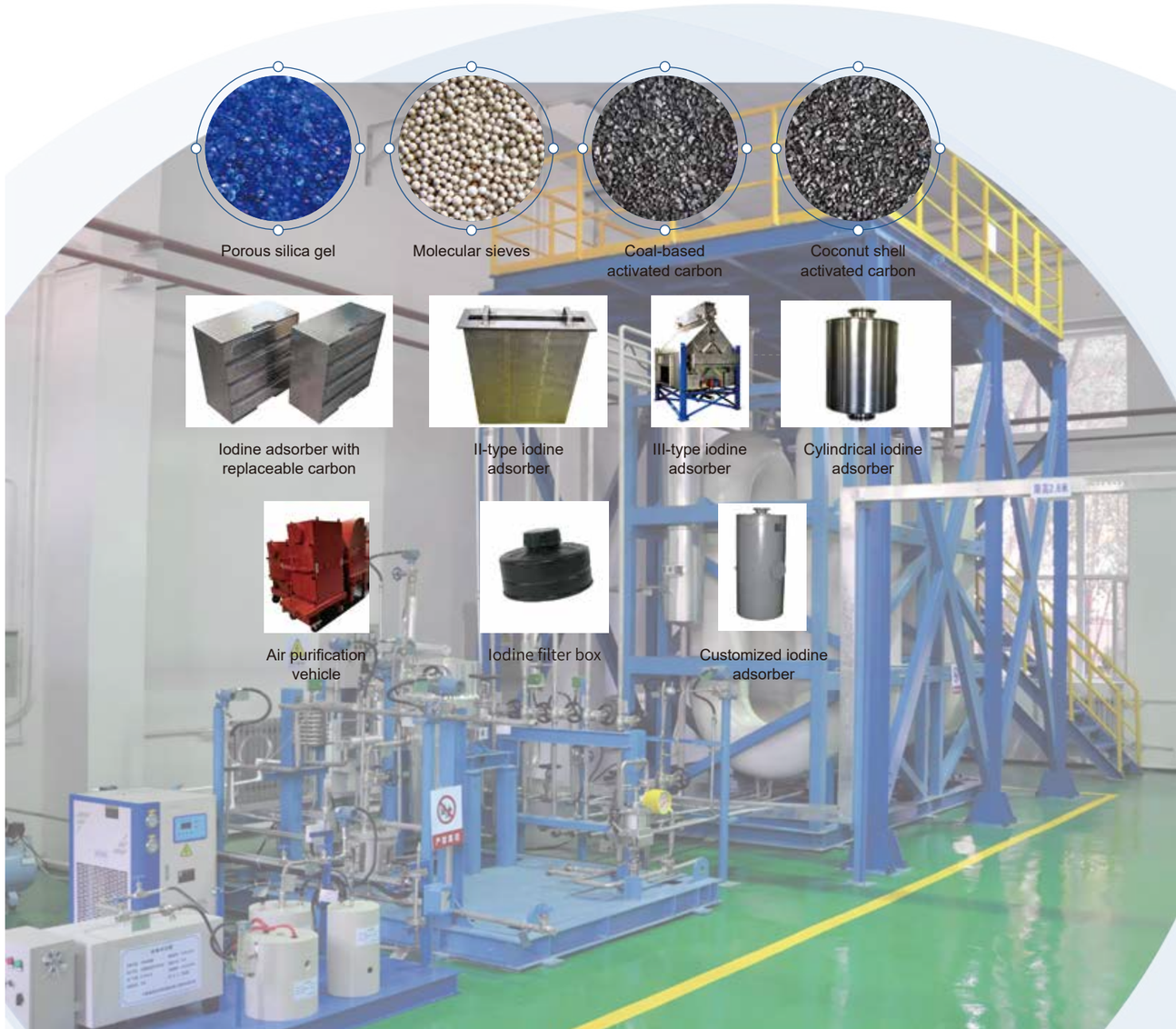
02 Performance Test of Cemented Waste Form

With the most comprehensive cemented waste form performance testing & assessment platform and capabilities within China, CIRP has developed a number of special equipment for sample preparation, pretreatment and performance testing. CIRP has undertaken more than 95% of the cement solidification performance testing and assessment assignments of domestic nuclear power TES system, as well as similar projects of NUKEM in Germany, AVERA in France and Karachi NPP in Pakistan.

RADIOACTIVE WASTE TREATMENT

01 Radioactive Gas Purification

CIRP provides product series of iodine adsorber (type I, II, and III, reusable folding iodine adsorber and impregnated activated carbon), HEPA filters, and inert gas delay bed system, the supply percentage of type I folding iodine adsorber and impregnated activated carbon achieved 100% domestically, and 100% of commissioning test and regular test for the performance assessment of the air purification system at nuclear facilities are undertaken by CIRP. Furthermore, CIRP is the only institution in China that can evaluate the performance of HEPA filters and iodine adsorber in nuclear ventilation systems with different methods.



02 Radioactive Waste Incineration

CIRP is able to provide full-process technical services such as incineration products research and development, design, equipment supply, on-site installation and commissioning, technical upgrading and transformation. The main product line covers radioactive waste pyrolysis incinerators, compact incinerators, mobile/vehicle incinerators, and related pretreatment and high-temperature exhaust gas purification devices, being capable of meeting the radioactive waste incineration treatment requirements in different fields and environments.

Pyrolysis Incineration Technology of Combustible Radioactive Waste

The third-generation incineration technology is endowed with the advantages of long equipment life, less secondary waste, no need of auxiliary fuel, complete combustion, and less flue gas. The equipment has been successfully introduced into engineering applications by many domestic plants. In 2017, the technology was successfully exported to Pakistan.

Compact Low-level Combustible Waste Incineration Technology

The compact low-level combustible waste incineration unit, owing to improved controlled air pyrolysis incineration technology, is advantageous in good waste adaptability, small area coverage, short construction period, low construction cost, intermittent operation and no waste water generation. It has been introduced into engineering application. Such technology is applicable to scientific research, military, medical and other institutions due to low waste generation, low radioactive level and less operator required.

Mobile Low-Level Combustible Waste Incinerator

The mobile low-level combustible waste incinerator can be transported with vehicle, requiring small area coverage, low cost in investment & operation and short construction period. It is designed for mobile incineration of wastes in multiples locations and can be used for on-site treatment of radioactive wastes generated due to nuclear accidents and nuclear emergencies.

Waste Pretreatment, Conditioning, Exhaust Purification and Cooling Technology

CIRP is able to provide patented equipment for radioactive waste pretreatment and conditioning, including glove boxes, ventilation hoods, conveying equipment, compression equipment and packing equipment for waste crushing, packing, compression, sorting, metering and weighing, so as to achieve efficient temporary storage, transportation and management of radioactive waste. In addition, CIRP can also supply patented equipment for tail gas treatment, including bag filters, combined filters, heat exchangers and quench tower applicable to high-temperature tail gas nuclide filtration, cooling, harmful gas chemical absorption/physical adsorption for the sake of on-spec emission of radioactive tail gas.

03 Radioactive Water Treatment

CIRP has formed a complete system covering design, R&D, production, testing and technical services of water filters and cartridges applied to NPPs, which is domestically leading and internationally advanced. Product types meet the needs of both pressurized water reactor and heavy water reactor, with filter fineness ranging from 0.1 to 100 μm.

The water filter and cartridge series independently developed by CIRP is the only product with on-site practical application in China. Since 2020, multiple batches of filter elements have been supplied to Ningde, Fuqing, Haiyang, Sanmen and other nuclear power plants, which not only reduced the operating costs of NPPs, but also achieved excellent on-site application results.

Water filter cartridges product series

4-inch water filter

8-inch water filter

Water filter for AP1000

Inorganic ion exchanger

The inorganic ion exchanger developed by CIRP is able to have the radioactively contaminated water treated by adsorbing radionuclides in the water with adsorbing capacity of 84 mg/g (Sr^{2+}), 160 mg/ g(Cs^{+})s 55 mg/g (Co^{2+}).

Inorganic ion exchanger

Multi-process combined treatment of radioactive wastewater technology

Multi-process combined treatment of radioactive wastewater is to process various types of radioactive wastewater by leveraging the techniques of complexation, adsorption and filtration. The device is compact in size and easy to operate, especially suitable for field treatment of a small amount of radioactive wastewater. The removal rate of radionuclides with multi-process combined treatment technology can be ≥ 90%, and the absorbing capacity of absorbent material to Co, Sr, Cs are ≥ 50 mg/g.

Mobile organic wastewater treatment vehicle

The mobile organic wastewater treatment vehicle is to directly open and cut the covalent bonds in organic molecules by taking advantage of the photon energy of low-pressure ultraviolet mercury lamp and utilizes the strong oxidizability of ozone to process the organics in wastewater. The treatment capacity can reach 1.0m^3/h, and the treated wastewater is in compliance with the discharge requirements by national standard.

Mobile organic wastewater treatment vehicle

04 Spent Radioactive Source Conditioning

The spent radioactive source conditioning technology refers to withdrawing spent radioactive sources temporarily stored at the user site from the original container, with spent radioactive source conditioning device, and encapsulating multiple spent radioactive sources in one or several packaging tubes, which are subject to containment in thin-walled stainless steel container, and this container is to be encased in long-term storage container to finalize the process of safe storage/ disposal.

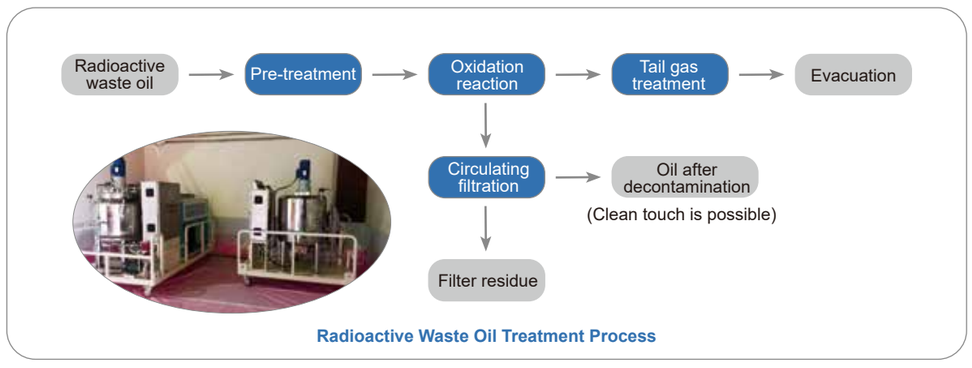
CIRP is competent in the design, construction and operation of waste radioactive source conditioning equipment and is able to undertake maintenance operations and technical training services.

Spent radioactive source conditioning

05 Radioactive Waste Oil Purification Treatment

The radioactive waste oil treatment technology is characterized with simple process, safe operation and reduced volume. The supporting treatment device is compact in size and movable, which can be directly applied to the treatment of radioactive waste oil produced by nuclear facilities. The total activity concentration of γ in waste oil is less than 0.1 Bq/g. With the designed capacity of 200 L/batch, the radioactive waste oil treatment device has been operating stably for more than 1,500 hours at the Daya Bay Nuclear Power Plant with accumulated of 5,000L waste oil being treated.

The combined treatment method of oxidation aging and circulating filtration used in waste oil treatment can also be used for the treatment of waste organic solvents (bolt cleaning detergent) and other waste organic phases.



Radioactive Waste Oil Treatment Process

06 Wet Oxidation of Spent Resin

CIRP can provide wet oxidation system of spent resin, which is suitable for treating various types of anion resins, cation resins and mixed resins. The overall area needed for the system is less than 40 square meters. After the waste liquid and residue are all solidified, the comprehensive reduction ratio of spent resin will be 1.5-3. The treatment capacity of each batch can be up to 10kg with decomposition rate of spent resin greater than 99%. It has undergone the hot test at Qinshan Nuclear Power Plant.

Featured Technology

- **A** Wet Oxidation Treatment Process R&D of Radioactive Spent Resin
- **B** Wet Oxidation Technology of Radioactive Organic Waste Liquid
- **C** Research and Test Platform for Key Technologies of Wet Oxidation Treatment of Radioactive Spent Resin
- **D** Development of Wet Oxidation Treatment Device for Spent Radioactive Resin

07 Special Radioactive Waste Treatment

CIRP possesses a multitude of special waste treatment technologies for treatment of waste organic solvents, waste molecular sieves, waste metals and waste TBP/OK, and has developed mobile and modular treatment equipment such as infrared heating barrel drying unit for concentrated liquid, conical stirring drying unit for spent resin, microwave barrel drying unit for wet solid waste and inorganic treatment equipment for difficult waste organic solvents, being able to provide technical services, complete sets of equipment and technical support. CIRP has undertaken multiple technical service tasks for special waste treatment at domestic nuclear facilities.

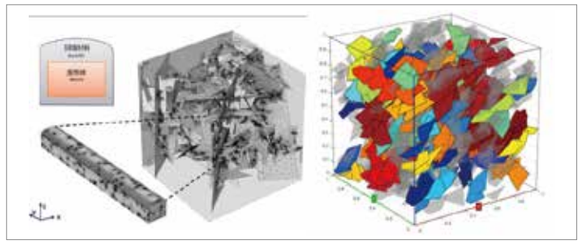
Microwave barrel drying unit for wet solid waste

Mobile grouting fixation system

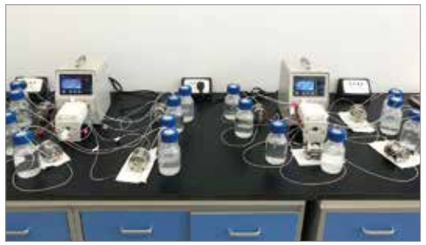
SAFETY ASSESSMENT OF RADIOACTIVE WASTE DISPOSAL

01 Research on Waste Disposal Safety Assessment Technology

As a member of the Key Laboratory of Assessment Technology for Geological Disposal of High-level Radioactive Waste of CNNC, CIRP is in a position to provide experimental research and numerical simulation research-based radioactive waste geological disposal site selection, low- and intermediate-level radioactive waste near-surface disposal safety assessment and radioactive waste geological disposal safety assessment services. The research output of Key Technologies for Safety Assessment of Beishan Pre-siting Area for Geological Disposal of High-Level Radioactive Wastes is rated as aligning to the international advanced level.



Numerical simulation of random fracture network model



Experimental test of nuclide diffusion performance

02 Evaluation of Irradiation Aging Properties of Materials

Gamma irradiation aging tests with different dose rates and accumulated doses can be carried out on polymer materials, metal, ceramic and composite materials, etc., and the gas composition, defects, microstructures, phase composition, thermodynamic properties and mechanical properties generated after the material being irradiated can be tested and evaluated.

X-ray fluorescence spectrometer

Raman Spectrometer

Aging test container

Mass spectrometer

DECOMMISSIONING OF NUCLEAR FACILITIES AND ENVIRONMENTAL REMEDIATION

CIRP is qualified for environmental assessment and safety analysis on nuclear facility decommissioning, with rich experiences in nuclear facilities decommissioning and integrated decommissioning technical capacities such as source term investigation, radioactive decontamination, disintegration, waste management and environmental remediation. CIRP has completed the decommissioning of the first domestic nuclear facility and the decommissioning of the only radium product plant in China, among others.

China's first fully decommissioned nuclear base

Decommissioning Scene

RADIOACTIVE DECONTAMINATION TECHNOLOGY AND PRODUCTS

Through technology introduction and independent R&D, CIRP has mastered radioactive decontamination technologies with gel, foam, electrochemistry, machinery, dry ice and ultrasound, being able to provide various decontamination technologies and related products for operation and decommissioning of nuclear facilities.

Chemical Decontaminant		
No.	**Type**	**Application**
01	Oxidized gel	For deep decontamination of heavily polluted stainless-steel chambers and hot chambers with radioactive contamination, and the secondary waste can be collected with vacuum cleaner.
02	Strippable decontamination gel	For the removal of radioactive contaminants on the surface of equipment, buildings, metals, glass, paint, cement, and plastics, with high decontamination efficiency and film-forming collectible.
03	High-elastic decontamination gel	For convenient decontamination of loose contaminants on surface, fast decontamination without forming liquid waste.
04	Cerium/nitric acid decontaminant	For highly contaminated pipeline internals or heavily contaminated disintegrated metal parts, with technology of deep decontamination for decontamination of stainless-steel materials.
05	Foam decontaminant	There are three formulas of acidic, alkaline and oxidizing properties, respectively for decontamination of rust, carbon steel/aluminum and stainless-steel tanks, high foaming ratio and stability with less waste liquid.

Decontamination Device		
01	Spraying machine for contamination suppression	For quick suppression of surface radioactive contamination from remote. The sprinkler head is carried by robot with good passability and quick suppression.
02	Blasting machine of dry ice	For quick decontamination of fixed surface contamination, applicable to quick removal of contaminated hotspots such as paint and rust on metal surfaces.
03	Vacuum cleaner	For rapid collection and filtration of various scattered radioactive contaminants with purification efficiency up to the nuclear-level standard.
04	Aerosol atomization fixing device	For rapid atomization capture and fixation of radioactive aerosols to achieve contamination suppression, capture efficiency ≥ 95%, fixation duration ≥ 14 days.
05	Mobile electrochemical decontamination device	For in-depth and quick decontamination of radioactively contaminated hotspots on metal surface, the decontamination corrosion rate can reach 0.5μm/h, and the decontamination factor can be up to 100.
06	Self-control mobile electrochemical decontamination device	For in-depth and quick decontamination of radioactively contaminated hotspots on metal surfaces, with decontamination corrosion rate up to 0.5μm/h, and decontamination factor up to 100. The entire process can be self-controlled and is equipped with a self-priming decontamination head.
07	Handheld mechanical stripping machine	For mechanical stripping of deep radioactive contamination on the ground and wall (can be used together with vacuum cleaner).
08	Trolley-type mechanical stripping machine	For rapid mechanical stripping of deep contamination of large-area ground (can be used together with vacuum cleaner).
09	Mobile foam decontamination device	For foam generation in large-volume tanks through internal soaking and decontamination process, it can be electric or pneumatic, and can be used with acidic, alkaline, oxidizing or foam decontaminants with customized foaming capacity.
10	Mobile demisting air purification device	Four-stage dust removal and purification through demister, vortex, bag filter and high-efficiency filter.

OTHER BUSINESS

ENVIRONMENTAL HEALTH PRODUCTS AND SERVICES

01 Fresh Air Ventilator

CIRP fresh air ventilator continuously filters outdoor air and sends it indoors, forming a weak positive pressure indoors, diluting various harmful gases and odors such as formaldehyde, benzene, ammonia and TVOC. It also sends 19%-21% of content of oxygen in the atmosphere into the room in real time to feature an ordinary room the function of "breathing".

02 Air Purifier Series

The air purifier is a brand-new ultra-high-performance air purifier manufactured in full compliance with the latest national standards. It can not only quickly purify indoor particulate matters, but also features the capacity of plasma sterilization.

03 Water Purifier Series

The IoT household water purifier is a water reverse osmosis and water purification integrated remote-control and intelligent dual outlet water purifier, to produce filtered direct drinking water with the license of approval related to drinking water hygiene.

04 Respiratory Protection System

The respiratory protection system is designed with electric air supply to effectively filter harmful substances such as bacteria, viruses and particles to ensure a smooth respiration without holding your breath. The CIRP nuclear-level respiratory emergency system in particular is the radioactive iodine protected system, developed dedicatedly for nuclear power plants, which can efficiently filter harmful gases such as methyl iodide and methyl bromide.

05 Hydrogen-rich Water Product Series

The hydrogen-rich water products series electrolyzes pure water into hydrogen and oxygen with the aid of imported SPE proton membrane and titanium clamp gold electrodes, to allow rich hydrogen to dissolve and to form hydrogen-rich water, which is side-effect free and is conducive to effectively improving the resistance to oxidation, eliminating free radicals and ameliorating sub-health condition.

06 Air Monitoring System

The real-time air environment monitoring system is an intelligent monitoring system for comprehensive air index. The product is independently developed by CIRP from software, platform and development. Thanks to the national CMA certification laboratory, the chemical monitoring data results are tested to be able to simultaneously monitor the five parameters of PM2.5, temperature, humidity, TVOC and carbon dioxide, basically reflecting the various indicators of air quality.

07 Embedded Air Purification Device

The embedded composite air purification device is a purification and disinfection integrated device installed at the air inlet of central air conditioner. The device owing to micro-electrostatic technology is effective in sterilization and purification, which is safe, reliable and pollution-free.

FOREIGN MATERIAL PREVENTION MANAGEMENT

A Establishment of foreign material Exclusion zone

B Supply and use of management tools

C Management specification for foreign material exclusion during maintenance

Foreign Material Prevention Supervision

- Routine inspection and supervision
- Quality control point supervision
- Supervision of important maintenance projects and area
- Work log of foreign material prevention
- Tracking and processing of problems found in inspection

NON-RADIOACTIVE ENVIRONMENTAL IMPACT ASSESSMENT

CIRP has been conducting research on environmental impact assessment since the early 1980s. It is one of the earliest institutes engaged in environmental impact assessment research in China and has achieved a large number of research results. It has the Class-A environmental assessment lab recognized by the former Ministry of Environmental Protection. Owing to a professional technical team composed of high-level and multi-disciplinary talents, CIRP is able to provide construction project environmental impact assessment, planning and development area environmental impact assessment, environmental impact assessment and environmental protection acceptance investigation of construction project, pollution discharge permitting, comprehensive environmental protection technical consulting services such as soil remediation and comprehensive treatment of contaminated sites, ultra-low emission assessment, carbon emission assessment and verification, and carbon emission peak plan preparation, having completed several large-scale environmental assessment projects. In recent years, CIRP has carried out numerical simulation research of ambient air, groundwater numerical simulation and pollution control research, contaminated site soil pollution control and remediation technology research, and undertaken the technical guide preparation for plume control in major industries of Shanxi Province.

The provision of professional equipment and technical personnel enables CIRP to provide environmental protection technical services. It has won some influences and good reputation in the industry and has been commended by the former Ministry of Environmental Protection and the provincial and municipal environmental protection departments for many times, and honored twice the National Top Ten Outstanding Environmental Assessment Institutions.

Completed the environmental assessment of a coal-fired power plant

Completed the first domestic environmental assessment of urban direct air-cooled gas-fired power plant

MANAGEMENT SERVICES

01 Safety & Quality Supervision and Management

Safety supervision and management service

CIRP is engaged in building the competency in high-end safety consulting service, high-end safety diagnostics and high-end safety supervision and management, and building core teams in industrial safety, radiation protection safety and nuclear emergency safety, and core competences in subdivided safety management for high-risk operations and electromechanical instrument are being built to create a service system of "comprehensive safety management" in the future.

Safety consulting service service

- A Safety management consultation
- B Dual prevention mechanism consultation
- C Safety law and regulation consultation
- D Safety training service

Safety diagnostic service

- A Safety inspection
- B Safety assessment
- C Formulation of safety management measures

Safety supervision service

- A Safety supervision and trusteeship
- B Use of safety management tools
- C Special customized service

Quality supervision and management service

Be responsible for daily/overhaul quality assurance inspection, supervision and support/cooperating work, be responsible for quality information collection, statistics, analysis, summary and reporting, etc., be responsible for daily/overhaul site inspections and tracking and handling of problems found, etc., be responsible for participating in qualified supplier assessment related data collection, statistics, analysis and summary, etc., be responsible for collection and sorting out of relevant documents and records of quality assurance, inspection and supervision.

02 Other Management Service

General services	To provide supportive services such as document management, warehousing management, training assistance management, foreign reception management, and audio & video management, etc.
Technical services	To provide technical services such as design management, procurement and warehousing management, contract management, plan and schedule management, industrial safety and quality assurance management, engineering construction management, and supervision on equipment manufacturing.

TRAINING AND EXCHANGE

TECHNICAL SUPPORT PLATFORM

International
- IAEA Nuclear Emergency Preparedness and Response Capacity Building Centre (CBC)
- Member of WHO BioDoseNet（Network of Biodosimetry Laboratories）
- Member of Secondary Standard Dosimetry Laboratories of IAEA and WHO (SSDL)
- Member of IAEA Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA)
- Member of IAEA Network of Laboratories for Nuclear Waste Characterization (LABONET)
- Member of IAEA Network of Environmental Management and Remediation (ENVIRONET)
- Member of IAEA Disused Sealed Radioactive Sources Network (DSRSNet)

National
- Technical Support Center for Nuclear Emergency Response
- On-Site Technical Support Team for Radiation Protection in Nuclear Emergency Rescue
- Center for Medicine Safety Assessment with National GLP Certification
- Technical Support Center for Radioactive Occupational Diseases Prevention and Treatment

Industrial
- Environmental Analysis and Test Center
- Radioactivity Measurement Center in North China
- Radiation Safety Training Base of Ministry of Ecology and Environment
- Radiation Safety Training Institution of State Administration of Work Safety

Nuclear Corporation
- Center for Personal Dose Management of Occupational Exposure
- Occupational Health Center
- Environmental Monitoring and Assessment Center
- Technical Support Center for Nuclear Accident Emergency
- Calibration Center for Radiation Protection Instruments
- Training Center for Radiation Protection and Nuclear Safety

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National
- National Demonstration Institution for Technology Transfer

Ministerial
- Key Laboratory for Environment Protection and Health of Ministry of Ecology and Environment

Provincial
- Key Laboratory for Pharmaceutical Toxicology and Radiation-induced Injury Pharmaceuticals

Nuclear Corporation
- Key Laboratory for Radiation Protection Technology
- Key Laboratory for Nuclear Environment Simulation and Assessment
- Key Laboratory for Radiotoxicology & Preclinical Assessment of Radiopharmaceuticals
- Key Laboratory for Deep Geological Disposal Technology of High-level Radioactive Waste (joint)
- Engineering Technology Research Center for Nuclear Facility Decommissioning and Radioactive Waste Treatment (joint)

CIRP

Protect the Health Safety and Environment