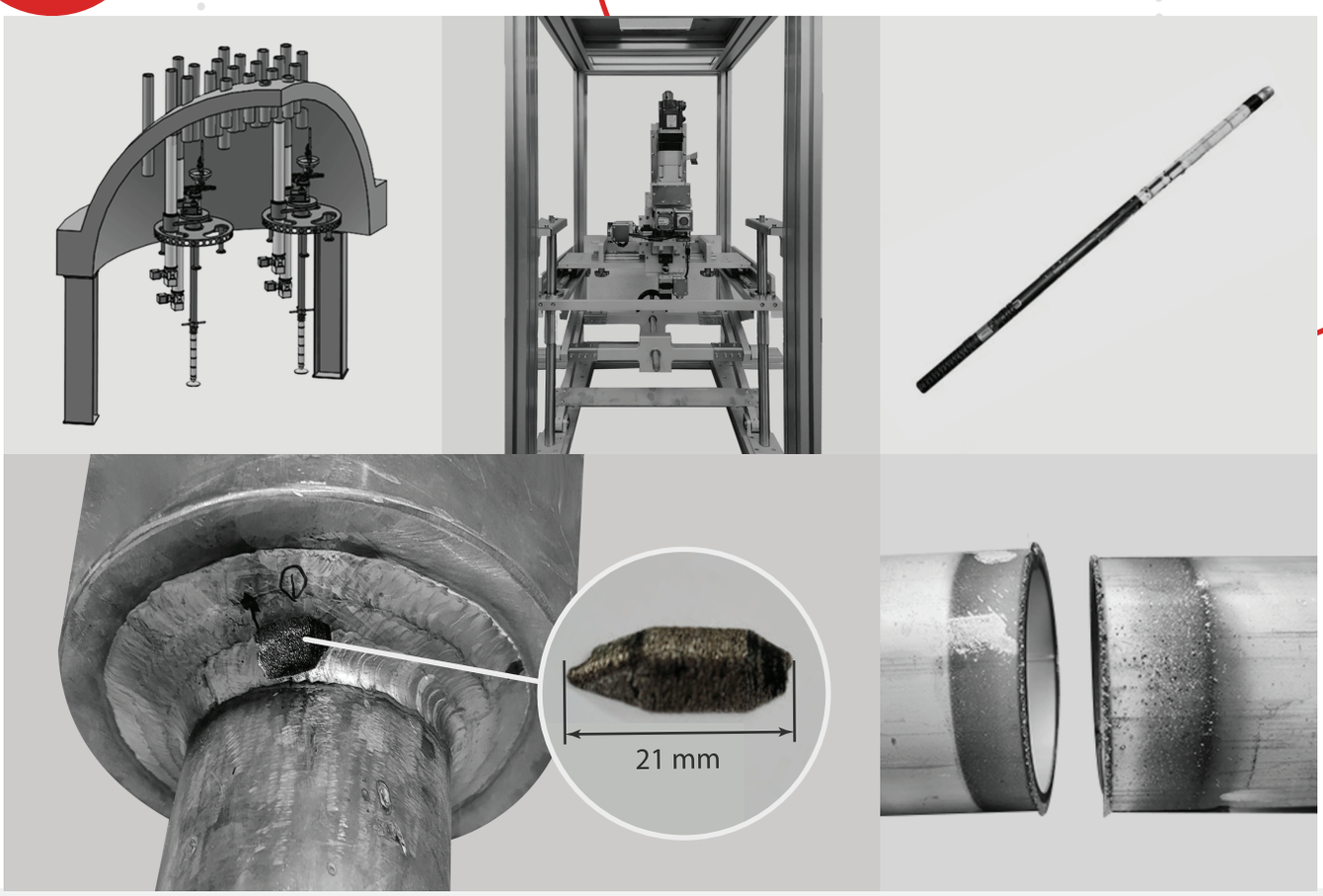
- SG Tube Cutting EDM In-Bore for Removing Foreign Objects.
- EDM Boat Sampling for the Internal/External Welding Part.
- SG tube Plugging robot
- In-Bore Laser Welding/Cutting Repair Robot

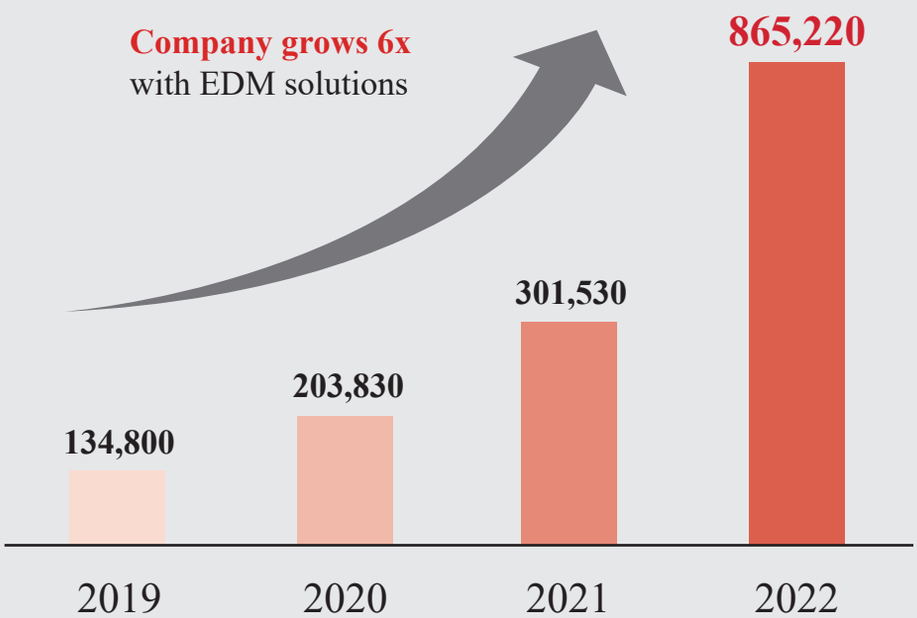
Korea
Nuclear power
Robotics

No.1 nuclear maintenance

EDM

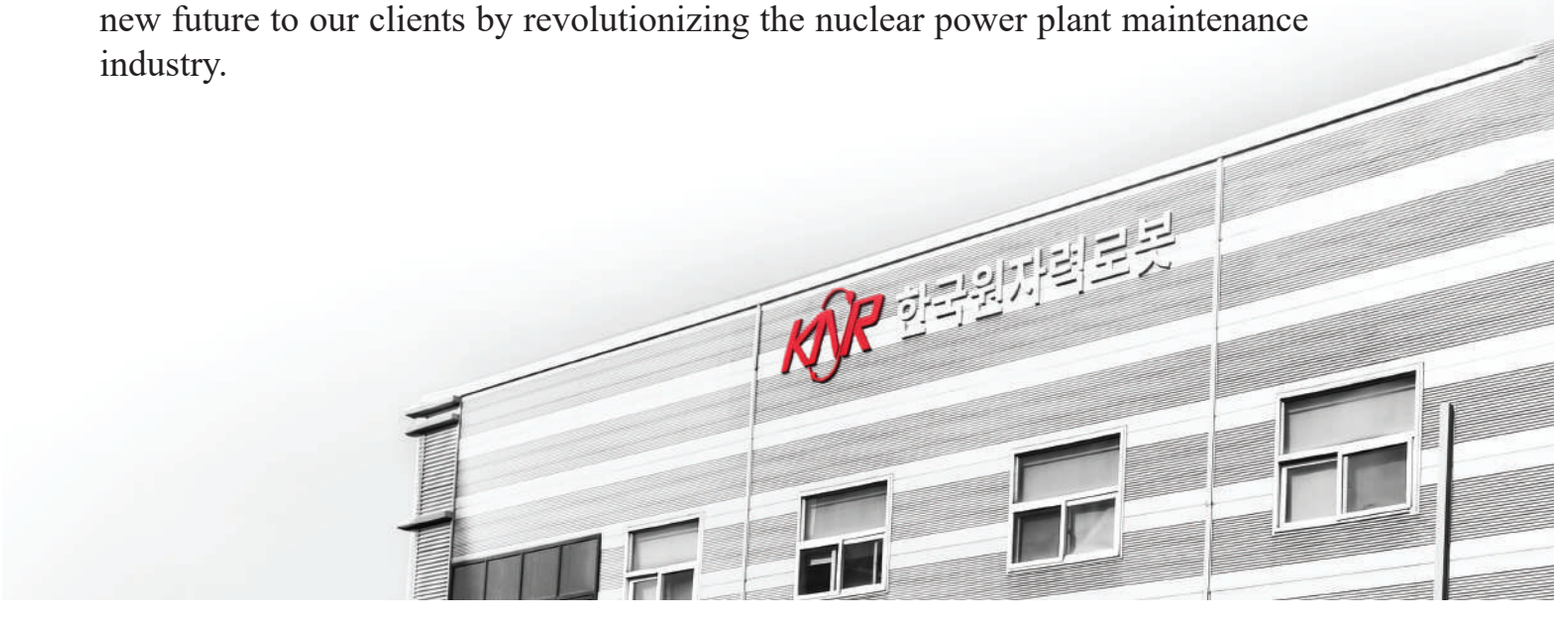


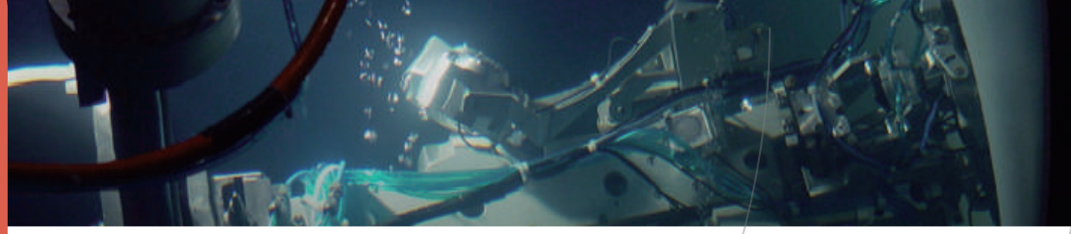
CONTENTS



REFERENCES Korea official corporate status information system, sminfo(thousand won)

The company successfully developed the world's first ultra-small in-bore heat exchanger tube processing EDM robot, which was applied in the field at Shin-Kori Unit 4, effectively removing foreign object and offering differentiated maintenance services. Through innovative solutions such as the internal and external sampling system for vulnerable welds in reactor nozzles, tube plugging robots, and in-bore laser welding and cutting robots, we maximize customer value and offer a new future to our clients by revolutionizing the nuclear power plant maintenance industry.

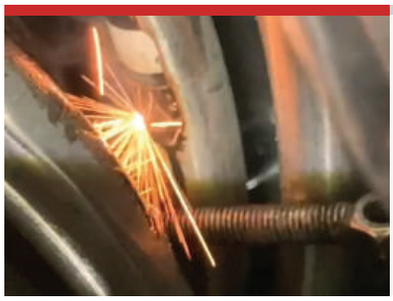




KNR Products

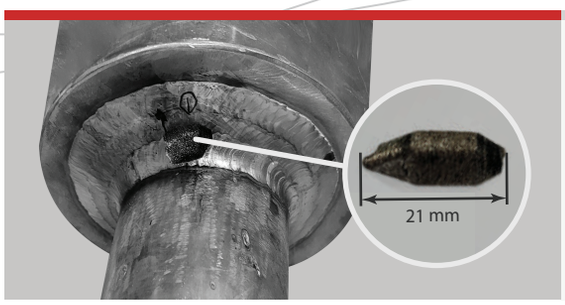
Innovative solutions
for nuclear power plant maintenance and beyond.

Product 1



SG Tube Window Cutting EDM In-bore robot used for removing foreign object

Product 2



Boat Sampling Tool for the Internal /External Dissimilar Welding Parts of the BMI Nozzle

Product 3

Tube plugging robot for Nuclear steam generator heat transfer tubes.

Product 4

In-bore laser welding/cutting robot insertable into Coolant pipe.

Solutions

Leading Maintenance, Securing the Future

Point 1

deployed in power plants

validated technology

Point 2

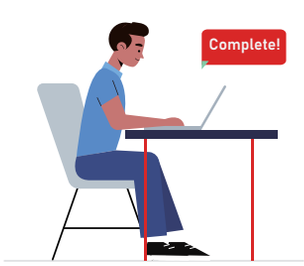
HW SW on-site construction all at once

reliable operations

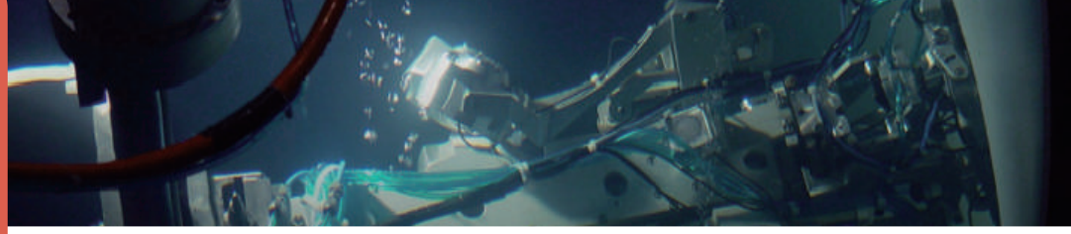
Point 3

Remote SW ensures the safety of workers

Beyond the reach of human hands



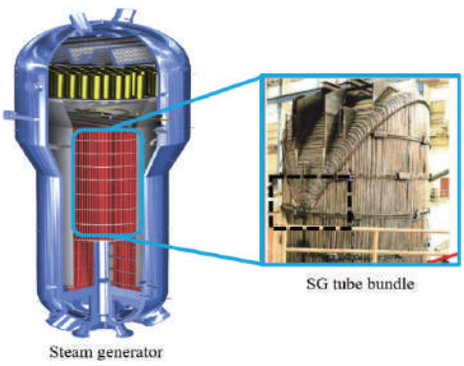
KNR

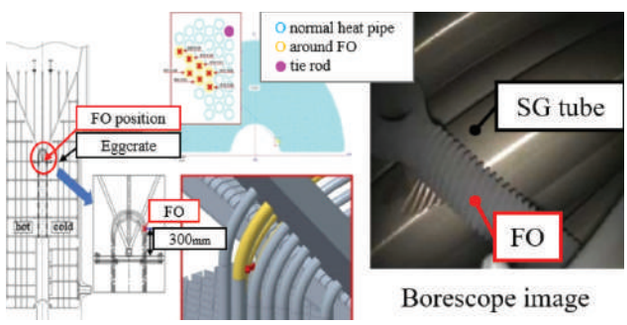


16Ø SG Tube Window Cutting EDM In-bore robot used for removing foreign object

Features a miniaturized EDM system

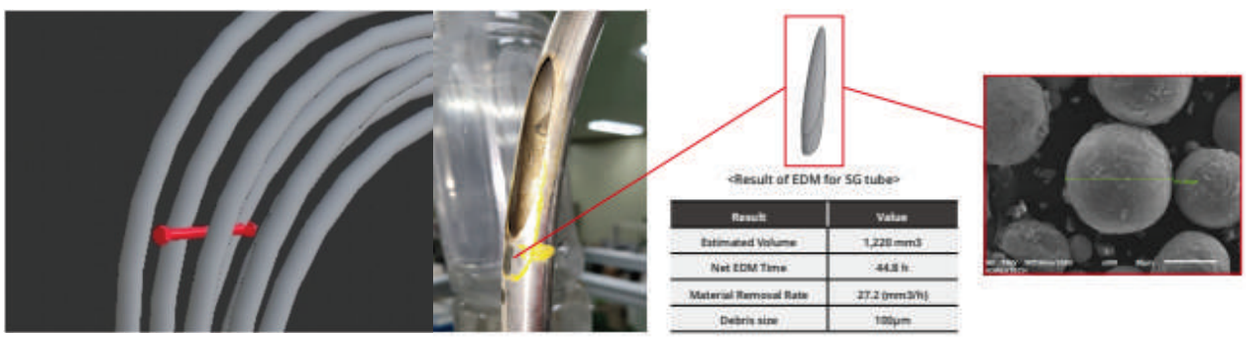
Steam generator maintenance is conducted periodically, and due to advancements in inspection technologies, there is a growing incidence of foreign objects being identified within the steam generator structure.





To address this issue, we propose **SG Tube Cutting EDM In-Bore Robot** as a foreign object removal system. This system is specifically designed for the safe removal of foreign materials located around the SG tubes within a nuclear power plant's steam generator. Targeting specific regions near the U-BEND, this system employs Electrical Discharge Machining (EDM) technology to remotely and automatically create an access window in the SG heat exchange tube, allowing for the removal of foreign objects. This process is accomplished without imposing additional mechanical stress on the SG tube, ensuring a stable passage for the safe removal of foreign objects from the secondary side. Furthermore, the in-bore EDM system allows for remote operation, minimizing radiation exposure for nuclear workers.

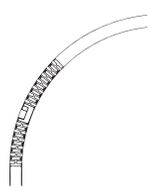
Equipped with ultra-miniaturized in-bore EDM technology and an optimally sized and shaped electrode, this tool can be inserted through the primary side tube sheet of the SG tube to accurately reach the target location. It ensures the removal of foreign objects without generating additional debris and safely exits into the steam generator’s primary side water chamber. Additionally, pipe blocking services can be provided in conjunction with this system.



This equipment, functioning as the distal end device where discharge machining is actually carried out, facilitates the occurrence of discharges between the electrode at the top of the device and the workpiece (inner wall of the thermal tube). As a result, it can create openings in the steam generator's thermal tube. Once the rotational angle adjustment is completed, the lower device's fixation component is activated, attaching an O-ring to the inner wall of the thermal tube, securely anchoring the device to the thermal tube's inner wall. During the supply of discharge machining fluid, the electrode undergoes reciprocating motion, generating discharge debris of 100μm or less. This process results in the formation of openings.

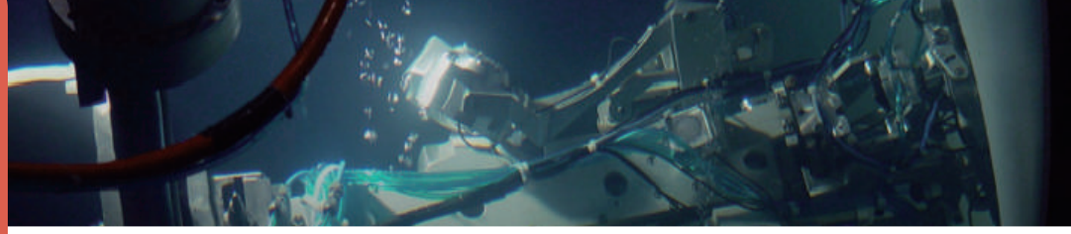
• Linear : The distal end device performs linear reciprocating motion in the direction of the thermal tube's conduit.
• Lateral : The distal end device performs diagonal reciprocating motion in the direction of the thermal tube's conduit
• Curved : The distal end device performs a diagonal reciprocating motion in the lateral direction of the thermal tube's conduit in a bending configuration. In the case of the bending configuration, it is possible to enter both the U-bend region and the fully curved section of the steam generator's thermal tube. The length of electrode disengagement from the thermal tube is structurally determined by the machining, which enhances the likelihood of preserving foreign materials. Additionally, even in the event of power loss, there is a possibility of manually retracting the device from the interior to the exterior of the thermal.

Specification



Linear End tool Dimension(ø*L)	16*(600-700)
Lateral End tool Dimension(ø*L)	16*(700-800)
Curved End tool Dimension(ø*L)	16*(700-750)
DOF(Electrode translation move & Rotation)	2DOF
Electrode movement Resolution	Max 50μm

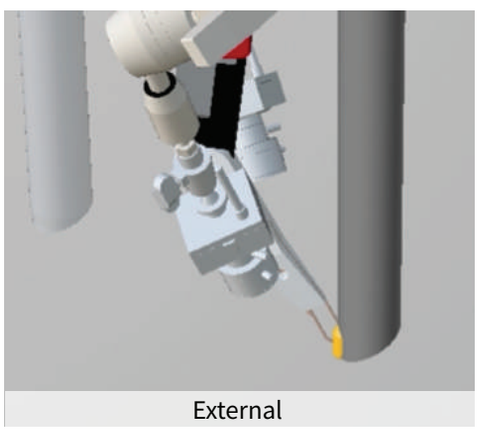
KNR

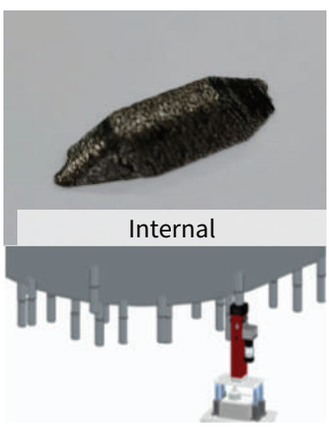


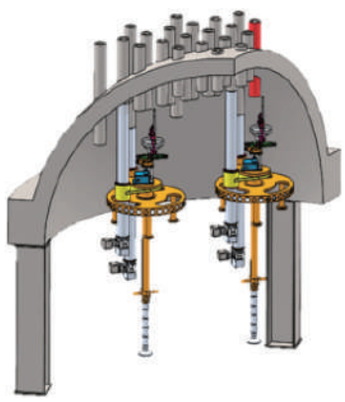
Boat Sampling Tool for the Internal/External Dissimilar Welding Parts of the BMI Nozzle

Operable even in underwater environments

Boat Sampling that Can Be Applied in a Short Period Without Damaging the Base Material


External

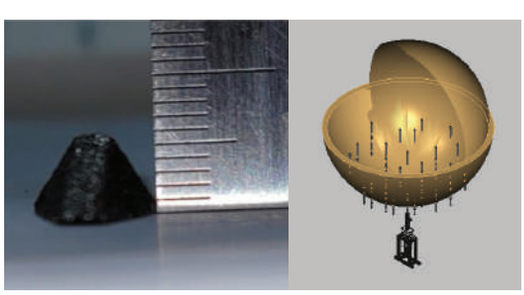

Internal



This technology involves collecting samples from welded joints as a precise means to identify the exact causes of defects in equipment located within nuclear power plants. It allows underwater operations without affecting neighboring equipment, and all nozzles, including those with angles less than 40 degrees, can be accommodated. Additionally, it has radiation resistance, making it suitable for work inside a nuclear power plant, ensuring durability for at least twice the exposure time of the entire process. This technology has been deployed in actual field applications.

In particular, it enables sample collection from vulnerable welds in both the upper and lower heads of the reactor, and it can collect weld samples not only from the exterior of the penetration nozzle but also from the interior. Equipped with a manipulator for sample collection, it allows remote sampling.

Specification

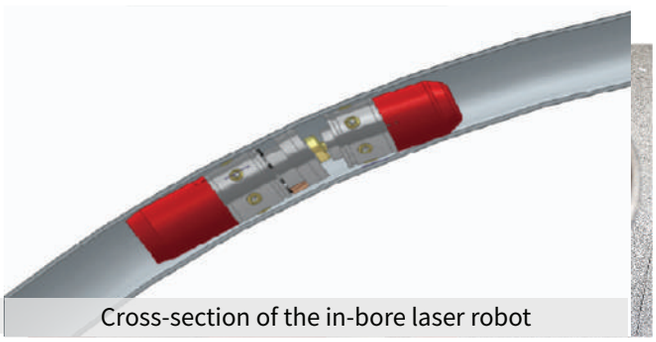


Electrode repeat precision	±0.1mm
Radiation resistance	double the durability
Radioactive water test	4400ppm pass
Degree of freedom	5-degree
UPS	Equipped

In-bore laser welding/cutting robot insertable into Coolant pipe.

Capable of remote cutting and welding

Coolant pipe



Cross-section of the in-bore laser robot

A remote maintenance robot using fiber lasers for welding and cutting defects inside nuclear power plant pipes

As nuclear power plants reach the end of their design life, the demand for effective maintenance technologies is increasing. Fast and reliable cutting and welding of hundreds of thick-walled steel pipes, which may have thinned or cracked over time, is essential. The remote-controlled in-bore laser cutting and welding tool is designed to perform repairs inside pipes with diameters as small as 80mm, without requiring the removal or reinstallation of insulation. This technology enables safe maintenance in high-radiation environments and confined spaces.

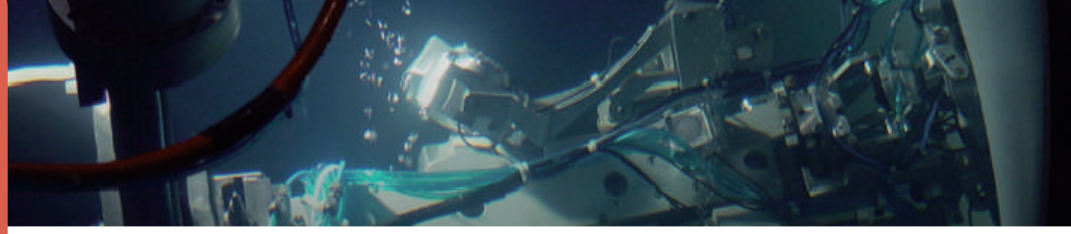
Equipped with a two-degree-of-freedom laser head, the tool precisely cuts curved pipe sections. Its remote operation ensures efficient and safe maintenance, reducing both costs and downtime by eliminating the need for insulation removal. Additionally, by minimizing secondary waste through laser cutting, it contributes to reducing nuclear waste. This technology also helps protect workers by limiting their radiation exposure during maintenance tasks.

Usage: Maintenance of secondary system pipes in nuclear power plants and cutting/welding of cooling pipes in fusion reactor breeding blankets

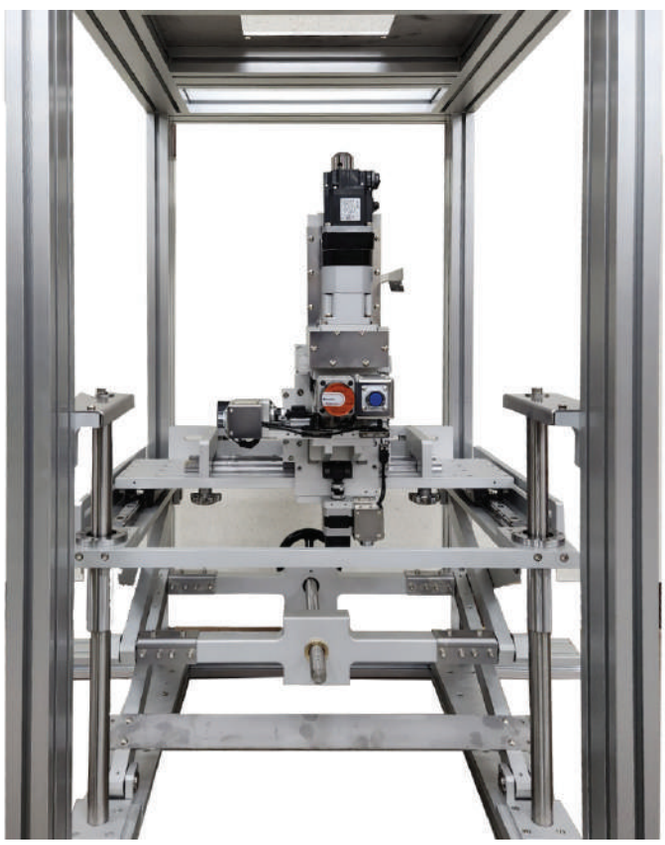
Features: Insertable into 80mm pipes, minimizes secondary waste generation through laser cutting

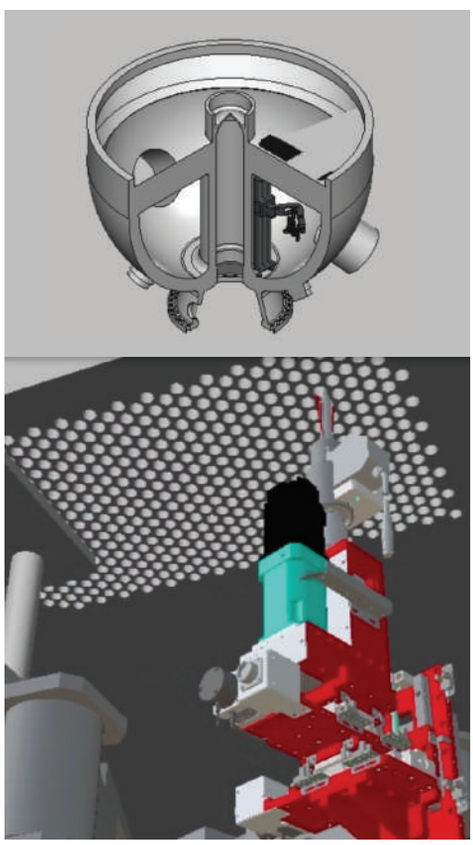
In-bore laser repair robot

KNR



Remote tube plugging robot for steam generator heat transfer tubes





Tube Plugging Robots for Enhanced Safety and Efficiency in Nuclear Power Plants A tube plugging robot is a specialized robot used inside the steam generator of a nuclear power plant. This robot performs the task of plugging the ends of heat transfer tubes to prevent damage or leaks that may occur in the tubes. This ensures the functionality of the heat transfer tubes and guarantees the efficiency and safety of the steam generator. The plugging operation is controlled remotely and is carried out precisely and effectively through the robot's accurate movements. This technology significantly reduces radiation exposure for workers and greatly enhances the safety of the operation.

Common Equipment

Specification

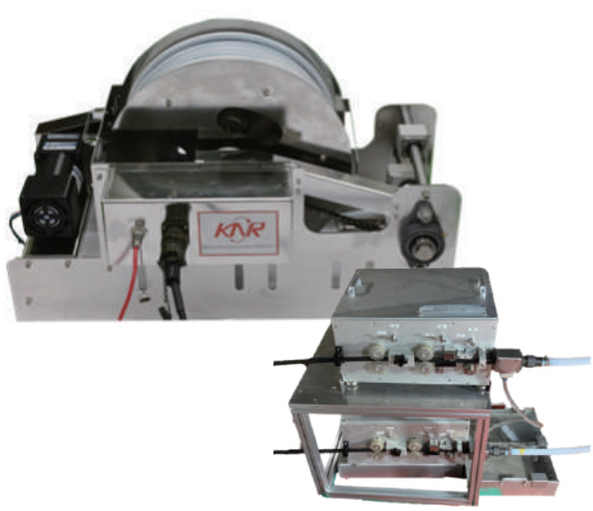
Motion C-BOX Dimension(W*L*H)	600*550*450
Power C-BOX Dimension(W*L*H)	600*550*580
Motion C-Box Control DOF	Max 6 DOF
Power C-Box Power	Max 4kW

Motion C-Box(Controller Box)

EDM motion control unit can control the position and orientation of various robots ranging from 1 to 6 axes, and it is customized to enhance the efficiency of discharge machining and optimize the versatility of robot movement range in line with customer requirements.

Power C-Box(Controller Box)

The output of the power control unit determines the maximum power capacity that can be exerted within the given environment, considering the discharge machining area and volume required by the customer.



Specification

EDM Puller Dimension(W*L*H)	600*850*600
EDM Pusher Dimension(W*L*H)	600*700*350
EDM Puller Wind Length	Max 25m
EDM Pusher Extrusion Force	Max 10kg

Puller

The EDM Puller can spool up cables connected to the EDM END tool up to a maximum length of 25 meters. It maintains real-time tension on the spooled cable to prevent detachment. Additionally, the borescope used for discharge machining position adjustment can also be wound up in a similar manner.

Pusher

The EDM Pusher plays a crucial role in transporting the EDM END tool to the target location. The EDM END tool, attached to the cable, is inserted into the interior of the thermal tube. It is then moved forward and backward by four interlocking rollers, achieving a minimum repeat precision of 1mm during the movement.

Business Partner

We move forward togerher in collaboration

DOOSAN

KHNP KOREA HYDRO & NUCLEAR POWER CO., LTD

KFE 한국핵융합에너지연구원 KOREA INSTITUTE OF FUSION ENERGY

KNDIA 한국원자력해체산업협회 Korea Nuclear Decommissioning Industry Association

KAIF

KEPCO NF

kps

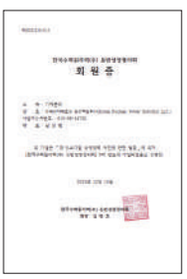
KAERI 한국원자력연구원 Korea Atomic Energy Research Institute

KNA

KNS 사단법인 한국원자력학회 KOREAN NUCLEAR SOCIETY

KSME 사단법인 대한기계학회

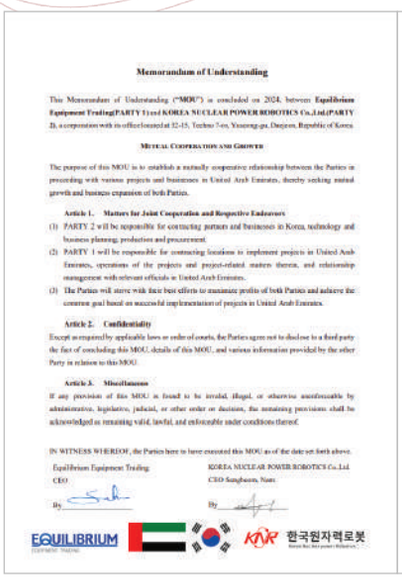
koita 한국산업기술진흥협회 Korea Industrial Technology Association



MOU

Forging Global Partnerships

We signed two significant MOUs during the WUC 2024 and CES 2025. At WUC 2024, we partnered with Equilibrium, a UAE-based nuclaer power plant equipment company, bringing us closer to providing advanced nuclear maintenance technologies to the Barakah Nuclear Power Plant, enhancing safety and efficiency in the region. At CES 2025, we entered into a partnership with Morphing I to collaborate on pipe maintenance technologies, further expanding our global presence and innovation.



Memorandum of Understanding

This Memorandum of Understanding ("MOU") is concluded on 2024, between **Equilibrium Equipment Trading(PARTY 1)** and **KOREA NUCLEAR POWER ROBOTICS Co.,Ltd.(PARTY 2)**, a corporation with its office located at 32-15, Techno 7-ro, Yuseong-gu, Daejeon, Republic of Korea.

MUTUAL COOPERATION AND GROWTH

The purpose of this MOU is to establish a mutually cooperative relationship between the Parties in proceeding with various projects and businesses in United Arab Emirates, thereby seeking mutual growth and business expansion of both Parties.

Article 1. Matters for Joint Cooperation and Respective Endeavors

(1) PARTY 2 will be responsible for contracting partners and businesses in Korea, technology and business planning, production and procurement.

(2) PARTY 1 will be responsible for contracting locations to implement projects in United Arab Emirates, operations of the projects and project-related matters therein, and relationship management with relevant officials in United Arab Emirates.

(3) The Parties will strive with their best efforts to maximize profits of both Parties and achieve the common goal based on successful implementation of projects in United Arab Emirates.

Article 2. Confidentiality

Except as required by applicable laws or order of courts, the Parties agree not to disclose to a third party the fact of concluding this MOU, details of this MOU, and various information provided by the other Party in relation to this MOU.

Article 3. Miscellaneous

If any provision of this MOU is found to be invalid, illegal, or otherwise unenforceable by administrative, legislative, judicial, or other order or decision, the remaining provisions shall be acknowledged as remaining valid, lawful, and enforceable under conditions thereof.

IN WITNESS WHEREOF, the Parties here to have executed this MOU as of the date set forth above.

Equilibrium Equipment Trading
CEO
By

KOREA NUCLEAR POWER ROBOTICS Co.,Ltd.
CEO Sunghoon, Nam
By

EQUILIBRIUM 한국원자력로봇

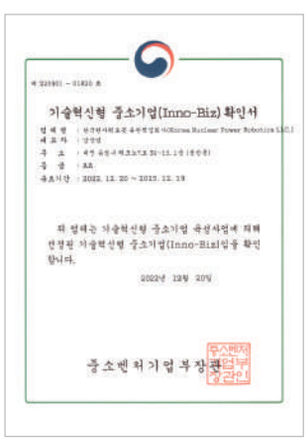
EQUILIBRIUM
EQUIPMENT TRADING

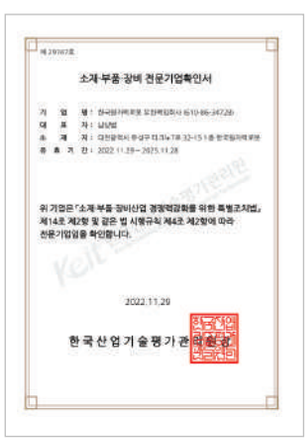
MORPHING I

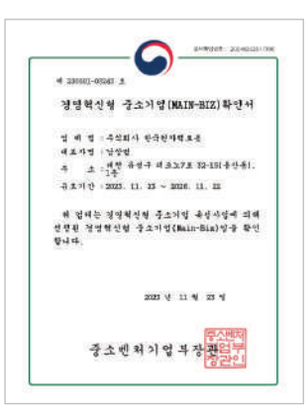
KNR

Certifications & Patents

Corporate Certifications and Accreditations







Patents


특허증
특허청장


특허증
특허청장


특허증
특허청장


특허등록원부
KHNP
KNR
Korea Nuclear power Robotics


상표등록증
특허청장


저작권 등록증
한국저작권위원회


저작권 등록증
한국저작권위원회


저작권 등록증
한국저작권위원회


벤처기업확인서
벤처기업확인기관장


저작권 등록증
한국저작권위원회


저작권 등록증
한국저작권위원회


저작권 등록증
한국저작권위원회

Technologies validated
through deployment in actual nuclear power plants

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