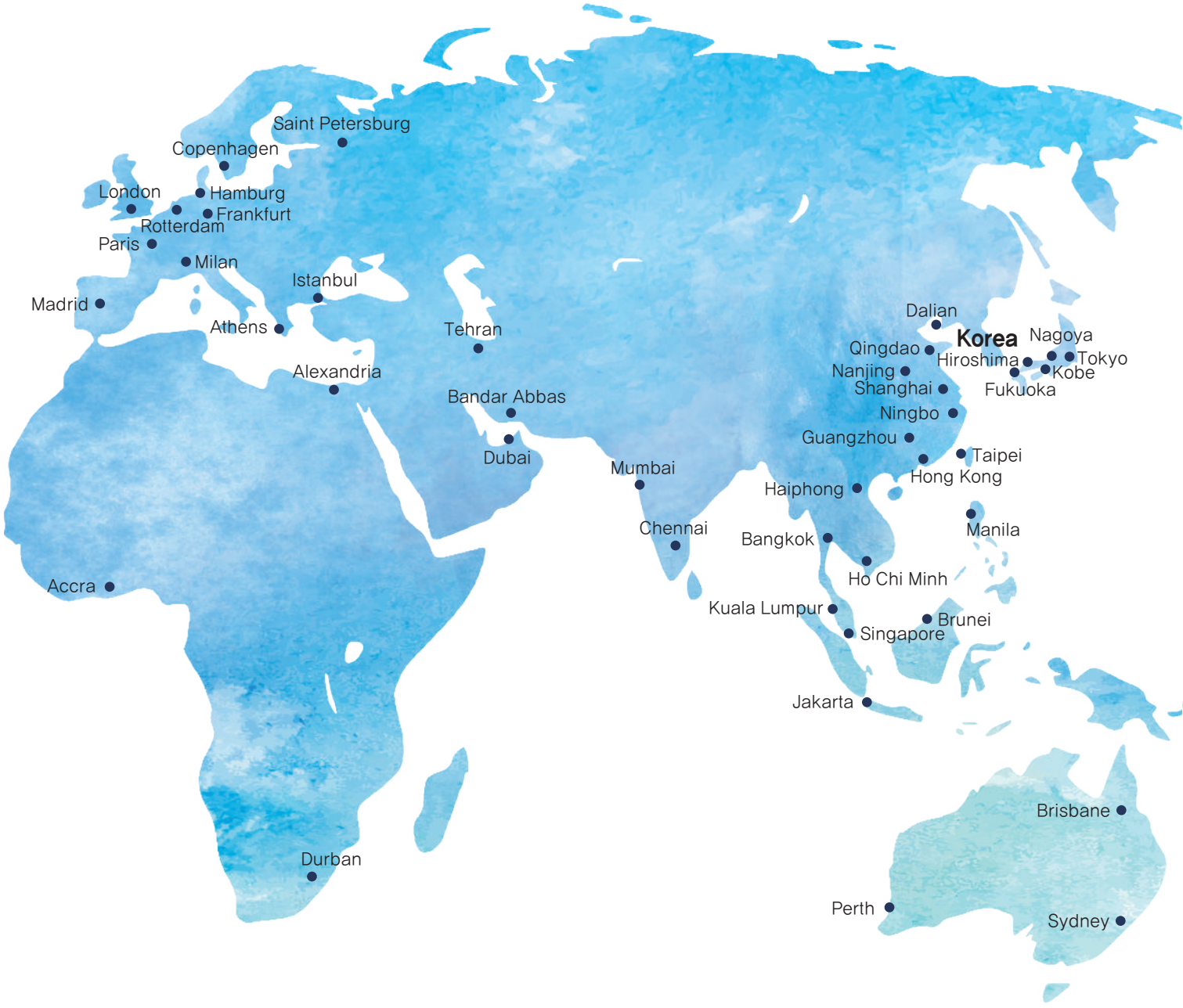
KOREAN REGISTER

BWMS
WIND ENERGY
EU MRV
AUTONOMOUS VESSEL
STATUTORY SURVEYS
DIGITALIZATION
CYBER SECURITY
ENERGETIC
STRATEGIC
INDUSTRY SERVICES
OFFSHORE
INTERNET
KR SEATRUST
SMART
DRONES
INDUSTRY 4.0
24/7
3D APPROVAL
KR-CON
DIGITAL
LNG
CE MARKING
ACADEMY
PRODUCT CERTIFICATION
APPROVAL
SYSTEM CERTIFICATION
FUTURE
BIG DATA
TECHNOLOGY
INFORMATION
TRUST
CLASSIFICATION
VIRTUAL REALITY
RELIABLE
QUALITY
INNOVATION
NAVAL SERVICES

KR KOREAN REGISTER

www.krs.co.kr

INTERNATIONAL NETWORK

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Ulsan
Gunsan
Jangsaengpo
Changwon
Busan
KR HQ
Gamcheon
Geoje
Mokpo
Yeosu·
Gwangyang
Tongyeong
REPUBLIC OF KOREA


KR
KR

KOREAN REGISTER

Established in 1960 as a not-for-profit ship classification society, Korean Register (KR) has been promoting safe ships and clean oceans by continually developing technology and human resources pertaining to shipping, shipbuilding and other industrial services.

KR became a member of the International Association of Classification Societies (IACS) in 1988, and in 1990, became listed in the Institute Classification Clause (ICC) of London Underwriters. The acquisition of these international standards of confidence is an indication of KR's solid underpinning and outstanding global recognition as a leading international ship classification society.


KR
KOREAN REGISTER
KR

KR SERVICES

KR is a world-leading, technical advisor to the maritime industry, safeguarding life, property and the environment through the pursuit of excellence in its rules and standards. Founded in 1960 and becoming a member of International Association of Classification Societies (IACS) in 1988, KR ensures its customers receive immediate and high quality service through a comprehensive network of more than 60 offices with its headquarters in Busan.

Survey

KR's class survey regime aims to help customers register their vessels and operate them in a safe and responsible way throughout their service life. Vessels under our service program benefit from all class surveys being undertaken by experienced KR surveyors stationed around the world.

Certification

We offer a range of certification services from our offices around the world. Our membership of IACS coupled with more than 50 years' industry experience allows our highly qualified and motivated teams of experts to deliver a tailored service.

Naval Services

We continue to provide verification of technical documentation for naval vessel design and contribute to the stability and combat performance of all types of warships and submarines.

Information & Technology
Research & Development / Academy

Dedicated KR professionals deliver a range of high quality technical services throughout the entire life-cycle of your vessel. Our experts are all highly qualified and experienced in working with world-class shipbuilders and shipping companies, putting us in a prime position to deliver expert practical advice to our customers.

Green Services

In keeping with our passion for the protection of the natural environment, we offer survey and certification services for renewable energies, including wind and ocean power. KR is continuously working on new and innovative green ship technologies to reduce emissions and fuel usage. These advances allow our customers to meet their environmental goals.

Industry 4.0

Industry 4.0 is driving a paradigm shift across the industry. To address these significant changes, KR established its ICT (Information Communication Technology) Center which integrates KR's resources, to enhance the application of advanced information and ICT across the maritime and ship classification industries.

MILESTONES

2018	Held IACS Chairmanship
2017	Authorized as verification body for EU MRV
2016	Ranked in no. 1 in the KOSHIPA (Korea Offshore & Shipbuilding Association) evaluation of classification technical services
2015	Opened the world's first Green-Ship Equipment Test and Certification Center
2015	Gained USCG authorization to perform BWM tests as an independent Laboratory
2014	Launched the world's first mobile application for IMO Conventions (additional version of KR-CON)
2013	Ranked as a top classification society of 2013 by KOSHIPA (Korea Offshore & Shipbuilding Association) for technical services based on major Korean yards' evaluation on IACS classification societies
2012	Moved headquarters to Busan, Korea
2011	Ranked as a top classification society of 2011 by KOSHIPA (Korea Offshore & Shipbuilding Association) for technical services based on major Korean yards' evaluation on IACS classification societies
2010	Reached 50th Anniversary
2009	Accredited as CE Mark (MED) Notified body
2008	Held the IACS Chairmanship
2006	Obtained recognition from six oil majors on KR-CAP
2005	Awarded Seatrade Award IT sector with KR-CON
2001	Launched KR-CON,the database of IMO instruments
1997	Established KR Engineering Co., Ltd.
1993	Moved Headquarters to Daedeok Innopolis in Daejeon
1990	Listed in the Institute Classification Clause (ICC) of London Underwriters
1988	Became a member of IACS (International Association of Classification Societies)
1975	Obtained authority to conduct statutory surveys from Republic of Korea
1960	Founded

Admission of KR as an IACS Member (1988.5)

KEY OPERATING DIVISIONS

World's first LNG fuelled bulk carrier classed under KR

KR FLEET

Ship Type	Number	Ratio	GT	Ratio
BULK CARRIER	478	15.8%	28,777,800	42.2%
TANKER	648	21.4%	15,474,039	22.7%
CONTAINER SHIP	243	8.0%	7,707,389	11.3%
RORO SHIP	192	6.3%	6,213,755	9.1%
LIQUEFIED GAS CARRIER	126	4.2%	4,404,519	6.5%
CARGO SHIP	350	11.6%	1,927,401	2.8%
BARGE	131	4.3%	621,034	0.9%
PASSENGER SHIP	101	3.3%	463,007	0.7%
FISHING VESSEL	196	6.5%	153,604	0.2%
TUG BOAT	433	14.3%	124,485	0.2%
OTHER	126	4.2%	2,377,688	3.5%
TOTAL	**3,024**	**100%**	**68,244,721**	**100.0%**

As of May 2018


HC
20'-60'
KR
KR

Survey

KR's class survey regime helps customers to register their vessels and operate them in a safe and responsible way throughout their service life. Vessels under our service program benefit from their class surveys being undertaken by experienced KR surveyors stationed around the world.

KR has also been awarded Recognized Organization status by a large number of major shipping nation governments. This allows us to conduct statutory surveys on their behalf and to certify compliance with international maritime codes and conventions.

CLASSIFICATION SURVEYS

Plan Approval

KR surveyors review and approve design plans of ships and offshore installations to verify compliance of hull structure, stability, machinery, electrical and automated systems, etc. to the requirements of KR Rules, international conventions and the national governments concerned.

EDAS : KR offers an Electronic Drawing Approval System (EDAS) to make plan approval process more convenient for clients. The system covers the entire online application, its review, the approval and any reply.

Classification Surveys during Construction

The construction, materials, scantlings and workmanship of a ship's hull, equipment and machinery are surveyed in detail in order to ensure that they are in compliance with the requirements of KR Rules. After the completion of the survey and approval by KR's Classification Committee, a ship is classed, entered into the KR registry and issued with a classification certificate.

Application → **Plan Approval** → **Survey** → **Issue of certificate**

Classification Surveys after Construction

To class your ship with KR, please contact our Survey Team in our Head Office or one of our local offices located closest to you. The process of classing your ship with KR will be conducted through the assessment and completion of our quality procedures.

Periodical Surveys for Registered Ships

KR surveyors carry out periodical surveys such as special, annual, intermediate and docking surveys in order to verify the robustness of its classed ships.

Materials and Equipment Approval and Surveys

KR surveyors conduct type approvals for all kinds of materials and equipment used on ships and offshore installations to verify their structural integrity and performance prior to installation onboard. KR surveyors also perform approvals on materials used onboard, in addition to quality assurance system approvals. These approvals are designed to ensure consistency in the quality of products manufactured and reliable performance in the marine environment.

- **Approval of Manufacturing Process**
- **Design Approval**
- **Approval of a Test Laboratory**
- **Type Approval**
- **Approval of Quality Assurance System**

TRANSFER OF CLASS

Step 1

Application

- Submission of application
- Review of application and status of ship
- Preliminary survey (if necessary)

Step 2

Review & Survey

- Submission of plans
- Review and approval of plans
- Commencement of TOC survey

Step 3

Classification

- Completion of TOC survey
- Issuance of relevant certificate

STATUTORY SURVEYS

Statutory surveys refer to surveys conducted to fulfill the requirements of the various IMO International Conventions and relevant national laws on behalf of national governments. KR, with the authorization given by more than 70 nations, is able to conduct statutory surveys for each nation's flagged vessels. Classification and statutory surveys can be performed simultaneously.

Governments delegating authority to KR for statutory surveys

Algeria
Antigua and Barbuda
Argentina
Australia
Azerbaijan
Bahamas
Bahrain
Barbados
Belize
Bolivia
Cambodia
Canada
Comoros Islands
Cook Islands
Cyprus
Denmark
Denmark (D.I.S)
Commonwealth of Dominica
Faroe Island
Equatorial Guinea
Fiji
France
Georgia
Germany
Ghana
Greece
Honduras
Hong Kong
India
Israel
Iran
Iraq
Jamaica
Jordan
Kenya
Kiribati
Latvia
Libya
Liberia
Lebanon
Liberia
Luxembourg
Malaysia
Maldives
Malta
Marshall Islands
Mauritius
Moldova
Mongolia
Myanmar
Niue
Oman
Pakistan
Palau
Panama
Papua New Guinea
Philippines
Portugal (Maderia)
Qatar
Republic of Korea
Romania
Saudi Arabia
Senegal
Serbia
Seychelles
Sierra Leone
Singapore
South Africa
Spain
Sri Lanka
St. Kitts & Nevis
St.Vincent & The Grenadines
Thailand
Togo
Turkey
Tuvalu
U.A.E
Vanuatu
Vietnam

Our Services

1. SOLAS Survey and Certification

KR provides survey and certification services in line with the SOLAS convention that regulates mandatory safety aspects for ships on international voyages such as construction, stability, machinery, electrical installations, fire safety, life-saving appliances, navigation, communications and the carriage of (dangerous) cargoes.

2. MARPOL Advice, Survey and Certification

KR provides full survey and certification services based on MARPOL 73/78, the international convention for the prevention of pollution at sea. MARPOL covers a wide range of regulations aimed at preventing and minimising pollution at sea from ships, KR can also advise on preventative measures and best practice procedures.

3. ICLL Survey and Certification

The International Convention on Load Lines (ICLL) defines unified requirements regarding the maximum allowed draught of the ship engaged in international voyages. KR provides statutory survey services based on this convention.

4. Safety Management System Certification by ISM Code

The International Safety Management Code (ISM Code) requires the company and their vessels to establish and implement a safety management system ashore and onboard for the safe operation of ships and for pollution prevention. KR has been authorized by many governments and has been providing ISM audit service on their behalf.

5. International Ship Security Certification by ISPS Code

KR has set up the infrastructure necessary for the provision of the international ships and Port Facility security Code (ISPS Code) certification services and has been authorized by many governments to conduct this work on their behalf. KR's ISPS Code certification services include the approval of Ship Security Plans (SSP) and issuance of International Ship Security Certificates (ISSC). This also includes running training courses for the Company Security Officer (CSO).

> Inspection of Port Facilities

KR has been authorized by the Korean government to conduct inspections of port facilities (except for public ports that are run directly by the Government). KR, as a government recognized training institution for port security, is running a series of courses for port facility security officers (PFSO).

6. Certification for Maritime Labour Convention

The Maritime Labour Convention 2006 (MLC 2006) is the consolidated international labour convention that was adopted by the International Labour Organization (ILO) and became effective on 20 August 2013. This relates to the development of and implementation of standards for seafarers' labour conditions and accommodation. KR provides various certification services including GAP analysis, Declaration of Maritime Labour Compliance Approval, conducting inspections for certifying MLC and issuance of MLC certifications.

PORT STATE CONTROL

Since the 1970s, port state authorities have undertaken port state control (PSC) activities under the guidance of a regional Memorandum of Understanding (MOU). These MOUs and other bodies such as the EU have initiated special control measures based on PSC detention rates. These include special inspections and denial of port entry which have the potential to result in expensive repairs and loss of business.

Recognizing the importance of PSC, KR works with ship owners, operators and managers as well as with various national governments to improve the PSC records of their ships. Significant achievements have been realized and as a result, KR-classed ships are recognized as high quality vessels throughout the world.

KR has been endeavoring to ensure the safe operation of its classed ships by setting “Zero PSC Detention” as one of its primary objectives. To this end, KR has been undertaking stringent surveys and technical assessments for older ships and withdrawing ‘sub-standard’ ships from its class registry. Furthermore, since 2002 KR has expanded its pre-inspection services to prepare ships for PSC inspections in Europe and US.

KR also has been maintaining an open dialogue with Flag States to give information on the latest trends and changes within IMO, various MOUs and Port States to shipowners. The society also holds a variety of seminars and training courses detailing preventive measures against PSC detentions.

EXCEPTIONAL PSC RECORD

2015-2017		Tokyo Mou	Paris MOU	USCG
Detention Ratio	KR	0.03%	0.08%	0%
	IACS	0.07%	0.21%	0.01%

*Source: MOU’s official annual report

TECHNICAL SERVICE FOR BWMS

The installation of a BWMS involves a CAPEX ranging from USD 500,000 to USD 3 million depending on the ship size, and so choosing the optimum type of BWMS to comply with ballast water regulations has become a critical decision for ship owners. Added to this, the process of analyzing the pros and cons of many approved systems on the market, makes it a very tough task for owners.

To assist the industry in choosing the right BWMS for their fleet, KR has been preparing for the implementation of the BWMC since 2004, by conducting type approval testing of BWMS and assembling a team of specialists comprising experienced surveyors as well as experts in the field of biology and chemistry.

KR's systematic quality control system and testing capabilities are well recognized and KR was designated as an USCG independent laboratory for BWMS in 2015. KR has performed type approval testing continuously for many years, and several systems have now been type approved by the USCG through KR's testing service.

KR BWMS Land-based testing Facilities

[KOMERI] Location: Geoje-si, Gyeongsangnam-do, Republic of Korea

Facility		
Items	Capacity	Number
Tanks	2,000m³	1
	576m³	3
	326m³	6
Pump	1,500m³/h	1

Installation information	
Piping standard	200A (DN200)
Power supply	440/380/220 VAC 60 Hz

[DHI DENMARK] Location: Hørsholm, Denmark

Facility		
Items	Capacity	Number
Tanks	700m³	1
	250m³	6
Pump	600m³/h	1

Installation information	
Piping standard	300A (DN300)
Power supply	400/230 VAC 50 Hz

Certification

KR provides clients with a range of certification services, covering many sectors such as ships, airplanes, chemistry, electricity, electronics, and materials, providing an important valued service as a specialist technology and certification body.

KR is accredited as a certification body of ISO 9001, ISO 14001, OHSAS 18001 and ISO 50001 by the Korea Accreditation Board. KR is also accredited as the sole certification body of ISO 28000 and ISO 28007 by the Korean Agency for Technology and Standards of the Korean Government.

To meet the needs of its clients, KR provides highly quality and specialized one-stop certification services to improve the competitiveness and productivity of its client's companies.

SYSTEM CERTIFICATION

ISO 9001 / ISO 14001 / ISO 18001 Certification

KR is authorized by KAB (Korea Accreditation Board) to provide ISO 9001, 14001 and OHSAS 18001 certification services.

The wide scope of certification that KR engages in, combined with its highly competent experts make KR a one-stop Certification Service in many fields of industry.

KR provides certification services for:

- chemicals, chemical products and fibres- rubber and plastic products
- basic metals and fabricated metal products
- machinery and equipment
- shipbuilding
- other transport equipment
- transport, storage and communication
- other services
- electrical and optical equipment
- aerospace
- construction
- engineering services
- public services

ISO 28000 Certification

ISO 28000 specifies the requirements for establishing, implementing, maintaining and improving the security management system, including those aspects critical to security assurance of the supply chain.

Security management is linked to many other aspects of business management including activities controlled by or influenced by organizations that impact on supply chain security.

These core aspects should be considered directly where and when they impact on security management, including financing, manufacturing, information control, packaging, storage and transporting goods along the supply chain.

ISO/PAS 28007 Certification

ISO/PAS 28007 is the international standard that specifies the guidelines for private maritime security companies providing privately contracted armed security personnel (PCASP) onboard ship. ISO/PAS 28007 certification with KR can enhance your credibility by demonstrating that you provide appropriate PCASP and also gives you confidence that you have addressed all external and internal issues relating to your PCASP.

ISO 50001 Certification

Certifying your energy management system to the ISO 50001 standard may benefit your organization in many ways.

Certification to ISO 50001 can contribute to;

- improvement of energy performance including efficient energy use and energy consumption
- reducing environmental impact including greenhouse gas emissions without affecting operations and simultaneously increasing profitability.

PRODUCT CERTIFICATION

KR Hellas Ltd. - CE MARKING Certification

The CE Marking is an compulsory certification required when manufacturer/trader who intends to export its products to Europe. KR Hellas Ltd., subsidiary of KR, has been accredited as a CE Marking certification provider since 2009. KR Hellas Ltd. can provide certification under 11 EU notified EC Directives.

> Scope of CE Certification Services provided by KR Hellas Ltd.

Directives	Product and application
MED	Marine equipment
LVD	Low voltage electrical & electronic product
EMCD	Electromagnetic compatibility for electrical & electronic appliances
PED	Pressure equipment
ATEX	Equipment used in potentially explosive atmospheres
CPR	Structural metallic and ancillaries for construction
PPE	Personal protective equipment, interchangeable components
RCD	Recreational craft
MD	Machinery equipment
SPVD	Simple pressure vessels
TPED	Transportable pressure equipment

Certification according to specific Regulation/Requirement

Before a manufacturer exports products to a specific country, the products must be assessed according to the safety requirement set forth in its national law and regulation.

KR has achieved several certification schemes in the following areas, from the relevant authorities and conducts certification services for design review and performance inspection, etc.;

Nation	Inspection Scheme	Product	Remarks
Korea	KOLAS	High pressure gas cylinder	
India	IBR	Boiler, Pressure vessel	
China	CNCA	Machinery, Electric equipment, etc.	8 divisions
Japan	MHLW 厚生労働省	Boiler, Pressure vessel	
Singapore	BC1	Structural steel	
U.S.A.	DOT	Transportable vessel	
EU	CE	Machinery, Electric equipment, Boiler, Pressure vessel, Steel product, etc.	Conforming with 11 EU Directives

Third Party Inspection

KR verifies and evaluates design, product, service, process and plant to determine whether they meet specific requirements of technical regulations, standards and customer specifications on behalf of private and public companies. As an independent and impartial third-party inspection body, KR provides the following inspection services.

- Inspection for mechanical property and chemical composition of raw material from Mill
- Performance inspection for mechanical, electrical, electronic, logic control and instrument equipment
- Inspection on behalf of purchaser (end user)
- Third-party inspection body on behalf of KOGAS (Korea Gas Corporation)
- Authorized product certification body recognized by KAS (Korea Accreditation System)
- VOC gas inspection body on behalf of KNOC (Korea National Oil Corporation)
- Incorporation body for Green technology certification and technical grade evaluation of Green Certification System
- Drawing approval and Design evaluation service as third-party inspection body
- Certification service for Welder qualification test / WPS and PQR approval service

KOLAS Inspection

Korea Laboratory Accreditation Scheme (KOLAS) has accredited KR in accordance with the recognized International Standard ISO/IEC 17020.

KOLAS accredits an inspection body when it meets the relevant requirements and demonstrates its competence in a specific area of operation. KR is accredited for;

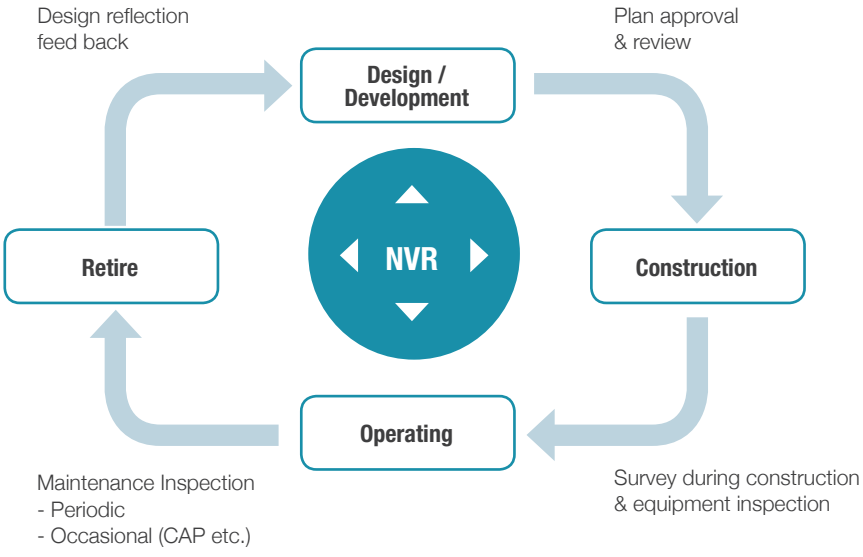
- Refillable seamless steel gas cylinders (ISO 9809-1, 2, KS B 6210)
- High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles (CNG-1 & CNG-2 type) (ISO 11439)
- Refillable seamless steel tubes of water capacity between 150L and 3,000L (ISO 11120)
- Packagings and containers for the transportation of dangerous goods (Packagings, Intermediate Bulk Containers, Large Packagings, Pressure receptacle) (IMDG Code)

Naval Services

KR continues to provide verification of technical documentation for naval vessel design and contribute to the stability and combat performance of all types of warships and submarines.

Based on KR's future-oriented model proposal regarding the registration and maintenance management of naval vessels, KR is ready to provide total solutions for clients, to establish a survey system in the life-cycle of naval vessels.

Model proposal for naval vessel survey in life-cycle



DEVELOPMENT OF NAVAL VESSEL TECHNOLOGY STANDARDS

Based on KR's independent technology standards of naval vessels established for the Republic of Korean Navy (ROKN), clients receive consistent quality assurance, shorter duration of design/construction, and secure cost savings.

Naval Vessel Rules

Technical intensity of each specialized field

Global trend	Cost saving and efficiency improvement	Specialization	Repair and maintenance after commissioning
• Enhancing maritime safety • Marine environment protection • Increasing trend in application of international conventions • Contribution to exporting naval ships	• Efficiency improvement by standardization • Promoting the policy of cost saving and efficiency improvement • Convergence with design and construction technologies of commercial ships	• Navy and DAPA[1] - Management of ROC[2] - Management of Naval Ship Acquisition System • Industry and academia - Development of design/construction technologies - Maintenance and management of technologies	• Systematization of life maintenance management for naval ships • Establishment of periodical management systems for naval ships

[1] Defense Acquisition Program Administration, [2] Required Operational Capability

Development/possession status of naval surface vessel's standards

- Naval Vessel Rule (Nine Parts, Result of "Dual Use Technology Development")
- Standards for Design and Construction of Naval surface vessel

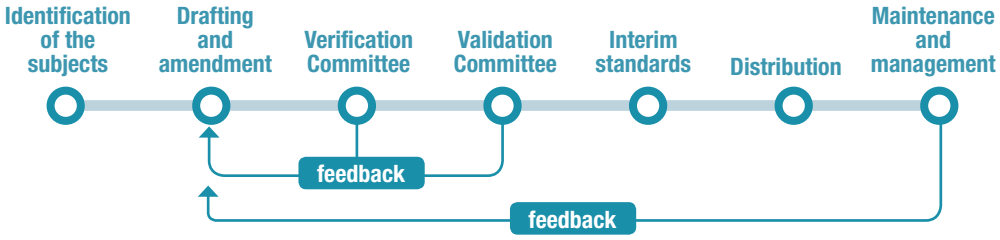
Development/possession status of submergible vessel's standards

- Submarine Rule, Submarine Standards for Design and Construction
  : 1st development step, 74 kinds (completed in 2016).
  : 2nd development step, 33 kinds
- Survey by law of Submarine, Equipment survey instruction of submarine.

Develop and maintenance procedure of naval vessel technology standards

KR continues to develop its comprehensive standards, considering safety, operability, construction techniques, performance and cost, through an ongoing process of in-depth formal review by the technology review committee. The committee is made up of experts from government, industry and academic institutions and other important organizations.

Development & maintenance process



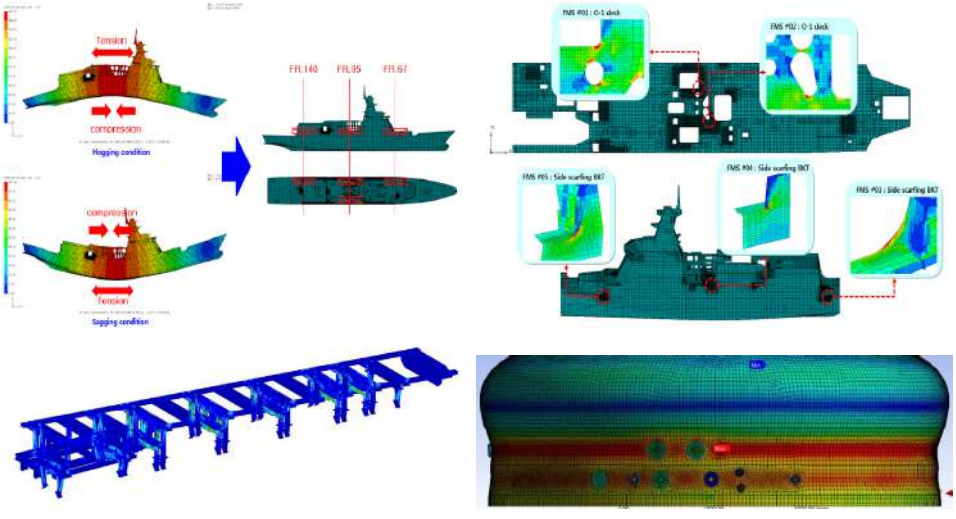
PLAN APPROVAL SERVICE OF CRITICAL SYSTEMS AND DESIGN DOCUMENTS

Using KR's expertise, clients can predict any problems in the design/development stage, and make amendments in good time via KR's certification service of conformity for design documents based on the appropriate standards.

KR provides risk analysis using FMEA method in critical systems for naval vessels and in-depth structure strength analysis for reinforced quality assurance service.

Plan approval and review of design documents (Report/Drawing)

- Certification for Jangbogo-III class submarine (Korea model)
- Certification for Salvage and Rescue ship (ATS-II)
- Certification for basic/detail design of Landing Craft Utility (LCU)
- Certification for basic/detail design of Landing Ship Tank (LST)
- Certification for detail design of Service Boat (SB-A)
- Certification for detail design of Mine Sweeper Hunter (LST)
- Certification for design documents of ADD (Agency for Defense Development) Test Research Ship
- Certification for design documents of Air-force survival training ship
- Certification for design documents of High Speed craft
- Certification for design documents of Export naval vessels (Thai, Indonesia, Peru and etc.)
- Certification for design documents of PHPL (Pressure Hull Product Layout)
- Structure Strength Assessment of ROKN's KDX-III, LPX, Submarine transfer unit, AGS-II, Submarine and etc.
- Suez/Panama Canal tonnage certificate of naval vessels



SURVEY SERVICE OF NAVAL VESSELS DURING CONSTRUCTION AND THEIR EQUIPMENT

Survey during construction of new naval vessels

KR services contribute towards enhanced safety, quality improvements, a shorter duration of shipbuilding, via survey during block erection and equipment store/installation, NDT and tightness tests, on board tests, major measurements, sea trials and miscellaneous quality assurance services provided during the construction stage.

- Survey during construction of Jangbogo-III class submarine (Korea model)
- Survey during construction for DPS, Diving/rescue systems of ATS-II
- Classification survey during construction of ADD Test Research Ship
- Survey during construction of Air-force survival training ship
- Survey during construction of Bangladesh navy's high speed craft
- Survey during construction of Cambodian and Russian high speed crafts
- Survey during construction of Indonesian high speed crafts
- Survey during construction of Indonesian coast guard's patrol vessels
- Survey during construction Royal Thai Navy's frigate and etc.



Inspection of naval equipment and special purpose equipment

KR offers inspection services, including drawing approval, for equipment installed in naval vessels, special purpose facilities on shore and related vessels/equipment. Specifically KR contributes to improve the seaworthiness of naval vessels through the certification of basic materials such as steel sheets, welding materials and cables.

- Maintenance inspection for propulsion motor of Jangbogo-I class submarine
- Drawing approval and survey during construction of transfer facility for Jangbogo-II class submarine
- Drawing approval and survey during construction of transfer facility for PKG class naval vessel in ROKN fleets
- Drawing approval and inspection for equipments : Water-jet propulsion system, main and aux. equipments
- Drawing approval and inspection for PHPL of Indonesian submarine
- Inspection for equipments of Indonesian submarine
- Approval of manufacturing process for PFS-700 steel plate
- Type approval of power, communication cables for naval ships (MIL Spec.)
- Type approval of high strength welding material without pre-heating
- Performance test for Coast Guard's Air Cushion Vehicles
- Certification assessment for Mine Disposal Vehicle (MDV) of ROKN
- Survey during construction and performance assessment for high speed jet boats
- Survey during construction for high speed crafts
- Safety grade inspection for Swimmer Delivery Vehicles (SDV) of ROKN

Inspection/certification for contract maintenance items

Miscellaneous quality assurance and construction supervision


MOKPO MARITIME UNIVERSITY

CAP SERVICE FOR NAVAL VESSELS, DIVING VEHICLES AND EQUIPMENT

KR offers an operational maintenance survey service, coordinating the depot maintenance period and docking plan of operating naval vessels, ensuring that the vessel remains operationally ready for any mission, a service which is gaining approval with clients.

CAP (Condition Assessment Program) for naval vessels

KR provides a lifetime assessment and condition assessment program for naval vessels to maintain maximum combat performance. This is achieved by predicting the remaining life of the naval vessel through scientific analysis and assessment of the hull, machinery and electrical equipment, noting changes, deterioration and aging of the naval vessels, associated facilities and special purpose vessels.

- CAP of submarines (SS-CAP) : ROKN SSM, 209 class submarine
- CAP of surface vessels (N-CAP) : ROKN DDH, LST, MSC, FF, PCC, PKM and etc.
- CAP of lifting and mooring facilities : Floating dock, slip-way, ship lift system and mooring barge
- CAP of JEJU island tourist submarine, ADD Test Research Ship and other vessels owned by government

Safety grade inspection for deep diving equipment of ROKN

KR continues to enhance divers' safety and performance of diving equipment based on its experience and independent knowledge of safety grade inspections relating to the navy's deep diving equipment.

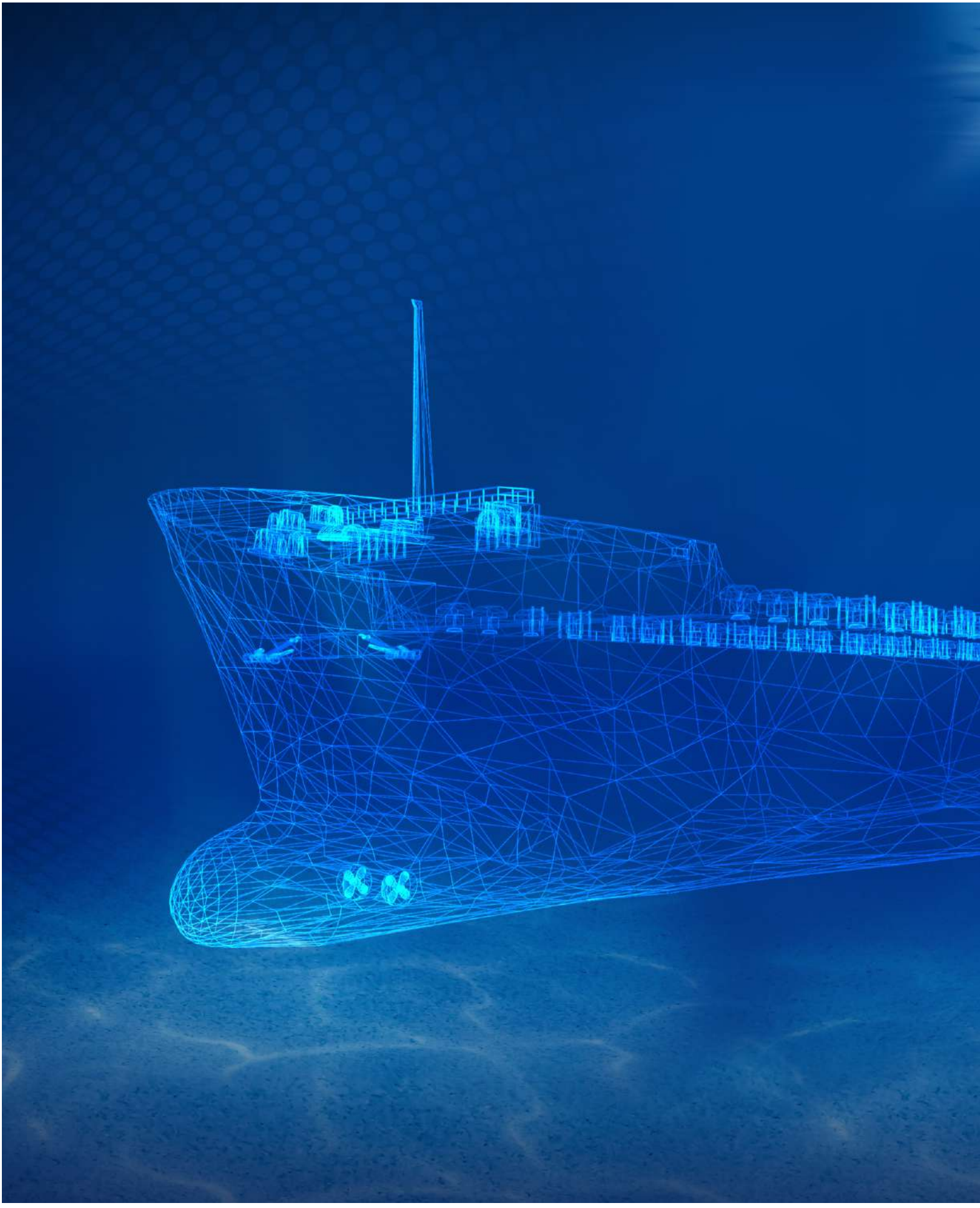
KR is expanding business sectors to include diving system certification of the next generation of salvage and rescue ships as well as the certification of public and private diving equipment.

- DSRV (Deep Submergence Rescue Vehicle)
- DDS (Deep Diving System) and DSS (Diving Simulation System)
- DDSS (Deep Diving Simulation System)
- Construction surveys for ROV (Remotely Operated Vehicles)
- DLSS (Divers Life Support System)
- Fixed/Portable decompression chamber and etc.

TECHNICAL ASSISTANCE AND TRAINING SERVICE

Third-party inspection and certification for all overhaul of submarines

- Training services relating to the Act concerning ships and international conventions
- Training services covering safety grade inspection of tourist submarines
- Training services on ship design/construction
- Support on various levels for technical reviews and engineering services
- N-CAP On The Job training services



Information & Technology/ Research & Development/ Academy

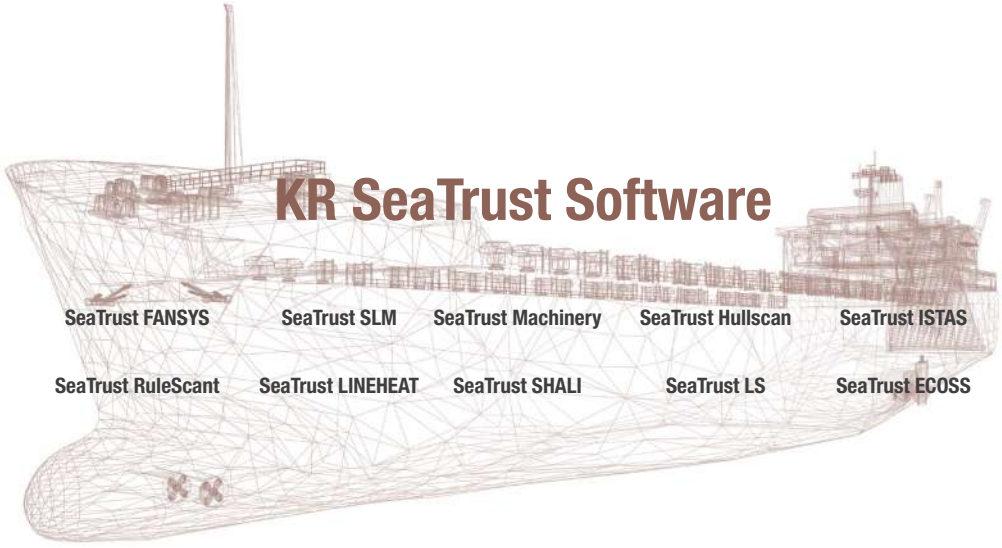
Dedicated KR professionals deliver a range of high quality technical services throughout the entire life-cycle of your vessel.

Our experts are all highly qualified and experienced in working with world-class shipbuilders and shipping companies, putting us in a prime position to deliver expert practical advice to our customers.

KR SEATRUST SOFTWARE SERIES

The SeaTrust software series is KR's unique solution to enhancing maritime safety and environmental protection. Originating in the early 1990s, this software series has been continuously updated to reflect state-of-the-art technologies, advances in IT and customer requirements. All software is fully verified and validated through model testing, full scale measurements and feedback from various users to ensure accurate and confident results and user friendly interfaces.

The SeaTrust software series covers rule scantling checks according to KR Rules and harmonized-CSR, structural safety assessments by direct methods, full spectral fatigue analysis, shaft alignment analysis and ship's life cycle management. It is applicable to all vessel types including tankers, bulk carriers, container ships, passenger ships, naval vessels and offshore structures.



KR-CON

A thorough understanding and identification of applicable IMO requirements are essential for the safe operation of ships and the prevention of marine pollution.

However, it is not always easy to obtain comprehensive information. To resolve this problem and to facilitate the applications of IMO requirements in the maritime industry, KR has developed a database of IMO instruments called 'KR-CON'. Available in USB format, mobile app, and via the internet (http://krcon.krs.co.kr), KR-CON is a powerful tool for accessing international conventions, codes, resolutions and IMO circulars.

KR-CON offers a cloud function allowing users around the world quick and easy access to the most up-to-date information on the IMO convention database.

USB version

runs directly from a USB memory stick without any need for installation or internet connection and is updated regularly through an internet connection.

Web version

is accessible via a standard web browser. (http://krcon.krs.co.kr/)

App version

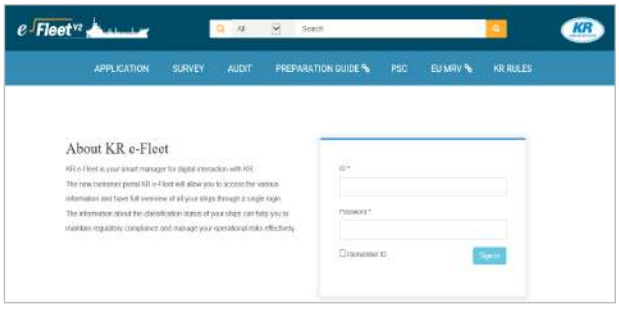
is available now on the App Store (iOS) and Google Play Store (Android OS).
It is the first app for IMO instruments in the world.

KR E-FLEET

Since March 2011, KR's e-Fleet service has provided its clients with all the principal information relevant to ships registered with KR, including survey applications, survey and international convention audits, the registration and status of various inspections / audits, and all of this information is easily accessible online, in real time.

The KR e-Fleet V2, newly refurbished and launched in 2018, has been improved to provide its clients with a one-stop online service from the preparation of survey/audit application process, through to the report / certificate reading for the customers' convenience.

The KR e-Fleet V2 offers customers even better value and greater convenience with the latest PSC information, greenhouse emission monitoring plans, emission reporting for EU-MRV verification and the KR rules, all with the enhanced functionality of KR e-Fleet V1.



To reduce the number of PSC detentions, KR e-Fleet V2 also provides a checklist for each port, reflecting the major PSC trends, all backed up via a cloud server for clients across America and Europe, providing prompt access to all services.

KR-CAP

(CONDITION ASSESSMENT PROGRAM)

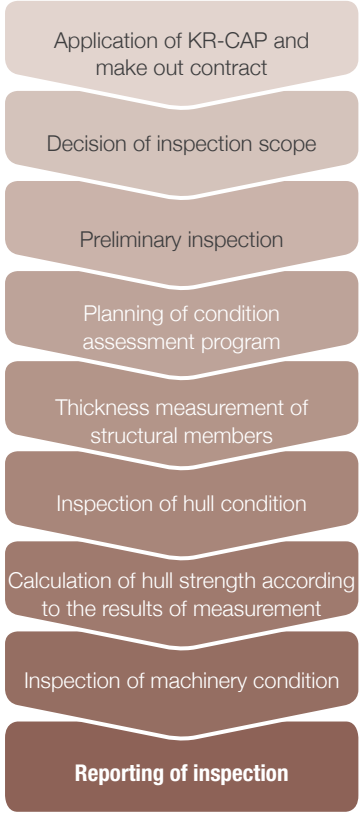
The service life of a ship diminishes over time as a result of incurred damage and defects, even in cases where the ship is regularly repaired and maintained.

It is, therefore, essential for shipowners to assess the ship's remaining service life to make plans for future repairs or replacement. Shipowners also need to obtain technical information on a ship's condition during its service life. To that end, KR has developed a ship condition assessment program called 'KR-CAP' which can provide owners with detailed information about a ship's condition and its remaining service life. KR-CAP is an independent and thorough verification of the condition of a ship to provide shipowners with quality technical services regardless of the ship's classification.

Our Services

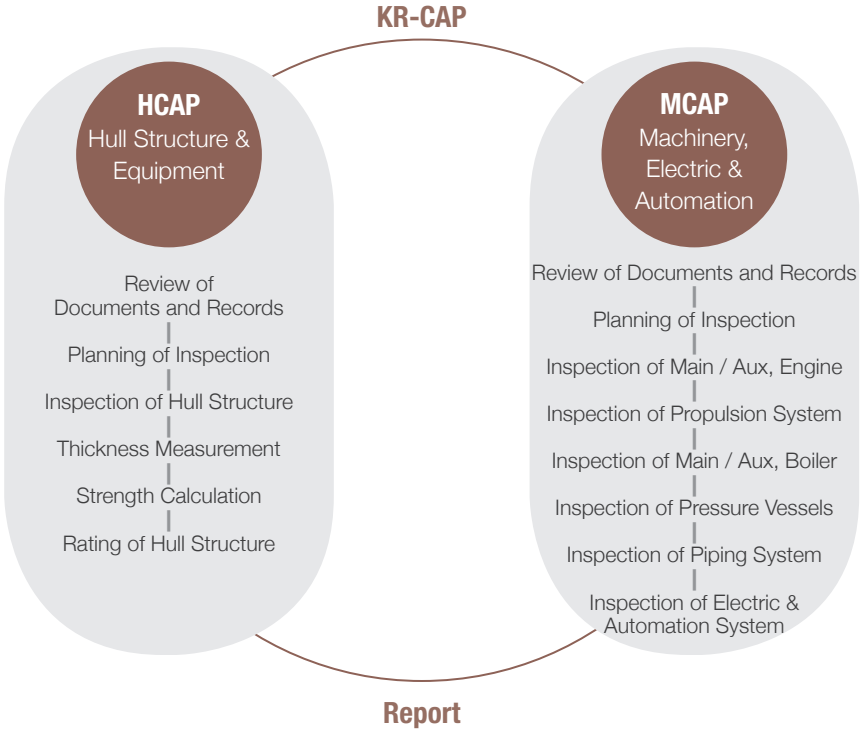
- Provision of information on ship's operating condition
- Assistance with newbuilding order decision-making
- Provision of information helping shipping companies developing their own rules for operating ships
- Assistance with repair or investment decision-making
- Provision of information on ship's condition to insurers
- Assistance with substitute ship decision-making

Procedure



Structure

KR-CAP consists of the following two modules, one is HCAP for hull structure and the other is MCAP for machinery. Each module can be implied separately depending on the applicant's needs.



KR-ERS

(EMERGENCY RESPONSE SERVICE)

The Emergency Response Service (ERS) provides technical information on stability, longitudinal strength and oil outflow through a series of software programs. Vessel damage caused by collision, grounding or other reasons is immediately calculated by KR-ERS to deliver stability, strength and any oil outflow information. On the basis of this technical information, a number of possible emergency procedures can be simulated and the most effective one selected.

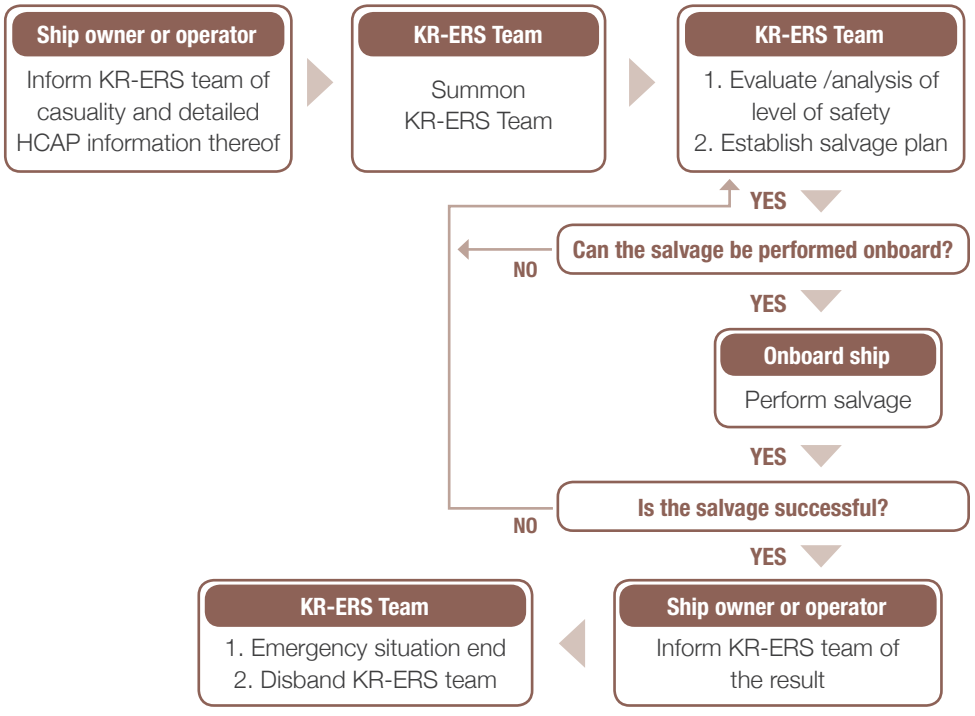
To provide an immediate emergency response service around the clock, KR operates an emergency response team (ERS team) comprising experienced hull, machinery and navigation specialists.

The ERS team is assembled immediately when an emergency situation arises to deliver prompt and appropriate advice. A ship registered under KR-ERS will be provided with sound solutions to manage difficult technical problems under an emergency situation.

Our Services

- Calculation of residual stability and buoyancy in damaged condition
- Calculation of longitudinal strength in damaged condition
- Calculation of oil outflow
- Technical review of salvage plan

Flow chart of KR-ERS



RESEARCH & DEVELOPMENT

KR continually invests in R&D resources to improve its technology and to enhance its capability to overcome the challenges that marine and offshore industries face today.

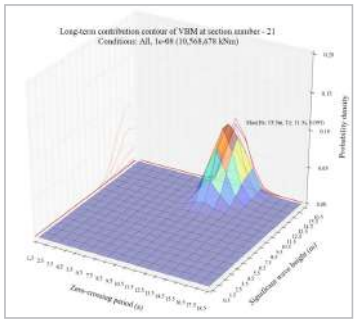
Through joint R&D projects with academia and various industrial organizations, KR combines its internal expertise with external skills to safeguard life, property and the marine environment.

Fundamentally, the core deliverable of KR's R&D continues to be the rule development. Beyond that, KR also leverages its capabilities to provide value-added services of engineering and consulting through the application of future-oriented technology.

Main R&D Activities in KR :

Hull Technology R&D

- Element and application technology of hull
- Technical rule development of navigation in an arctic environment
- R&D of Rules and Guidance Notes for hull
- Technical development of high value-added ship

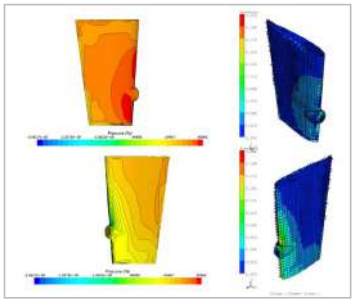


Machinery/Equipment Technology R&D

- Green ship machinery/equipment R&D
- Offshore plant R&D
- Technologies for global environmental regulation

IT Convergence R&D

- Software development for Technical Rules
- Software development for vessel navigation



Engineering

- Offshore plant
- Merchant and Naval vessels
- Risk assessment
- Wind Turbine Certification and Design Assessment
- Test & certification of Green ship equipment

ACADEMY

KR Academy was founded to meet its customers' training needs and to share more than half a century's worth of accumulated knowledge of international conventions and classification technology.

The Academy carries out regular training courses which include ship inspection, statutory courses, ISM/ISPS/ISO system certification courses and also courses on eco-friendly, new and renewable energy.

The Academy cooperates and shares knowledge with the marine industry, academic institutions, government and Navy. It also provides customized training programs tailored to suit individual client needs.

The KR Academy works hard to enhance the international competitiveness of the Korean maritime sector as well as the skills of its workforce. It consistently provides various training courses for offshore, LNG vessels and ice-class ships. In addition, courses are held on maritime conventions in order to deliver information on these rapidly changing regulations in a timely manner.

KR Academy has developed a standard for fostering talented personnel working in the maritime industry by developing National Competency Standards (NCS) in Korea. This is supervised by the Ministry of Employment and Labor who recognizes KR as one of a professional training institute representing the maritime industry. The Academy offers government-funded training programs as part of this initiative. As a result, it makes a significant contribution to enhancing workforce talent across the shipbuilding and maritime sectors by enhancing partnerships with universities, related institutes and overseas clients.

KR Academy is rapidly growing into a leading global training center to develop the world's best human resources for the international maritime sector.

Green Services

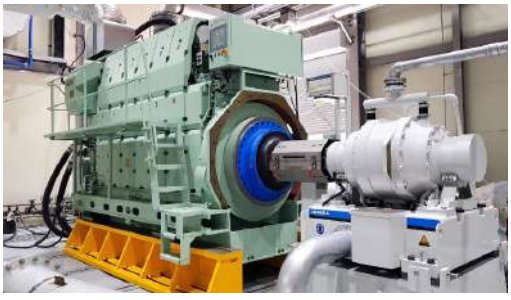
In keeping with our passion for the protection of the natural environment, KR offers survey and certification services for renewable energies, including for wind and ocean power. KR is continuously working on new and innovative green ship technologies to reduce emissions and fuel usage. These advances allow our customers to meet their environmental goals.

KR GREEN-SHIP EQUIPMENT TEST AND CERTIFICATION CENTER

KR Green-Ship Equipment Test and Certification Center (KR TCC) is a R&D institute of Green-Ship specialized for developing the related core technologies and performing test and evaluation of ship equipment in the shipbuilding and shipping industry. KR TCC has a great diversity of Green-Ship related test facilities and applied technologies providing following services.

- Evaluation, analysis and test of marine diesel engines
- Precise measurement and analysis on combustion and emission characteristics
- Evaluation of marine fuel quality
- Measurement on corrosion and anti-corrosion of materials
- Analysis and evaluation of thermal controlling systems and flow systems
- Analysis and evaluation of advanced hybrid power system

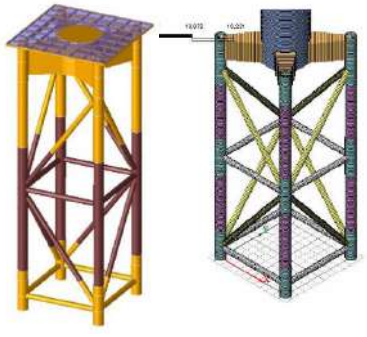
KR TCC



High Speed Engine Cell

RENEWABLE ENERGY

KR is developing design evaluation technology and rules for the international certification of wind power energy. KR is also committed to R&D for ocean energy as the next-generation energy source. The society is providing the highest level of technical services, international certification and technology training for the renewable energy sectors.



Model of integrated jacket

Wind Energy

Being certified as an international product certification body by KAS (Korea Accreditation System) of the Agency for Technology and Standards, an affiliated organization of the Korean government, and having been appointed to approve the use of the mark of the IAF (International Accreditation Forum), KR is the first international accredited certification body in Korea qualified to provide certification services for wind turbines.

Design assessment of wind turbines is at the core of the certification process. It involves evaluating the conformity of the drawings and technical data submitted by clients, using international codes and standards to provide type certification, component certification, prototype certification and project certification.

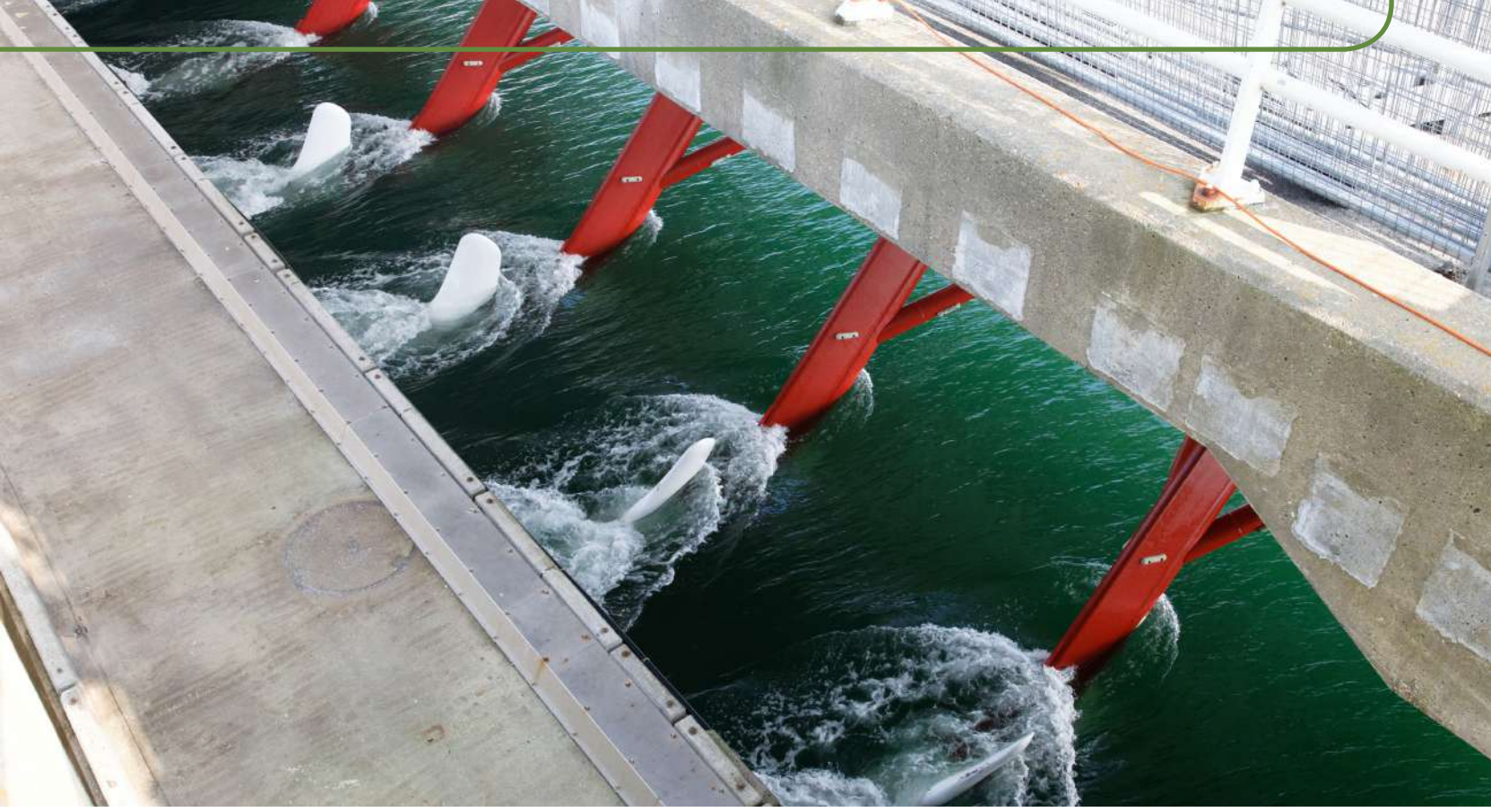
KR delivers best practice to make real differences to the long-term efficiency and profitability of wind farms. Superior Operation and Maintenance (O&M) practices are critical to ensuring the profitability of wind farms and through a continuous improvement process, the society captures the full financial potential of O&M by focusing on availability, efficiency and O&M cost.

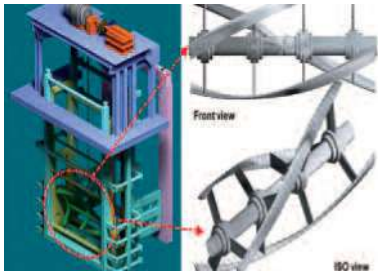
The global outlook is changing, making renewable growth an unstoppable trend in which the center is uniquely positioned to create lasting value. KR is developing a common IEC standard to provide best practice on principles and technical requirements and guidance for design, construction and in-service inspection of fixed and floating wind turbines.

Design guideline for offshore wind substructure

Offshore wind gravity substructure specification

Offshore wind suction substructure specification





Design evaluation of 50kW tidal current power generation

Ocean Energy

Ocean Energy is a potential new, large scale, energy source which is beginning to gather interest amongst coastal nations. KR has developed technology guidelines for the design assessment of power generating facilities by analyzing the core technology associated with tidal current, wave power and ocean thermal energy conversion. KR has established certification systems for certifying ocean energy facilities through its participation in international standardization activities.

ENVIRONMENT & PLANT

A general increase in interest to move towards greener growth and to create a green economy presents an opportunity for KR to contribute to green standards, and to develop new technical skills.

Taking the opportunity that has arisen from the need to combat climate change as a driver of its continued growth, KR is developing green growth technology and is a passionate and active supporter of domestic and international initiatives for protecting the environment.

Greenhouse Gas

Greenhouse Gas Verification is a third-party service to prove the accuracy and objectivity of greenhouse gas emissions. KR was accredited as a verification body for a pilot project relating to a greenhouse gas emission trading scheme by the Korean government and has conducted a number of verifications since that time. KR actively conducts validation and verification/certification of CDM projects and contributes to international issues such as mitigation of climate change by UNFCCC, IMO MEPC and other international regulatory bodies.


Deutsche Akkreditierungsstelle GmbH

Accreditation


Deutsche Akkreditierungsstelle GmbH


Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-V5-20014-01-00
according to ISO 14065:2013

Accreditation Certificate
for EU MRV Verifier

Verification body for EU MRV

As a verification body for EU MRV(Monitoring, Reporting, Verification) by Germany's National Accreditation Body (DAkkS), KR provides prompt and effective services covering

the assessment of the monitoring plan, the verification of the emission report and the issuance of document of compliance to the shipping companies. Furthermore, KR's EU MRV services can be delivered to any ship anywhere in the world regardless of its flag or class.

KR's successful accreditation is attributed to its experience and significant capability gained through more than 700 GHG (greenhouse gas) verification projects including ISO 14064, and the analysis of environmental performance of ships for the Clean Cargo Working Group (CCWG) and CSI (Clean Shipping Index).

KR is ready to provide the full range of statutory EU MRV services to shipping companies anywhere in the world, quickly and cost-effectively through its global network.

KR provides German maritime industry with EU MRV Verification Services

Plant and Industry

KR provides certification and technical services and conducts various R&D activities regarding inland and offshore plants, oil refining, petrochemistry, and desalination plants. It has provided valuable support to government, financial institutions and companies with various technical services including third-party certification and inspection.

Asia's first eco-friendly LNG powered ship classed under KR

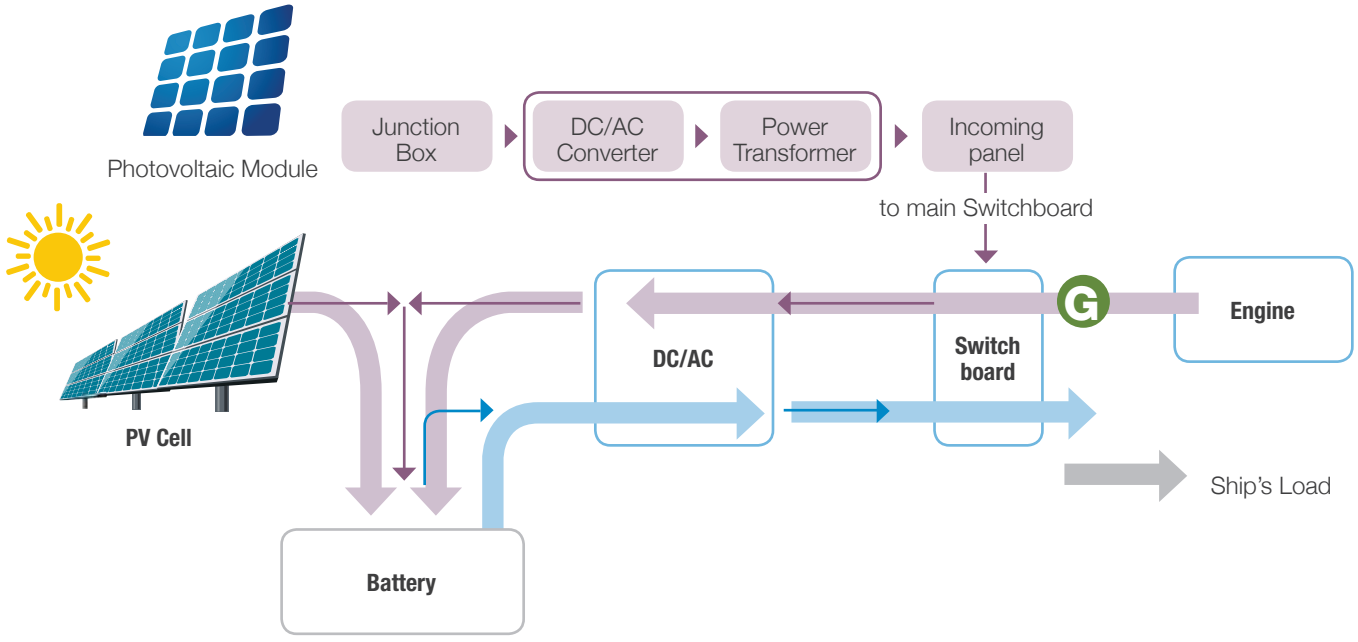
Green Ship

KR has developed a range of green ship technology - the core technology of the international shipping and shipbuilding industries - and is conducting various green ship related R&D initiatives including the 'Green ship TCS (Testing, Certification and Standard) system development' project. KR is also delivering the world's leading green ship technology services by transferring and sharing technology, managing green ship certification and grading systems and participating in green ship related international activities.

Hybrid power system

Hybrid power system is considered to be a leading technology as a technology reducing fuel consumptions and emissions from ships due to use of electric energy storage and new and renewable energy sources such as a fuel cell, a photovoltaic cell, etc. It has significant potential to replace traditional engines for propulsion and onboard power of ships.

KR has developed test/certification systems relating to the application of hybrid power system including fuel cell and electric energy storage and photovoltaic cell onboard ships. KR is working towards becoming the world's leading inspection and certification body for the hybrid power systems relating to industrial and transport sectors.



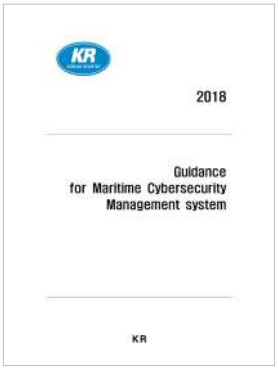

Performance
Ai
4.0

INDUSTRY 4.0

Industry 4.0 is driving a paradigm shift across the industry. To address these significant changes, KR established its ICT (Information Communication Technology) Center which integrates KR's resources, to enhance the application of advanced information and ICT across the maritime and ship classification industries.

KR provides cyber security services to its client.

CYBER SECURITY



As the shipping industry becomes more and more digitalised, so cyber attacks on ships have increased. Reflecting this trend, the International Maritime Organisation has added cyber risk management to the ISM code safety management on ships. Owners risk having their ships detained by port state control authorities if they have not included cyber security in their ship safety management by 1 January 2021, in compliance with the ISM code.

KR created a specialist Cyber Security Task Force Team in 2016 and has undertaken extensive technological research into this area, following the development of the KR Cyber Security Guidelines in 2016. With a world-class reputation for technology and the provision of leading-edge IT solutions, KR has now been appointed by the industry to deliver technical consultancy services, and to establish an effective, comprehensive management system for the company's ship cyber security.

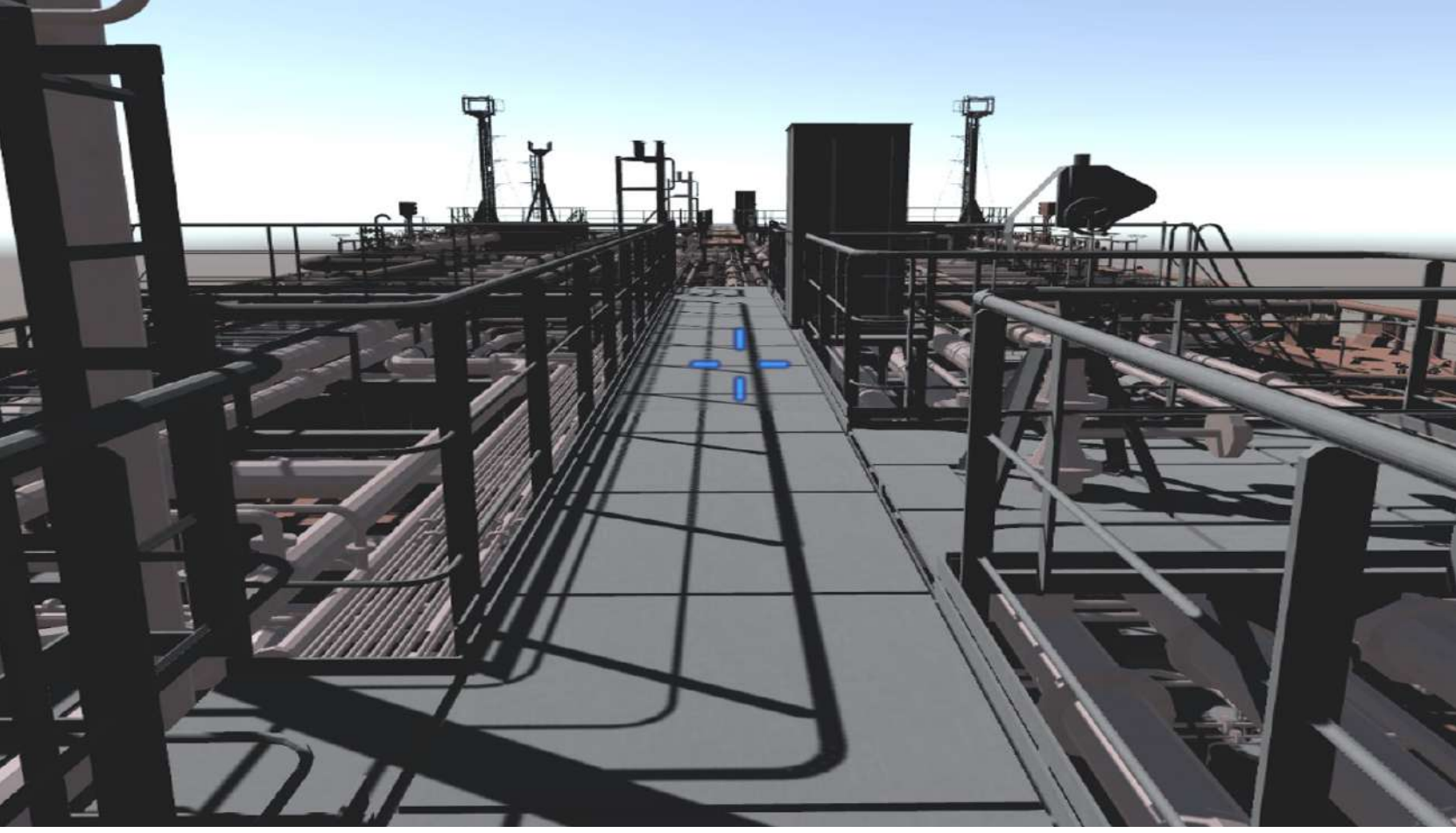
KR has steadily increased its investment in R&D focused on cyber security over the years, as technology and digitalisation has increased across the industry. KR is committed to being an industry-leader in this area, and is also conducting advanced technical research on autonomous ships and ship surveys conducted using drones.

SURVEY USING DRONES

KR is using drones on a regular basis to conduct ship inspections, offering the service from its network of offices, wherever customers need it around the world. Initially launched to save customers time and money and enhance the safety of the organisation's workforce, the surveys are conducted onboard in and around ships in many of the high risk and difficult to access areas. Using unmanned aerial vehicles or underwater remotely operated vehicle drones, the drones can easily and safely explore confined spaces with restricted access, poor ventilation or environmental high-risk areas, or parts of the ship which would require scaffolding for surveyor access.

Developed specifically for bulk carriers' cargo holds and the ballast tanks in barges, KR is using the drones for close-up surveys too, to inspect detailed structural components. Already an important part of the decision making and assessment process, the drones provide clear visual data for analysis, which can be reviewed by KR's inspectors in real time, complimenting their traditional skills.

Moving forward, KR plans to provide new services using a variety of different drones to expand its inspection service areas. The footage will still be analysed by KR's expert surveyors but different drone types will be used to assess thickness measurement and conduct more intensely detailed surveys.



VR TRAINING SIMULATOR

In recent years, maritime industry has introduced the concept of a digital twin to maximize operational efficiencies by combining the data generated during the ship's life cycle with the ship's 3D digital model. This concept currently supports a seamless workflow and reduces production costs at the ship production stage, and in the future it will also be possible to evaluate the customer's operations using a cloud service and simulation platform. KR is already using the performance data to provide guidance on identified operational risk factors obtained using a 3D ship digital replica.

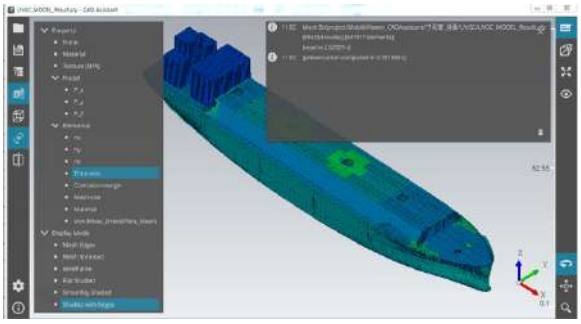
Furthermore, KR is extending this digital twin concept with the introduction of a virtual reality based training simulator using a 3D digital replica of the ship. As virtual reality devices become more popular and more virtual reality realization technologies are developed, the efforts to introduce and apply virtual reality technology to ship design and ship operations are increasing.

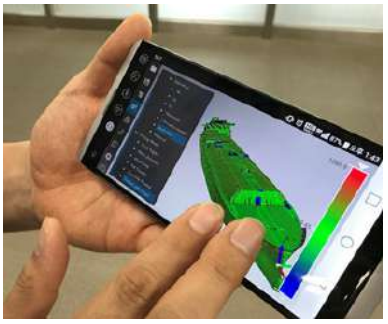
KR has been developing various VR based application systems since 2014, including a ship inspection training simulator and a ship crew safety training simulator and using digital 3D replicas of the relevant ship, and is continuing to expand its application range.

3D MODEL-BASED DRAWING APPROVAL

There have been growing demands from shipyards for KR to provide 3D model-based drawing approval, as 3D modeling is increasingly used in a ship's initial structural design phase. To meet demand and as part of KR's strategic vision; Be digitalized, KR's ICT center has developed CAE interface with heterogeneous CAD, to provide consistent 3D modelling throughout the ship design process alongside a 3D model-based ship management system.

The project focuses on the development of a 3D CAD/CAE interface between the shipbuilding 3D CAD and KR's SeaTrust-HullScan software, the ship design support solution that analyzes and appraises a vessel's hull structure. It provides a 3D viewer of the entire ship, listing the management function and its history so that the drawing approval process can be more easily and efficiently accessed.





AUTONOMOUS SHIP

The idea of a ship without seafarers was the kind of story that would only occur in a movie, but thanks to the fourth industrial revolution, it is highly likely that we will see autonomous ships sailing at sea, in the near future. Such vessels could cut operating costs by as much as 20% and would dramatically reduce the risk of incidents and accidents caused by human error on board.

KR describes an autonomous ship as being an unmanned, fully operational ship offering the maximum guarantee for a safe voyage and offering significantly lower operating costs while complying with all environmental regulations.

To prepare for the industry changes, KR has steadily increased its investment in advanced technological research into autonomous ships to lead the industry in both the domestic and global markets.

KR has already started to develop the core technologies starting with the ship's planned maintenance system, known as PMS since the maintenance will be critical to operating the systems when no one is onboard. As a result, KR has initiated the development of technology to monitor the status of hull and engine. KR also plans to install a relevant system on board to collate real vibration data over several voyages, which will then be used to anticipate and carry out predictable maintenance on the autonomous vessel.

In 2015, KR worked with the Korean government to suggest the basis for a legal framework for autonomous vessels. KR is also an important partner in a Korean government project focused on the 'Development of Operating Technologies and Infrastructures for Autonomous Ships", which is scheduled to end in 2020.

KOREAN REGISTER

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