



OCEANCARE
BEST SOLUTION YOUR PARTNER

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*Green Chemistry
&
Eco-friendly Solution*

EnviroClean Product Introduction



*Value Added Solution & Service Partner
with Excellent **Green** & **Energy** Technology*

 **g&e Bridge**

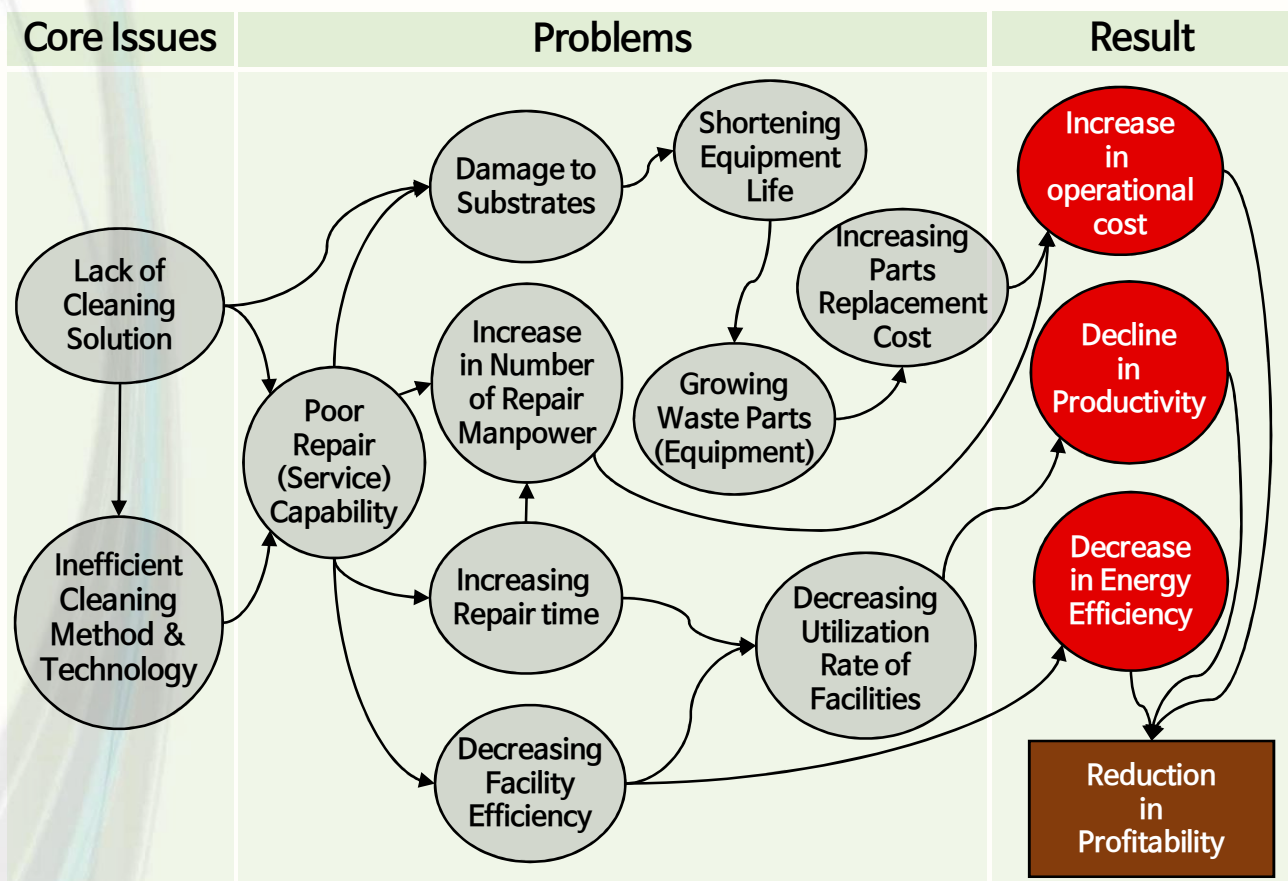
g&e Bridge's *EnviroClean* puts a top priority on the **Safety** and the **Environment** of clients and the **Customer Value Creation**.

To meet the various needs of all industries around the world, we are leading the new paradigm in the field of facility management that aims to environment and safety by researching and developing optimal eco-friendly customized chemical solutions.

We want to contribute to achieving our customer's goals for Total Cost of Ownership (TCO) savings by providing differentiated products and technologies that comply with the best performance of the Green Technology-based solution, the safety for equipment and workers, and the international environmental standards.

Need for optimized tailored chemical cleaning solution

If lack of optimal customized solution suitable for a specific chemical cleaning work, the operational capability of chemical cleaning due to its inefficient cleaning method and technology is lowered, resulting in various problems in the facility management. As a result, operating costs are increased, productivity is lowered, energy efficiency is reduced, and so finally these lead to reducing the profitability. To solve the core issues, the optimal customized chemical cleaning solution is needed.



EnviroClean Competency

The *EnviroClean* Solution is committed to the criteria of the international environmental safety, the eco-friendly standards and the excellent performance

High Performance (Cleaning Excellence)

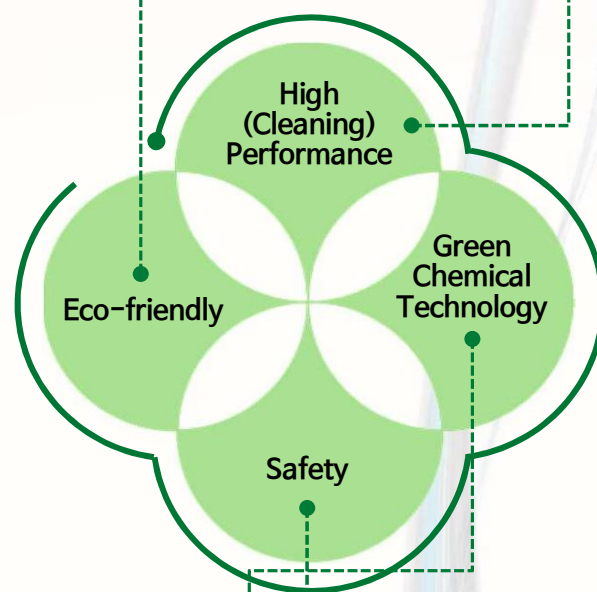
1. The most effective customized solution which is researched and developed considering specific requirements for solving any types of the hard-to-remove contaminants in a wide range of industries from consumer to petrochemical → Improves efficiency and effectiveness
2. Reduction of work hours and costs compared to the existing manual maintenance (repair) tasks → Increases operational efficiency
3. Economical chemical solution which ensures the maximum cleaning performance with its optimum consumption
4. Raises plant efficiency, lowers operational cost, conserves energy, decreases downtime, and extends the usable life of cleaned equipment → Enhances productivity and saves total cost ownership

Eco-friendly Chemical Solution

1. Water-based cleaners with the neutral substances of carboxylic polymer (organic acids, a salt of organic acids, etc.), and eco-friendly solvent-based cleaners designed to remove specific deposits → The ingredients with strong acidity and high alkalinity (Hydrochloric acid, Sulfuric acid, Hydrofluoric acid, etc) are displaced by the neutral substances.
2. Assures compliance with international environmental regulations and requirements through → Reducing incidence of hazardous substances affecting the environment
3. Needs no additional neutralizing agents because of not using the ingredients with strong acidity and high alkalinity

Safety for Equipment & Workers

1. Won't harm workers due to the non-release of toxic gas, as well as the non-flammable and nonpoisonous properties
2. Minimizes damage to the substrates (base materials) of items to be cleaned
3. Safe to use in all types and kinds of equipments made of all ferrous, non-ferrous metals and their alloys due to the noncorrosive features and the addition of special corrosion inhibitor, etc.

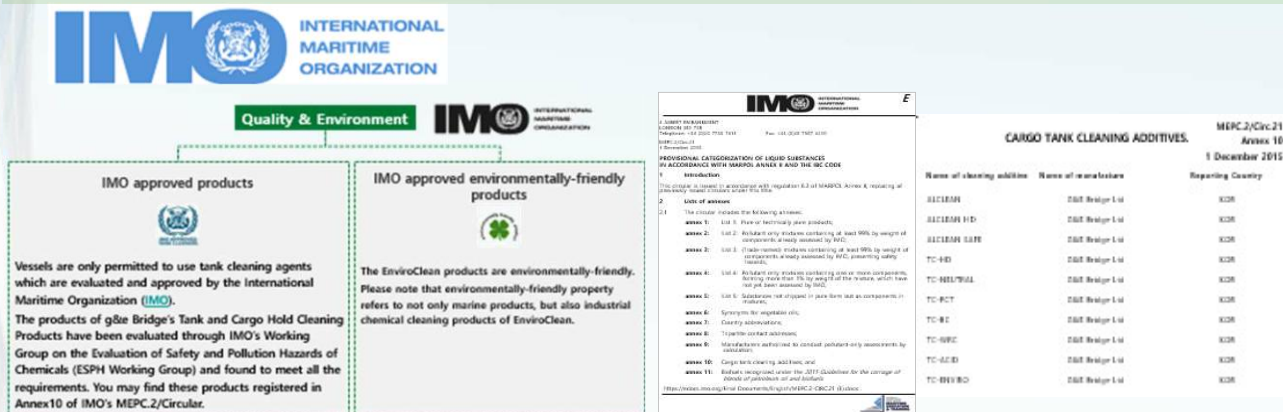


Green Chemical Technology

Planning, evaluating and reviewing environmental-friendly chemical technology from the development stage to the manufacturing, the use, and the waste disposal treatment stage throughout the product life cycle

Certifications & Achievements

1. Environmentally Friendly Products Approved by the International Maritime Organization (IMO) (The total 10 products registered) (Verification and Approval by MEPC/PPR4 Committee ESPH Working Group of IMO) (2017.12.04)



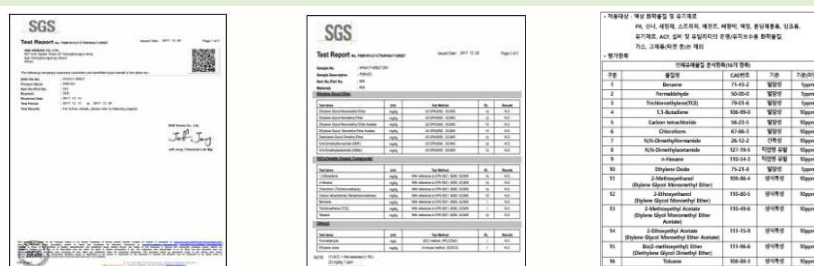
2. Acquisition of KC Mark (Household Chemicals) by Korea Testing & Research Institute (2014.09.24)



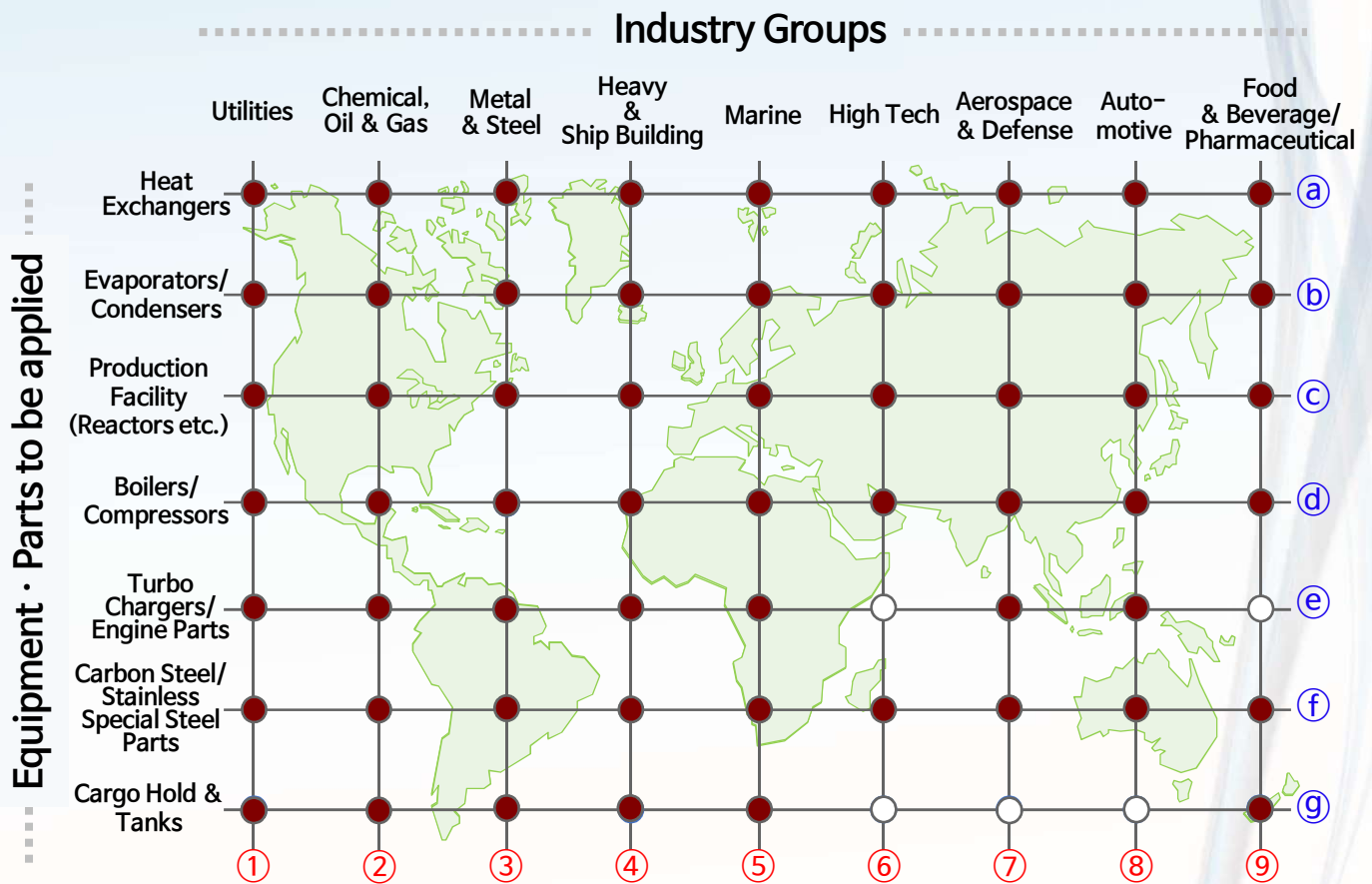
3. R&D Project of NAVAL LOGISTICS COMMAND ‘Development of Chemical Cleaning Technology for Warship’s Heat Exchanger using Eco-friendly Chemical Solution’ (Environmentally friendly Chemical Product Verified by Korea Testing & Research Institute) (Extended Application to the Navy as of today) (2015.12.31)



4. 'PI/PR Cleaning Solution (PSR-EC) Human Hazardous Materials (16 inspection items) Test Analysis and Verification' by SGS Korea, a test and analysis certification body of Samsung Display - Acquisition of Test Result of Not-Detected (below standard value) by All-Inspection Items (2017.12.29)



Application Domain



Reference

- ① KEPCO(Yeongheung/Taeon/Dangjin/Incheon), KHNP(Gori/Uljin/Youngkwang), Incheon Airport Energy, etc.
- ② GS Caltex, SK Energy, SK Chemicals, SKC, S-Oil, LG Chem, LG Hausys, Lotte Chemical, Kolon Industries, Korea Petrochemical, KCC, BASF, YNCC, Hanwha Total, etc.
- ③ POSCO, Hyundai Steel, Korea Zinc, BNG Steel, Dongbu Steel, Novelis Korea, etc.
- ④ Hyundai Heavy Ind., DSME, Samsung Heavy Ind., Cummins, Jonghap Maritime, etc.
- ⑤ HMM, PANOCEAN, POLARIS Shipping, KMTC, H-Line, Heung-A Shipping, KLC, KSS, etc.
- ⑥ LG Electronic, LG Display, LG Innotek, Samsung Electronics, Samsung SDI, LS Cable, Samwha Electric, etc.
- ⑦ Incheon Airport, KAI, Korean Air, Asiana Airlines, etc.
- ⑧ Hyundai Motor, GM Korea, etc.
- ⑨ CJ CheilJedang, Daesang, Bingrae, Samyang, etc.

Equipment / Parts

- (a) Heater/Cooler(Plate type HE, Shell & Tube Type HE, Finned Tube Type HE), etc.
- (b) Evaporator, Condenser, Fresh Water Generator(Ship), etc.
- (c) Production Equipment(Reactor, etc.), Extruder, F.O/L.O Filter & Disk, Distilled Water Filter, Membrane type Filter, etc.
- (d) Boiler, Air Compressor, Fan, Vacuum Pump, etc.
- (e) Turbo Charger, Engine Components(Piston, Nozzle, Block), Turbine, etc.
- (f) Pump, Valve, Nozzle, Tool, Scrubber, Radiator, etc.
- (g) Industrial Tank, Cargo Hold and Tank(Chemical Ship)

EnviroClean Product Groups

1. Water Scale Remover Product Group

Removes many kinds of water-related scale:

Lime scale into which cooling water would be transformed when the high temperature of fluid medium is above 100°C, Hardness salt, mud, shell growth, oyster shell which would be generated as seawater is used for cooling the medium, Water scale which would be accumulated in the equipment caused by the industrial water

2. Polymer·Resin Scale Remover Product Group

Removes many kinds (1~n) of polymer, resin and etc. in a wide range of industries from consumer to petrochemical:

Scale which is produced by polymerization process in petrochemical and refinery industry, Scale which is caused by production process (process for removing photoresist, adhesion, nano-particles, capacitor scale, etc.) in Hi-Tech industry (→ used as a substitute for IPA, as process chemical; PR Stripper & Polymer Remover to clean etch-mask photoresists for the patterning process in Display and Semiconductor industry), Scale which is generated by the production process of polyester film material, and paint and varnish related scale to be removed

3. Oil & Carbon Scale Remover Product Group

Removes various kinds of oily and carbonized scale:

Denatured and concentrated carbonaceous contaminants of fuel oil, lubricating oil, grease, wax, etc., Concentrated carbonaceous scale of rolling oil and synthetic heat transfer fluid in the metalworking process and petrochemical production process, Scale which is deposited on the machine tools, engine components, etc. (→ Providing an excellent alternative to traditional kerosene as a pre-cleaner: water-based and solvent type solution)

4. Rust Scale Remover Product Group

Removes rust, and rust with oil: Rust on the ferrous and non-ferrous metal surfaces, Rust with oil on the ferrous and non-ferrous metal surfaces (→ removes rust and oil simultaneously), Carbonized and oxidized film on the ferrous and non-ferrous metal surfaces (→ as a Pickling agent)

5. Organic·Inorganic Scale Remover Product Group

Cleans various kinds of organic and inorganic scale stuck on the objects to be cleaned in consideration of scale characteristics, such as organic fouling from reverse osmosis membranes, etc.

6. Fire Side Treatment & Fuel Oil Treatment Product Group

Removes soot and contaminants on the fire side, fuel additives for improving compatibility and stability, dispersing sludge, enhancing and conditioning the lubricity of HFO, LSFO, MGO and MDO

7. Oil Spill Dispersant Product Group

Disperses oil on water, at shore and in port, either on or off-board

8. Cargo Hold & Tank Cleaning Product Group (Approved by IMO)

Cleans cargo tank following discharge of drying, semi-drying and non-drying cargo; The products are registered in Annex 10 of IMO's MEPC.2/Circular 21.

9. Water Treatment Solution Group

Boiler water treatment solution prevents/controls corrosion and scale, removes sludge by blow-down, provides passivation on all inner surfaces, Cooling water treatment solution provides corrosion and scale inhibition to protect ferrous and non-ferrous metal surfaces, prevents overheating caused by sludge, Evaporator treatment solution prevents scale, removes existing scale deposits and prevents foaming

10. Ultrasonic Chemical Cleaning Machine Group

Accomplishes the complete removal of deposits, soil and fouling without additional manual work and without damage to the items to be cleaned, reduces chemical cleaning time as well

1. Water·Seawater Scale Remover Product Group

Chemical cleaning agents for removal of lime scale from industrial water and for cleaning hardness salt, mud, shell growth, oyster shell from seawater as well as inorganic oxidized substances and organic scale caused by cooling water and water treatment solution

Product Name	Code	Scale to be removed/cleaned	Equipment to be applied
Heavy Limescale Remover	WSR-HL	Lime scale being hardly removed, generating by industrial water in high temperature condition	Heat exchanger in Chemical, Oil and Gas Industry (Reactor jacket cooler etc.)
Sea Water Scale Remover (Liquid)	WSR-SW	Hardness salt, Cooling water scale, Mud scale, Oyster shell scale	Fresh water generator, Seawater cooling system, etc.
Sea Water Scale Remover (Powder)	WSR-SWP	Hardness salt, Cooling water scale, Mud scale, Oyster shell scale	Fresh water generator, Seawater cooling system, etc.
Water Scale Mineral Remover	WSR-FW	Cooper oxide film, Cooling water scale	Chiller, Heat exchanger, Boiler, Vacuum pump, etc.
Mud Scale Remover	WSR-MUD	Mud and silt scale	Chiller, Heat exchanger, Boiler, Ballast Water Tank, Vacuum pump, etc.
Water Organic Deposit Remover	WSR-OD	Organic deposits	Cooling water tower, Heat exchanger, etc.
Water Non-organic Scale Remover	WSR-NS	Inorganic oxidized scale	Heat exchanger, Pump, etc.
Waste Water Scale Remover (Powder)	WSR-WP	Waste scale with hydrochloric acid, calcium hydroxide, polymer etc. (Contaminants to be hardly removed with acidic and alkaline cleaner)	Heat exchanger for waste disposal and treatment, etc.

2. Polymer·Resin Scale Remover Product Group

A variety of tailor-made solutions (1~n) for industry-wide contaminants with various substances of polymer, resin and etc.

Product Name	Code	Scale to be removed/cleaned	Equipment to be applied
Polymer·Resin Scale Remover	PSR-HE ^{1~n}	Various scale from polymerization process, production process and waste treatment process in refinery·chemical industry (Polymer·Monomer·Resin substances etc.)	Equipment of polymerization process, production process and waste treatment process in refinery·chemical industry (Reactor, Heat exchanger, extruder, distillation column etc.)
Coating Scale Remover	PSR-EC	PI·PR scale from color filter · photoresist coating process in Hi-Tech industry (Substitutes for IPA, Aceton, etc.)	Equipment of color filter · photoresist coating process in Hi-Tech industry and film production process
Acryl Scale Remover	PSR-AS	Acryl scale in chemical industry (peeler & treatment solution)	Equipment for producing and handling acryl substances
Paint & Varnish Remover	PSR-PV	Surface matter with paint, varnish, etc.	Outer surface of railway vehicle automobile, ship, air plane, vessel of heat exchanger, etc.

3. Oil & Carbon Scale Remover Product Group

Removes a wide range of oily and denatured concentrated carbonaceous scale of fuel oil, lubricating oil, grease, wax, rolling oil, synthetic heat transfer fluid, coal tar, pet cokes, turbine oil, etc.

Product Name	Code	Scale to be removed/cleaned	Equipment to be applied
Oil & Carbon Scale Remover (Solvent Type Solution)	OCSR-CRS	Denatured concentrated carbonaceous heavy oil and lubricating oil scale	Heater·cooler, diesel engine injects, burner tips, etc. (Nonaqueous solution)
Oil & Carbon Scale Remover (HFO Filter)	OCSR-F	Denatured concentrated carbonaceous heavy oil (HFO) scale	Equipment and components such as fuel oil (HFO) filters and strainer (for ships) (Water-soluble)
Oil & Carbon Scale Remover (LSFO Filter)	OCSR-FL	Denatured concentrated carbonaceous low sulphur oil (VLSFO) scale	Equipment and components such as fuel oil (VLSFO) filters and strainer (for ships)
Oil & Carbon Scale Remover (Heavy Duty Oil Cleaner)	OCSR-FC	denatured concentrated carbonized oil scale (heavily attached)	Surfaces, equipment and components (Spray type - CORTEC 411 replacements) (Shipbuilding·Heavy Industry) (Water-soluble)
Oil & Carbon Scale Remover (Disc Cleaner)	OCSR-PD(A)	Denatured concentrated carbonized lubricant (L.O.) scale	Purifier·Separator discs for ships (OCSR-PD/OCSR-PDA) (Water-soluble)
Oil & Carbon Scale Remover (Engine & Parts)	OCSR-E	Denatured concentrated carbonized oil scale	Engine and turbocharger components (Pistons, rings, valves, atomizers, pipes, gear boxes, etc) (Water-soluble)
Oil & Carbon Scale Remover (Air Cooler)	OCSR-AC	Denatured oil and carbonized scales, metal oxides and organic scales (Dust)	Engine air cooler/air fan cooler in refinery·chemical industry, steel industry, and utility industry/boiler fan cooler, Screw type Refrigeration Systems (Finned tube type cooler) (Water-soluble)
Oil & Carbon Scale Remover (Heat Exchanger)	OCSR-HE	Denatured concentrated carbonized lubricants and heavy oil scale (severely adhered)	Heat exchanger such as heaters and coolers (Water-soluble)
Oil & Carbon Scale Remover (Heat Exchanger)	OCSR-HES	Scale of coal tar, pet cokes, And heat transfer fluids	Heat exchanger and process equipment in refinery·chemical and steel industry (Nonaqueous solution)
Oil & Carbon Scale Remover (Industrial Product)	OCSR-IP	Lightly contaminated grease and wax, etc., water-soluble and water-insoluble metal- cutting oil	Industrial products·components (To be used for cleaning and degreasing solution during the production process) (Water-soluble)
Rolling Oil Scale Remover	OCSR-R	Concentrated carbonized oil scale, unburned carbon scale	Rolling oil exchangers and equipment in Heat exchanger and process equipment in refinery·chemical and steel industry (Water-soluble)
Turbine Oil Scale Remover	OCSR-TO	Carbonized turbine oil scale	Turbine oil equipment and parts in refinery·chemical industry (Water-soluble)

Product Name	Code	Scale to be removed/cleaned	Equipment to be applied
PFO* Scale Remover	OCSR-PFO	Carbonized PFO scales	PFO-related equipment in utility Industry (PFO* = Pyrolysis Fuel Oil)
General Oil Cleaner	OCSR-GOC	General oil cleaner and degreaser	Multi-purpose oil cleaner (Water-soluble)
Environmental General Oil Cleaner	ENVIRO-CLEAN	General oil cleaner and degreaser (lightly contaminated)	Environmentally friendly general oil cleaner (Water-soluble)
General Oil Cleaner (Solvent type)	OCSR-SOL	General oil cleaner and degreaser	Multi-purpose oil cleaner as pre-cleaner (Nonaqueous solution) Substituted solution for kerosene (flash point: higher than 60°C)

4. Rust Scale Remover Product Group

Removes rust and oil scale, carbonized scale, oxide film and organic-inorganic scale on the ferrous and nonferrous metals for each application

Product Name	Code	Scale to be removed/cleaned	Equipment to be applied
Rust Scale Remover	RR-R	Metal rust, unburned carbon, oxide film scale	Ferrous and nonferrous metal surfaces (Removal of rust from cooling line system)
Rust & Oil Scale Remover	RR-RO	Rust caused by oil and grease, unburned carbon, oxide film, organic matter scale	Ferrous and nonferrous metal surfaces (Simultaneous removal of rust and oil scale)
Rust Scale Remover (Tool Cleaner)	RR-AR	Rust scale to be lightly adhered and coated	Removal of slight rust from offshore plant and surfaces (anti-rust effect, CORTEC 422 alternatives) (shipbuilding and heavy industry)
Rust Scale Remover (Tool Cleaner)	RR-T	Metal rust scale, oxide film	Machinery and tools (Removal of rust and anti-rust effect)
Rust Scale Remover (Heavy Duty Cleaner)	RR-HD	Rust and oxide film heavily adhered to metal surfaces	Machine equipment (especially stainless steel surfaces) (removal of severe-occurred rust and anti-rust effect, alternatives of CORTEC 427) (shipbuilding and heavy industry)
Rust Preventives	RR-P	Rust-proofing treatment after removing rust and rinsing process	Equipment and components made of ferrous and nonferrous metal (Ant-rust work after removal of rust)
Pickling Treatment LIQUID	RR-PTL	Weld slag and foreign matter, annealing scale from heat treatment process and grinding dust	Surfaces welded and made with metal alloys constructions such as tanks, installation (heat exchangers, etc.) and parts (anti-rust effect) (Liquid type pickling treatment agent)
Pickling Treatment PASTE	RR-PTP	Weld slag and foreign matter, annealing scale from heat treatment process and grinding dust	Surfaces welded and made with metal alloys constructions such as tanks, installation (heat exchangers, etc.) and parts (anti-rust effect) (Paste type pickling treatment agent)
Mud & Silt Dispersant	M&S DISPERSANT	Mud & Silt	Ballast tanks, cooling systems and related pipelines (ship's vessels) (Anti-corrosion effect)

5. Organic·Inorganic Scale Remover Product Group

Tailor-made product considering the equipment and parts which are to remove and clean organic and inorganic contaminants (impregnation solution scale, etc.)

Product Name	Code	Scale to be removed/cleaned	Equipment to be applied
DI Water Scale Cleaner	ONSR-DI	DI water sludge	DI Water piping system and process equipment in High-Tech industry (Display & Semiconductor)
General Cleaner	ONSR-GC	general organic·inorganic scale	Industrial equipment and components
Electric Cleaner	ONSR-EC ^{1~n}	Organic·inorganic matters attached on electrical and electronic equipment·parts and manufacturing products in High-Tech industry	Electrical·electronic equipment·components (PCBs, switch boards, motors and accessories) tailor-made solutions (types 1~n) considering the characteristics of contaminants • ONSR-ECS: Fast Dry (rapid drying solvent type) • ONSR-EC: Slow Dry (water-soluble) • ONSR-ECH: Removing LED Packager Sealer • ONSR-ECM: Cleaning MLCC Electrode • ONSR-ECL: Removing Mask Solder·Paste
Alkaline Cleaner	ONSR-AC	Contaminants on the surface of ferrous and nonferrous metals	Precision parts for ferrous and nonferrous metals and plastics (steel products, automotive parts, press processing products, etc.)

6. Fire Side Treatment & Fuel Oil Treatment Product Group

Remover for soot and contaminants on the fire side, fuel additives for improving compatibility and stability, dispersing sludge, enhancing and conditioning the lubricity of HFO, LSFO, MGO and MDO

Product Name	Code	Substance to be treated	Equipment to be applied
SOOT REMOVER	FS-SOOT	Soot and ash deposits	Exhaust gas economizers, waste heat recovery systems and auxiliary boilers (Powder type)
HFO Sludge Dispersant & Conditioner	SDC-HFO	Heavy oil (HFO) sludge and sediment	HFO storage tanks and related systems (settling & service tanks, pipelines, etc.)
VLSFO Sludge Dispersant & Conditioner	SDC-VLSFO	Low sulphur oil (VLSFO) sludge and sediment	VLSFO storage tanks and related systems (settling & service tanks, pipelines, etc.)
Low-Sulphur Fuel Oil Lubricity Conditioner	FOL-LSFO	Low sulphur oil (LSFO/MGO/MDO) and mixed fuel oil	LSFO fuel supply system (fuel pump, injector, pipeline, fuel oil tanks, etc.) (Conditioner of Low sulphur fuel oil to improve lubricity)

7. Oil Spill Dispersant Product Group

Disperses oil on water, at shore and in port, either on or off-board

Product Name	Code	Pollutants to be removed/cleaned	Surface to be applied
Oil Spill Cleaner (Type I)	ENV-HDC	Greases, oil, sludge, carbon deposits, polymer compounds, general dirt and grime, vegetable and animal oils	Engine rooms, tanks and cargo holds, bilges, bulkheads and other shipboard surfaces, etc.
Oil Spill Dispersant (Type II)	ENV-OSD	Mineral oils, crude oils, fuel oils, kerosene, white spirit and lubricant oils	Oil spills at sea, on seashores and on solid surfaces such as docks, decks, piers, wharfs, ship hulls, etc.

8. Cargo Hold & Tank Cleaning Product Group (* : Approved by IMO)

Cleans cargo tank following discharge of many kinds of drying, semi-drying and non-drying cargo
(Registered in Annex 10 of IMO's MEPC.2/Circular 21)

Product Name	Code	Cargo to be removed/cleaned	Cargo holds & tank to be applied
Alkaline Cleaner	ALCLEAN*	Animal and vegetable oils, fats, white mineral oils	Cargo holds and tanks in chemical ship (Tanks made of stainless steel)
Alkaline Safe Cleaner	ALCLEAN SAFE*	Animal and vegetable oils, fats, white mineral oils	Cargo holds and tanks in chemical ship (Zinc-silicate and epoxy coated tanks)
Alkaline Heavy Duty Cleaner (Low Viscosity)	ALCLEAN HD*	Base oils in low viscosity (heavy duty residues, such as greases, waxes, vegetable and animal oils, sludge, soot, carbon deposits, dirt and grime, etc.)	Cargo holds and tanks, decks, bulkheads, etc. in chemical ship
Alkaline Heavy Duty Cleaner (High Viscosity)	ALCLEAN HD(X) *	Base oils in high viscosity (LCO, LSFO, UCO, etc.) (with dynamic viscosity more than about 600cst)	Cargo holds and tanks, decks, bulkheads, etc. in chemical ship
Tank Cleaning -Buffered Cleaning Solution	TC-BC*	Traces of leaded gasoline blends of MTBE (Methyltert-butyl ether, $(CH_3)_3COCH_3$), chloride compounds, sulfide compounds, and other aromatic hydrocarbons	Cargo holds and tanks in chemical ship (Applied when removing the remaining trace amounts of hydrocarbons from the porous surface of zinc-silicate coated tanks after unloading the gasoline mixture cargo)
Tank Cleaning -Acid Cleaner	TC-ACID*	Lime stone, caustic lime deposits and dry lime stains, cement deposits and stains, bauxite deposits and stains, rust, etc.	Cargo holds and tanks in chemical ship
Tank Cleaning -Neutral Based Cleaner	TC-NEUTRAL*	Hydrocarbons remaining after the use of solvent based cleaners such as TC-PCT and TC-HD (used as after-treatment agent in hydrocarbon free cleaning)	Cargo holds and tanks in chemical ship (Final cleaning agent for removing cargo residues and before loading pure chemicals, as the tank must be completely chloride or sulfide free.)
Tank Cleaning -Pet Cokes & Coal Tar Remover	TC-PCT*	Coal tar, crude oil, bitumen, benzene and similar substances as well as dried tars and asphalt residues	Ballast tanks, cargo tanks and fuel oil tanks in the ship as well as heavily contaminated heat exchangers
Tank Cleaning -Heavy Duty Cleaner	TC-HD*	Oil residues, carbonized deposits, paraffin waxes and petroleum-based compounds such as crude and refined mineral oils	Cargo tanks, double bottom tanks, deep tanks, fuel oil storage tanks, ballast tanks, bilges, pipelines, etc.
Tank Cleaning-White Residues Cleaner	TC-WRC*	White residues remaining after carrying certain cargoes, such as vegetable oils, palm fatty acids, oleins, and stearins as well as caustic soda residues	Cargo holds and tanks in chemical ship (Can be applied for epoxy coated and stainless steel tanks; not suitable to be used in zinc-silicate coated tanks)
Tank Cleaning -Enviro Cleaner	TC-ENVIRO*	All vegetable and animal fats and oils, and light mineral oils	Cargo holds and tanks in chemical ship (Applicable alternatives to strong alkaline and solvent-based tank cleaners; eco-friendly tank cleaners)
Tank Cleaning -Passivation Liquid Cleaner	TC-PC	Specifically applied to passivate surfaces made of austenitic stainless steel, and to provide a protective oxide layer against corrosion contamination	Cargo holds and tanks in chemical ship, and industrial installations made of austenitic stainless steel

→ Product that IMO approval is not necessary

9. Water Treatment Solution (WTS) Group

Water treatment solution for the protection of boilers, cooling water systems and evaporators to prevent corrosion from ferrous and nonferrous metal surfaces, and to control scale formation (additionally, provided with test kits and reagents)

Classification	Code	Product Name/Application
Cooling Water Treatment Solution	CWT-CIL	Cooling Water Corrosion and Scale Inhibitor to prevent corrosion and to control scale formation (Liquid)
	CWT-CIP	Cooling Water Corrosion and Scale Inhibitor to prevent corrosion and to control scale formation (Powder)
Evaporator Treatment Solution	EWT-PF	Evaporator treatment to prevent the scale forming minerals in seawater and foaming
Boiler Water Treatment Solution	BWT-NTC	Boiler Water New Technology Conditioner a premium neutral organic acid-based liquid treatment solution containing scale and corrosion inhibitors, sludge conditioner, alkalinity controller and condensate controller
	BWT-TC	Boiler Water Total Control (Complete Conditioner) a full treatment solution to protect boiler surfaces, to prevent corrosion and to control water hardness, alkali and salt levels, and to act as an oxygen scavenger
	BWT-CC	Condensate Corrosion Inhibitor to control corrosion, neutralizing acidic conditions
	BWT-HC	Boiler Water Hardness Control an active phosphate-based solution to control hardness and scale
	BWT-AC	Boiler Water Alkalinity Control to maintain alkalinity within optimum limits
	BWT-DOC	Boiler Water DEHA Oxygen Control to control oxygen, providing the outstanding protection from oxygen corrosion and inhibiting ferrous and non-ferrous corrosion in feedwater, containing Diethylhydroxylamine (DEHA)
	BWT-OC	Boiler Water Oxygen Control a hydrazine oxygen scavenger to protect against oxygen corrosion
	BWT-GC	Boiler Water General Cleaner to disperse oils in feedwater of boilers and in cooling water systems of diesel engine via leaks in the oil heaters or tank heating coils
Cooling Water Treatment Solution	CWT-SWAT	Sea Water Antifoulant Treatment to prevent the formation of marine biofilm in seawater cooling systems, heat exchangers and ballast water tanks, and to inhibit the growth of living micro- and macro-organisms
Potable Water Treatment Solution	PWS	Potable Water Stabilizer to prevent "Red Water" in the storage systems of potable water and to provide scale and corrosion control in hot water heaters, coolers, hot water tanks, etc.
Sanitation Treatment Solution	ENV-BTC	Sanitation Treatment & Cleaner to degrade biological sanitation wastes for sanitation devices, holding tanks, drains, collection line, and sewage treatment system
	ENV-TCL	Biological Toilet Cleaner to dissolve uric acid and lime scale and to remove bad odors for toilet sinks, pipelines and other parts of waste systems (Water-soluble)
	ENV-CHLON	Chloride Sterilization to provide easy and convenient chlorination of swimming pools, sewage and waste water systems (Water-based)

10. Ultrasonic Cleaning Machine Group

The ultrasonic cleaning machine to support the chemical cleaning process of equipment and components to be applied



Standard baskets for filter elements(Sieve candle insert basket):

The contaminated filter elements are put into a cleaning basket which is hung in the bath filled with cleaning solution.

Product Name	Model Code	Specification (Capacity of internal cleaning bath)
ULTRASONIC CLEANING MACHINE Model M	USG-1500M	ULTRASONIC CLEANING MACHINE Internal Capacity of Cleaning Bath(mm): 850(L) x 500(W) x 500(H)
ULTRASONIC CLEANING MACHINE Model F	USD-1500F	ULTRASONIC CLEANING MACHINE Internal Capacity of Cleaning Bath(mm): 600(L) x 400(W) x 700(H)
ULTRASONIC CLEANING MACHINE Model L	USD-1500L	ULTRASONIC CLEANING MACHINE Internal Capacity of Cleaning Bath(mm): 1000(L) x 400(W) x 600(H)

Features and Benefits

1. Ultrasonic cleaning machine is appropriately and specially designed for use in the ship's engine room to remove even the most stubborn deposits.
2. The electric high-frequency energy produced by Frequency Generator is transformed to mechanical energy by piezoelectric Ultrasonic Transducer and is then transmitted into the bath fluid, so that the contaminants can be removed from complicated and fine structure.
3. Robust units, material made of stainless steel which comes into contact with chemical cleaning agents can not be damaged.
4. Secures convenient chemical cleaning operation due to the thermostatically adjustable temperature setting for heating chemical solution, and due to the timer function to control cleaning process time automatically.
5. Applicable to water-based as well as nonaqueous cleaning solution.
6. Reduces cleaning time due to the excellent performance of Ultrasonic cleaning machines, and this efficiency results in saving chemical solution consumption.
7. Recommended to use ecofriendly chemical solutions OCSR-F, OCSR-E, OCSR-PD, OCSR-HE, OCSR-SOL, OCSR-GOC for its minimal damage to the cleaning bath.
8. Supplied ultrasonic cleaners to more than 800 ships both domestic and overseas, as of today (August 2024).

Reference list for general Industry

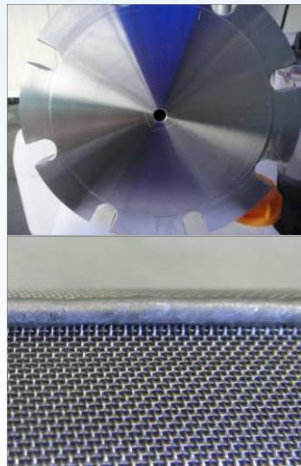
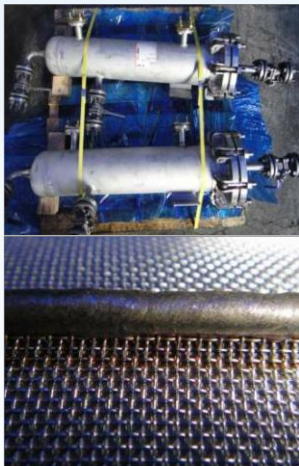
Client	Equipment to be applied (for maintenance)	Type(supply/service)
BNG Steel	• 1BA/2BA/3BA /UBA/UTA Gas Coolers(18 Units) (Finned Tube Type) (Fin-Side & Tube-Side) • 2ZM/3ZM Bearing/CRM Coolers(5 Units) (Plate Type) (Oil-Side & Water-Side) • Air Compressors (7 Units) (Shell & Tube Type) (Oil-Side & Water-Side) • Top Roll Chambers (2 Units) (Water-Side) (28 Units) • Oil Mist Collectors (5 Units) (Mesh Demister 70 Units)	• Supply and repair service • Annual turnkey contract-based maintenance service
Dongbu Steel	• Compressor Inter-Coolers(2Units)/After-Cooler (1 Units) (Shell & Tube Type) • Gas Cooler(1 Units) (Finned Tube Type) (Fin-Side)	• Supply and repair service
Korea Zinc	• Low Pressure #2 Coolers • Compressor Inter-Coolers (Shell & Tube Type) (Tube(Water)-Side) • Coolers of Sulphur plant (Plate Type) (Water-Side) • Carbon Graphite Type/Spiral Heat Exchangers • Pump Impeller Housing in zinc electrolysis plant	• Supply and repair service
LG-Nikko	• Jacket Water Cooler in smelting plant (1 Units) (Plate Type) (Jacket Water- & Cooling Water-Side) • Heat Exchanger in #2 Sulphur production site (1 Units) (Plate Type) (Weak Acid-Side)	• Supply and repair service
Novelis Korea	• Slitter (chemical cleaning in process with Ultrasonic cleaning machine)	• Supply (including Ultrasonic cleaning machine)
Cummins Korea	• Turbo Charger/Engine Parts (for chemical cleaning)	• Supply
Samjeong Turbine	• Turbo Charger/Impeller (Air-cushion vehicle)	• Supply
LG Display	• Oven Coolers (Gumi P6E plant) • Heat Exchangers (M20-MFM) (Gumi 2/3 plant) (Plate Type) (Fluid-Side & Water-Side) • Heat Exchangers (Plate Type-Water-Side) & VP Condensers (Shell & Tube Type) (Gumi 4/5 plant) • PCW Heat Exchangers (Plate Type) (PCW-Side & Water-Side) (Gumi 4/5 plant/Paju P7/8 plant)	• Supply and repair service • Chemical cleaning for DI Membrane Filters • Chemical cleaning for chillers
	• Color Filter equipment (for washing PR/PI scale - as substitutes for IPA/Aceton, etc.) • Photo Resist equipment (for removing PR scale) • Photo Resist equipment (for removing the SiO₂ scale from the crystal plate)	• Supply (as alternatives to IPA, etc. for removing PI/PR/DI scale)
LG Electronics	• Air Compressor Coolers (Changwon #2 plant) (Shell & Tube Type) (Copper oxidized film & Water Scale) • Air Compressor Coolers (Changwon #1 plant) • Vacuum Pump (C & C division Changwon #1 plant) • Evaporators/Condensers/Sub-Coolers) (Anti-Rusting and Drying work)	• Supply and repair service • Chiller manufacturing business unit of LS Mtron has been emerged into LG Electronics
Samwha Electric	• Assembly line equipment (for removal of resin Impregnating (materials) scale) • Winding Machine (for removal of aluminum dust)	• Supply

Client	Equipment to be applied (for maintenance)	Type(supply/service)
LS Mtron	Chiller (evaporator/condenser) (Shell & Tube Type)	- Supply and repair services - Chemical cleaning for Chiller
LS Cable	- Extruder (Research Machine) (Cooling Water-Side) (Anyang R&D Center) - Hot Press Heat Exchanger (Anyang Plant) (Heat Transfer Oil-Side) - Sub Extruder (Cooling Water-Side) - Heat Exchangers (4 Units) (Plate Type) (Cooling Water-Side / Glycerin-Side)	Supply and repair service
Daesang	- Compressor porous resin filters - Compressor Inter-Coolers / After-Coolers (3 Units)	Supply and repair service
Incheon International Airport Energy	- GT RCA Coolers (Finned Tube Type) (2Units) (Water-Side & Fin-Side) - Oil Coolers (2 Units) (Shell & Tube Type) (Oil-Side)	- Supply and repair service - Performing cleaning service every year
Korea Hydro & Nuclear Power	- Machinery and Components (#1 power plant in Gori) - Pump Cage (to remove iron oxide from disc stacks) (#2 power plant in Uljin)	- Supply - Registered in Supplier Portal (KEPCO SRM)
LG Hausys	Cold Press Cooler (Cooling Water-Side) (Chungjoo plant)	Supply and repair service
Kumgang Corporation	Boiler Fan Coolers (20 Units) (Fin-Side)	Supply and repair service
Kolon Industry	- Resin Production Filter and Peripheral Equipment & Mechanic Seal Unit (to remove carbonized resin scale) - E-405 A/B/C Main Coolers & Sub Coolers (3 Units) (Shell & Tube Type) (Removal of medium (Dicyclopentadiene) Scale) - PR-1/PR-3/PR-5/PR-10/PR-11 Heat Exchangers in Production Process (Water-Side) (32 Units) (Ulsan plant)	- Supply and repair service (Ulsan & Yeosu plant) - Performing chemical service every year (Heat Exchangers (32 Units)) (Ulsan plant)
Lotte Chemical	- E-5502 Heat Exchanger (1 Units) (Plate Type) (Waste-Side) (Ulsan #1 plant) - PTA E-5103 A/B Heat Exchangers (2 Units) (Plate Type) (Waste-Side) (Ulsan #2 plant) - E-5501 A/S Heat Exchangers (2 Units) (Plate Type) (Waste-Side) (Ulsan #1 plant)	- Supply and repair service - Performing cleaning service every year
SK Chemicals	EGS Cooler (Plate Type) (EG-Side)	Supply and repair service
LG Chem	- Screw Freezer (1Set - 8 sides) (Finned Tube Type) (Fin-Side) (Battery Division in Ohchang plant) - Battery Production Process Carrier (Ultrasonic Cleaning) (Battery Division in Ohchang plant) - NCC Process Plate Heat Exchanger (Yeocheon plant)	Supply and repair service
S-Oil	- Inter-Coolers & After-Coolers (Shell & Tube Type) (Shell (Water)-Side) - Bearing Housing Cooling Jacket - Seal Oil Cooler (Cooling Water-Side) - Boiler Feed Pump Cooler (Cooling Water-Side)	Supply and repair service
KCC	- Condenser (Shell & Tube Type) (Shell (Water)-Side) (Ulsan plant) - Dispenser Jacket Cooler (Shell & Tube Type) (Shell (Water)-Side) (Ulsan plant)	Supply and repair service

Client	Equipment to be applied (for maintenance)	Type (supply /service)
Samsung Fine Chemicals	• Toner Production Process Equipment (Removal of carbonized scale) (Ulsan plant)	• Supply
Chinyang Chemical	• Heat Transfer Oil Cooler (Finned Tube Type) (Tube(Heat Transfer Fluids)-Side) • Roller (Boiler) (Water-Side)	• Supply and repair service
Korea Petrochemical Industry	• Plate Heat Exchanger (Ulsan #4 plant) • PP Production 4T-503 Distillation Tower (Ulsan #4 plant) • Extruder Jacket (Ulsan #5 plant)	• Supply
BASF Korea/ BASF India	• Vacuum Pump (BASF Pigment plant in Ulsan) • Styropor Plant Reactor Jacket (Removal of water scale from jacket cooling-side) (BASF India)	• Supply • Supplied chemical cleaning solution to Styropor plant in BASF India (Approved by BASF Global)
SKC	• Polyol Production Process Reactor/Filter (Ulsan plant)	• Supply
Wacker Chemical	• Polyol production process piping • Heat Exchanger (Polyol Production Process) (Plate Type)	• Supply
GM Korea	• Heat Exchanger (Plate Type) (Paint Medium-Side & Water-Side) (Paint Shop)	• Supply
Hanju	• Machinery/ Components (Removal of rust) • Equipment of refining salt production process	• Supply
DSME	• DSME-H3619 HIMSEN Engine Cooling Water System Line(Removal of rust)	• Supply (if needed for new ship under construction)
Hyundai Heavy Industry	• HIMSEN Engine Cooling Water System Line (Removal of rust & water scale) • Cleaning of new ship under construction (to remove the scale of rust and paint from ship's deck and bulkheads, etc.)	• Supply (if needed for new ship under construction; to replace a previously used products with a low cleaning performance)
GS-Pocheon Combined Heat & Power Plant	• Vacuum pumps and Heat Exchangers (Shell & Tube Type) (4 Units)	• Supply and service
GFC Building (Gangnam Finance Center)	• Building cleaning solution to remove the contaminants from the marble floor between the GFC building and the subway station	• Supply
SUDOKWON Landfill Bio Gas Power Plant	• Radiator of generators (5 Units) (Finned Tube Type)	• Supply and service
POSCO Kwangyang	• Heat Exchangers for collecting BTX, extracting rich oils (RO) and absorbing oils (AO) from the production process of cokes (8 Units)	• Supply
Korean Naval Repair Base	• Heat Exchangers (Cooling Water-Side) of Vessels (Plate Type/Shell & Tube Type) • Heat Exchangers (Oil-Side) of Vessels (Plate Type/Shell & Tube Type) • Ultrasonic Cleaning Machine (1 Unit) & Chemical Circulation with Bubble shot Machine (2 Units)	• Supply (incl. cleaning machines after accomplished project for verification of eco-friendly products & technology by R&D Project in 2015)

Chemical Cleaning Cases by Industry

1. Refinery · Petrochemical Industry



Cleaning of DCP Filter (Welding slag/Oxidized scale)

- ① The filter is a device for perfectly filtering an additive which is injected in a resin manufacturing process, wherein the pore size of the filter is $1\mu\text{m}$, $50\mu\text{m}$, respectively.
- ② The complete chemical cleaning work is required not only when removing pollutants generated during the operation of the device, but also because of the characteristics of the process of installing the new device.
- ③ As a case of chemical cleaning work that overcomes the limitations of physical work due to the complex internal structure of this filter, a method using chemical cleaning solution for manufacturing a new filter device is planned to be introduced in the future.



Cleaning of Plate Type HE (Scale of Monomer/Seawater)

- ① A chemical cleaning case for removing a monomer scale fixed to the inside of a heat exchanger in a resin production process, which has a very low efficiency of the heat exchanger due to the large amount of deposits.
- ② The circulation cleaning work is performed using the chemical solution (WSR-SW) to remove the mineral scale from the seawater side (cooling water-side).



Cleaning of Polymer Feeder Parts

- ① It's required to have a considerable amount of time when cleaning hard polymerized materials that are difficult to remove by applying general cleaning liquid solution.
- ② Pollutants from these polymer compounds often occur in various equipment or parts (e.g., in the pipe connection parts such as Bellows).



Cleaning of Compressor Turbo Impeller & Shaft

- ① Complete removal of unburned carbons from impeller and of rust from shaft.
- ② After heating the RR-R cleaning solution at 50°C , the agitating work is performed by using an air compressor to perform cleaning work; the remaining scale is washed by a high pressure water jet, and finally drying process executed.



Cleaning of Drum Cooler

- ① Corrosion and cooling water deposits remain inside the cooler and have a direct effect on the quality of the product by temperature deviation.
- ② Cleaning work for 8 hours after heating at 60°C by applying WSR-HL (concentration rate of 30%).
- ③ After cleaning operation, the circulation water amount is increased four times, and the temperature deviation between measuring points is improved to 2°C within.



Cleaning of Air Cooler (Finned Tube Type)

- ① Cleaning work is executed with the spray method, heating the washing solution heated to 50°C (actually 24°C).
- ② Completely cleaned after checking the state of heavily contaminated parts.



Cleaning of Pump Seal Cooler

- ① Cooling efficiency is lowered by cooling water deposits accumulated in the equipment, which are hard to remove by existing manual repair method.
- ② The results of the cleaning work with higher satisfaction than the conventional repair were obtained by conducting the circulation work condition (WSR-FW concentration rate of 30%, temperature 30°C, cleaning time 100 minutes).



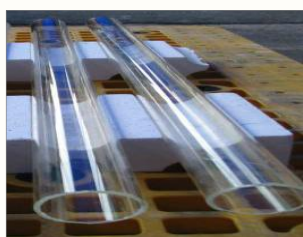
Cleaning of Heat Exchange with carbonized Heat Transfer Oil

- ① Accumulated carbonized sludge which is thermally decomposed in the equipment due to the high temperature and long-time operation.
- ② The scale is completely dissolved for 4 hours at a temperature of 65°C using the newly developed cleaning solution.



Cleaning of Jacket Cooler

- ① Cooling system blocked up the water circulation by contaminants.
- ② The circulation cleaning work is practiced to the condition (WSR-HL concentration rate of 25%, temperature 50°C, cleaning time 4 hours), and so the contaminants of the jacket cooler are completely removed and the jacket cooler is restored to its original form).



Cleaning of APH (Waste Heat Recovery System)'s Glass Tube

- ① Cleaning of the SiO_2 scale of unburned carbon and ash deposited on the glass tubes in the waste heat recovery system.
- ② The circulation cleaning work is performed to the working condition (OCSR-SI concentration rate of 25%, temperature room temperature~50°C, cleaning time 20~30 minutes), and so the scale on the glass tube is thoroughly removed.



Removal of Resin Scale from Heat Exchanger to be cleaned

- ① The solid resin materials attached to the cooling coil of reactor should be removed after production for one week with 8 hours of batch process every day.
- ② The circulating cleaning operation is executed with the working condition (PSR-100M concentration rate of 50%, working temperature 65°C, cleaning time 2 hours), so that the resin solid materials are peeled off and removed from the reactor.



Removal of PTA Waste Scale from Plate Type Heat Exchanger

- ① Cooling efficiency is lowered by PTA waste scale accumulated in the heat exchanger, which is hard to remove by existing manual repair method with the previously applied chemical solution.
- ② The circulation cleaning work is executed under the cleaning condition (PSR-PTA concentration rate of 25%, temperature of 60°C, cleaning time 6 hours), and so that the contaminants are completely removed.



Cleaning of Shell & Tube Type Heat Exchangers (32 Units)

- ① Cooling efficiency decreases due to water scale and rust accumulated in Cooling-Side of heat exchangers.
- ② Chemical cleaning operation for 32 heat exchangers is executed with WSR-FW concentration rate of 30% for 6 days during overhaul period every year. The thermal efficiency of heat exchangers has been significantly improved.

2. Steel·Non-ferrous metal Industry



Cleaning of Heat Exchanger for cold rolling oil

- ① Removal of the cooling water scale from the Water-Side and rolling oil scale from the Oil-Side in the heat exchanger.
- ② The WSR-FW for Water-Side and OCSR-HE for Oil-Side were circulated with a concentration rate of 30% for 5 hours at 50 °C, so that the contaminants are removed from the heat exchanger.



Cleaning of Shell & Tube Type Heat Exchanger

- ① Removal of oxidized film and other deposits from the Shell-Side.
- ② Firstly, after 4~8 hours immersion cleaning work is practiced in the RR-R solution (concentration rate 20~50%, and the cleaning temperature 25~60°C), and then the remaining scale is eliminated by using the high pressure water jet. All contaminants are completely removed, without damage to the substrate of the heat exchanger.



Cleaning of Finned Tube Type Gas Cooler

- ① Removal of zinc powder scale from the gas cooler.
- ② The cleaning process is performed using the high pressure water jet with OCSR-AC cleaning solution with a concentration rate of 25~30% at a ambient temperature.



Cleaning of Compressor (Inter-Cooler & After-Cooler)

- ① Removal of water-mud scale from Shell-Side (Tube Bundle).
- ② As an example of greatly improving the effectiveness and efficiency of excellent cleaning work, total cost ownership is secured (the economic effect of 3.9 times the investment of chemical cleaning work is achieved).



Cleaning of Inter-Cooler and After-Cooler

- ① Removal of the oxide film scale from the Fin-Side which is equipped in tube inside of inter-cooler and after-cooler.

3. Utility Industry



Chemical Circulating Cleaning in the Shell & Tube Type Heat Exchanger in Coal-fired Power Plant

- ① Removing the scale of copper oxide film and cooling water scale in Shell-Side, which is made of copper and copper alloy.
- ② Circulating the cleaning solution with a concentration rate of 25% for 4 ~ 8 hours at a ambient temperature ~ 50 °C.



Cleaning of thermo-oxidized Boiler Tube in Coal-fired Power Plant

- ① Peeling off the thermo-oxidized layer of the boiler tube inner wall in the cleaning solution.
- ② The thermo-oxidized scale is completely removed through the immersion cleaning operation at a temperature of 25 °C for 90 minutes, or at a temperature of 50 °C for 30 minutes in SR-100 cleaning solution.



Removal of seawater mud scale from the measuring equipment piping system in Nuclear Power Plant

- ① The instrument is not normally operated because the seawater mud is deposited inside the connection pipe.
- ② The seawater mud scale is discharged by carrying out the circulation with WSR-MUD chemical cleaning solution.



Cleaning of Cross Cooling Water Exchanger in Coal-fired Power Plant

- ① Removal of oyster, shell and mud scale from the heat exchanger using seawater as cooling water.
- ② Circulating the WSR-SW cleaning solution at a concentration rate of 25-50% and a temperature of 40-50 °C for 4-8 hours.

4. Shipping · Shipbuilding · Heavy Industry



Cleaning of Lubricating Oil Purifier Heater in Engine Room

- ① Removal of carbonaceous lubricating oil deposits from the purifier heater.
- ② Circulating OCSR-HE cleaning solution with a concentration rate of 50% at a temperature 70-80 °C for 2-4 hours, and so thermal efficiency of heater is enhanced and the repair time is reduced.



Cleaning of Fuel Oil Filter for Main Engine in Ship

- ① Removal of carbonized fuel oil scale from the fuel oil filter element.
- ② Immersion cleaning in the Ultrasonic cleaning machine using OCSR-F detergent with a concentration rate of 25% at a temperature of 70-80 °C. for 1-4 hours.



Cleaning of Fin-Side of Main Engine Air Cooler

- ① Removal of oxide film and unburned carbonized oily contaminants from Fin-Side made of copper alloy.
- ② Spray cleaning method is applied using OCSR-AC cleaning solution with a concentration rate of 25% at 60 ~ 70 °C for 5 hours.



Cleaning of Turbo Charger & Engine Parts

- ① Removal of large amounts of oily carbonized scale from engine components made of aluminum, special steel, iron alloys and titanium metals.
- ② Immersion cleaning method is applied with OCSR-E solution with a concentration rate of 25% at a temperature of 50 ~ 90 °C for 30 minutes to 4 hours using the ultrasonic cleaning machine.



Cleaning of Plate Type Heat Exchanger (seawater and fresh water as cooling water)

1. Removal of hardness salt and rust scale from Plate Type Heat Exchanger (Central Cooler, Fresh Water Generator)
2. Circulating the WSR-SW cleaning agent with a concentration rate of 25% at a temperature of 50°C for 2~4 hours (Inspection of cleaning result before and after application).



Cleaning of Chiller Cooper Tube

- ① Removal of cooper oxidized film and rust from the chiller tube.
- ② Immersion method is used for cleaning the cooper tube using RR-R detergent with a concentration rate of 30% at a ambient temperature for 10-30 minutes without damage to cooper tube to assure cleaning and damage to the substrate of tube.



Cleaning of Chiller (Evaporator/Condenser)

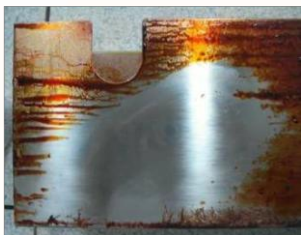
- ① Removal of rust from the evaporator and condenser.
- ② Firstly, circulating RR-R cleaning solution with a concentration rate of 30% at a temperature of 50-55°C for 6 hours to eliminate rust and contaminants, and then drying process with steam and refrigerant is executed in order.



Cleaning of Railway Compressors (After-Cooler)

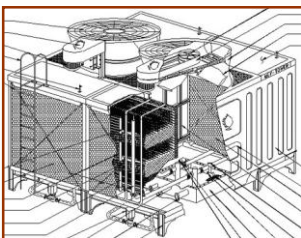
- ① Removal of oily carbonized scale, which is generated by passing high temperature compressed air mixed with oil, from the tube-side of the compression cylinder.
- ② Complete cleaning with RR-RO detergent by immersion method.

5. Hi-Tech Industry



Cleaning of PI/PR scale of Color Filter and Photo Resist Process Equipment in Display Industry

- ① Eco-friendly water-based alternatives to cleaners such as IPA, Aceton, etc. to remove PI/PR scale.
- ② The cleaning performance of PSR-EC solution at a concentration rate of 30% is excellent and more safe, compared to the cleaners such as IPA, Aceton, etc. which are to be widely applied.



Cleaning of Cooling Tower

- ① Removal of many kinds of scale such as rust preventives, corroded metals and salts from the cooling tower.
- ② Circulating of WSR-CT cleaning solution at a concentration rate of 30% for 8 hours at a ambient temperature, without damage to the substrate made of cooper, aluminum, etc.



Cleaning of Condenser Parts made of Aluminum

- ① Removal of zinc and aluminum powder, oily contaminants from condenser parts to substitute TCE to be widely used.
- ② Firstly, immersed in the cleaning bath with ONSR-ECS nonaqueous solution with a concentration rate of 30% at a temperature of 50-60 °C for 60 seconds, and finally dried after rinsing with water.



Chemical Cleaning of Printed Circuit Board (PCB)

- ① PCB is immersed in the cleaning bath of ultrasonic cleaning machine with ONSR-ECS nonaqueous solution at a temperature of 50-60 °C for 60 seconds.



Cleaning of Extruder Cooling System

- ① The cooling water line of the extruder is blocked with contaminant, and so the cooling water flows irregularly.
- ② Confirmed an increase of the water flow quantity after the circulation cleaning operation.



Cleaning of Hot Press using Heat Transfer Oil

- ① The denatured carbonized heat medium oil residue is deposited inside the hot press under the high temperature state of about 280°C.
- ② The circulation cleaning operation with OCSR-HE chemical solution in a concentration rate of 50% for 2~4 hours per line at a temperature of 70 to 80°C is performed, so that the amount of circulating quantity to be measured is secured.

6. Food & Beverage Industry



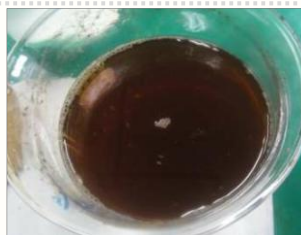
Cleaning of Production Line for frozen Food Products

- ① The food waste to be burned is firmly adhered to the outside of valves and deposited in the inside of piping wall.
- ② Spray cleaning operation using high pressure water jet to remove scale from pipe and valve with the chemical solution at a temperature of 50°C for about 4~6 hours is carried out, so the valves and pipes is renewed to the original form.



Dissolution Test of Scale of Cleaning of Chiller (Evaporator and Condenser)

- ① Dissolution test of the scale composed of calcium, magnesium, etc. is executed without damage to the zinc substrate of the equipment.
- ② Based on the test result, spraying method is performed with RR-RZ solution in a concentration rate of 30% at a ambient temperature for 8 hours.



Cleaning of Process Equipment in Sugar Production Plant

- ① Melting test is carried out by immersing 7g of scale accumulated in the equipment in 500ml of undiluted WSR-HL solution.
- ② Based on the test scale completely dissolved for 2 hours at a ambient temperature, the cleaning work is effectively executed.

7. Other Cases



Cleaning of the Water Supply Piping System in the deteriorated Apartment Building

- ① Due to the scale accumulated in the tap water pipe of the apartment complex, the cleaning work is necessary.
- ② Circulating cleaning operation with RR-R solution in a concentration rate of 30% for 15 hours at a temperature of 50~60 °C is carried out, following by rinsing with water to discharge the dissolved residues completely.



Cleaning of Sprinkler Piping System in Airport

- ① The water supply is impossible due to plugging in the pipe inner wall, in which the deposits are accumulated.
- ② Immersion cleaning with RR-RO solution in a concentration rate of 25% at a temperature of 50~60 °C for 20 minutes is carried out, and so the contaminants of 95% or more are removed.

Types of Scale and Contaminants

The Type of Industrial Water Scale



Lime Scale



Silica & Mud Scale

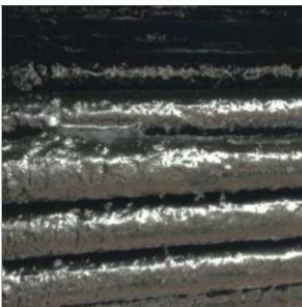


Slime



Seawater Scale

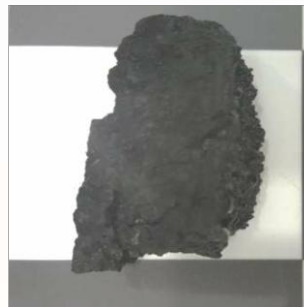
The Type of Carbonized Oil Scale



Heavy oil



Cokes Scale



Carbonized Tar Scale



Crude Oil

Type of Petrochemical Polymer·Monomer Scale



Synthetic Resin



Polymer Powder



PVC Raw Material



Epoxy Scale



Oligomer



Polycarbonate



Styrene Monomer



Polyester Scale

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