ULTRANODE

ULTIMATE SOLUTION FOR WATER DISINFECTION

ELECTROCHLORINATION SYSTEM

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ELECTROCHLORINATION PLANT

ON-SITE SODIUM HYPOCHLORITE GENERATION SYSTEM

INTRODUCTION

ULTRANODE, an ISO 9001:2018, 14001:2018 issued company, was founded by an international research group of skilled engineers with years of experience in Electrochemistry. At the beginning ULTRANODE was mainly focused on the Electrochlorination and Water Disinfection. Developing the technology of MMO (mixed metal oxide) coating for the Anodes of the Electrolyzers paved the road for the manufacturing of Brine and Seawater Electrochlorination Packages, Skids and Plants. ULTRANODE is among the limited number of Electrochlorination companies that have the technology of MMO anodes, with the highest quality.

ELECTROCHLORINATION

The electrochemical process of conducting a direct electrical current (DC) through the seawater or brine (salt water) to generate sodium hypochlorite is known as Electrochlorination. Normally, the sodium hypochlorite solution less than 1% of free chlorine that is considered non-hazardous to humans by health organizations. However, this low concentration yet removes pathogenic organisms such as viruses, bacteria, and other harmful microorganisms present in the water.

In more details, Salt is composed of Sodium (Na) and Chloride (Cl-). When DC is passes through titanium electrodes, the following steps happens one after another:

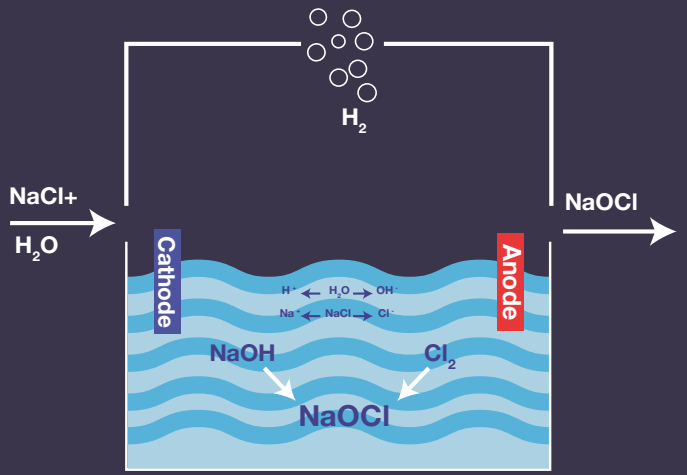
1. At the **MMO Anode**: Oxidation of Chloride (Cl-) to produce chlorine (Cl2).
2. At the **Cathode**: Reduction of water to produce Sodium Hydroxide (NaOH) and Hydrogen (H2)
3. Liberated chlorine (Cl2) reacts with the Sodium Hydroxide (NaOH) to produce Sodium Hypochlorite (NaOCl) instantaneously.

Electrochlorination is considered highly effective technique for water disinfection. Unsurprisingly, it's used worldwide to treat the cycling water from a home capacity Electrochlorination units to huge industrial plants.

$$NaCl\ (salt) + H_2O\ (water) \longrightarrow NaOCl\ (hypo) + H_2\ (hydrogen)$$

The overall reaction, sustained by electrical energy.

SODIUM HYPOCHLORITE (NaOCl) DISINFECTANT



USING CHLORINE GAS? THINK AGAIN!

Chlorination helped to eradicate the spread and contamination of various water related diseases and viruses in the 2nd decade of 20th century. This technology was so successful that it earned the title of “the most significant public health advance”. But the **Chlorine** gas was a flammable, toxic, and Explosive gas. Transportation and handling of the **Chlorine** cylinders was hefty and dangerous even for educated laborers. Therefore, new technologies were introduced to replace the chlorination but with same efficacy. Among these solutions Electrochlorination was among the most safe and economical technological solutions. At ULTRANODE we are focused on this solution for disinfection to help industries and municipal offices to conduct a safe water disinfection.

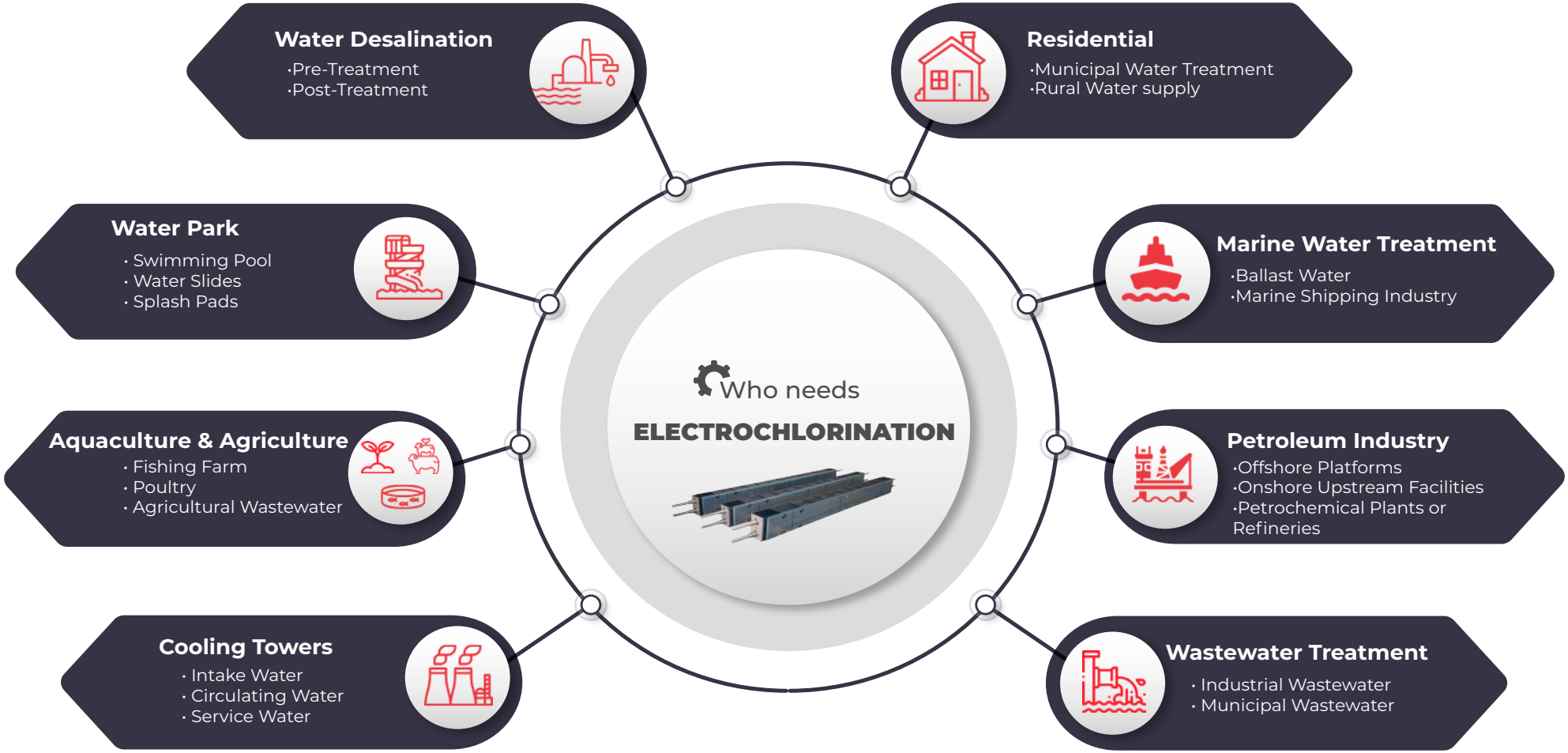
Unlike other chlorination methods, such as **Chlorine GAS** or commercial hypochlorite solutions, Electrochlorination does not require staff to handle hazardous chemicals in high concentrations. All is needed is Salt, Water and Electricity. The resultant Sodium Hypochlorite could be injected to the line directly or be stored for future disinfection operations as might be needed.

KADENA AIR BASE, Okinawa , Japan (June 22, 2020)

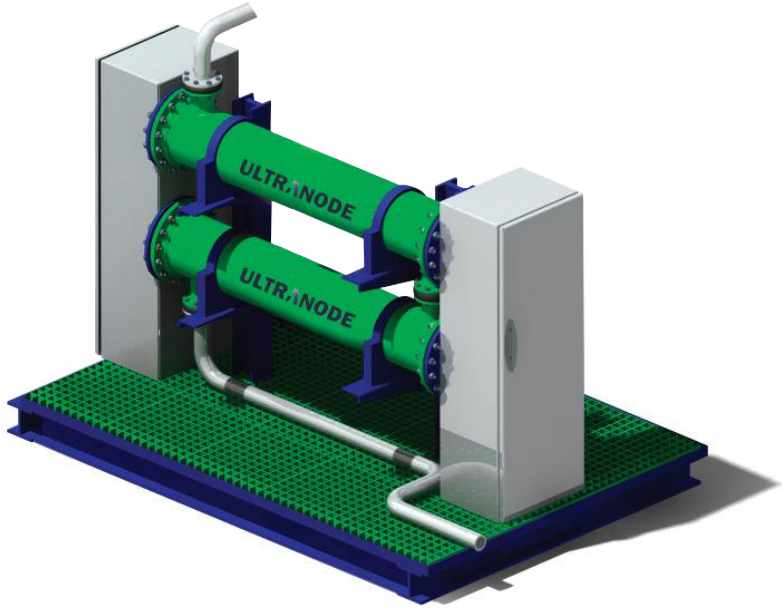
ELECTROCHLORINATION ADVANTAGES

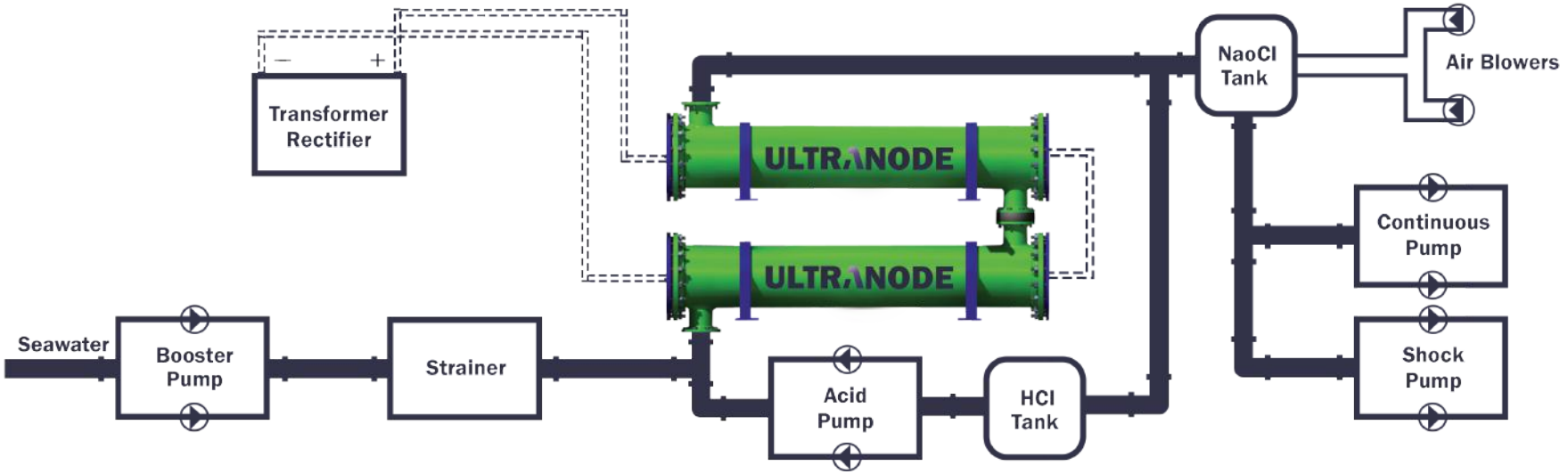
- Accessible and simple Inputs are the salty water (either brine or seawater) and Electricity.
- Instantaneous production of sodium hypochlorite solution as a powerful disinfectant eliminates the challenging procurement, risky transportation, and hazardous bulk storage of chlorine gas and various disinfection additives.
- Access to fresh disinfectant, Sodium Hypochlorite, at any time and volume.
- Reliability of the entire disinfection system as it is Non-hazardous and Easy handling for operators/personnel.
- Prevents the macro-fouling growth and receding corrosion potential. In detail, the smooth and turbulence-free flow discourages the corrosion/erosion of the pipes and pumps.
- Lower friction pipe surfaces means that flow rate efficiency will be improved. Hence, pumps, screens, heat exchangers and other flow equipment's life will be extended. Being so, the plant requires minimal maintenance and will propose longer service life.
- Nurturing Greener World and being Environmentally Sustainable is the core of this technology. In nutshell, Hypochlorite is a powerful biocide that eventually decomposes back to chloride ions and oxygen, both not hazardous to environment.
- Electrochlorination plants, could be designed in Small packages to help the out of reach areas regarding the quality of their waters.
- This technology is capable of engaging with Solar panels to disinfect water in rural areas where power/electricity is not available.

APPLICATIONS



CLASS UL-SW
(SEAWATER TYPE)



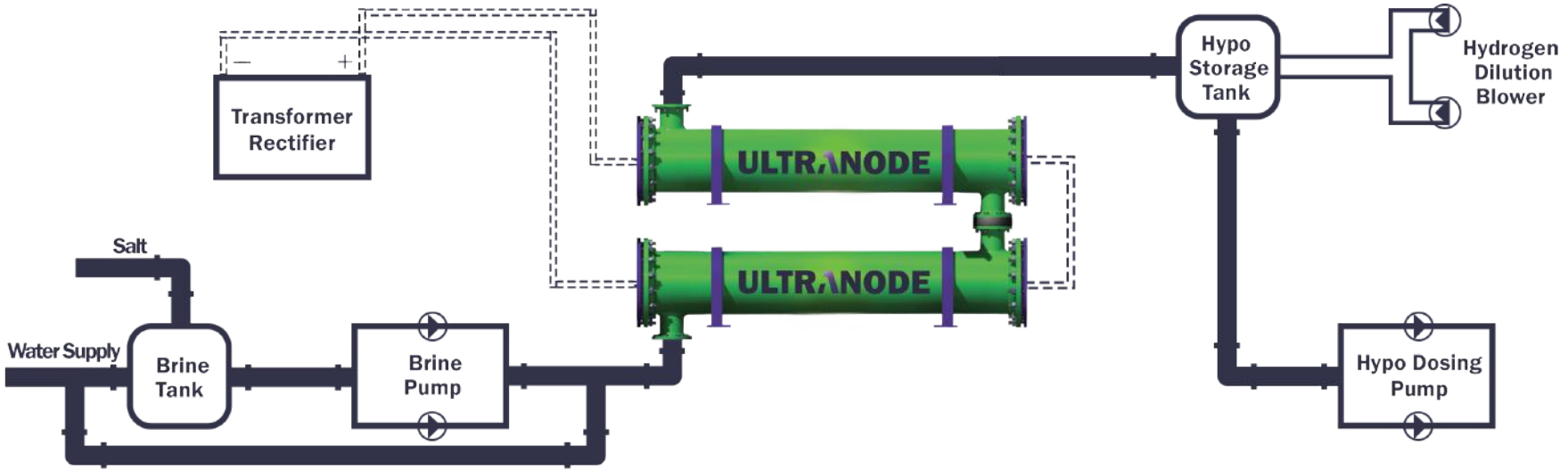


SEAWATER ELECTROCHLORINATION

MODEL	PRODUCTION ($kgCl_2/h$)	AMOUNT OF SEAWATER TO BE TREATED AT 2ppm (m^3/h)	OUTPUT CONCENTRATION (ppm)	SEAWATER FLOWRATE (m^3/h)	ELECTRICITY CONSUMPTION ($kWh/kgCl_2$)
UL-SW-0005	5	2500	2000	2.5	4.5
UL-SW-0010	10	5000	2000	5	4.5
UL-SW-0020	20	10000	2000	10	4.5
UL-SW-0040	40	20000	2000	20	4.5
UL-SW-0060	60	30000	2000	30	4.5
UL-SW-0080	80	40000	2000	40	4.5
UL-SW-0100	100	50000	2000	50	4.5
UL-SW-0140	140	70000	2000	70	4.5
UL-SW-0180	180	90000	2000	90	4.5
UL-SW-0200	200	100000	2000	100	4.5
UL-SW-0400	400	200000	2000	200	4.5
UL-SW-0800	800	400000	2000	400	4.5
UL-SW-1000	1000	500000	2000	500	4.5

Notice: The capacities could be customized based on your requirements

CLASS UL-BR
(BRINE TYPE)



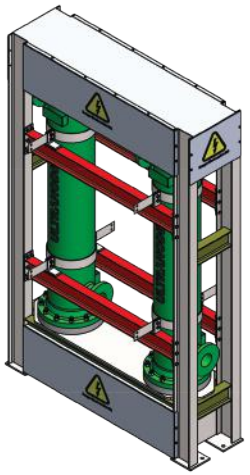
BRINE ELECTROCHLORINATION

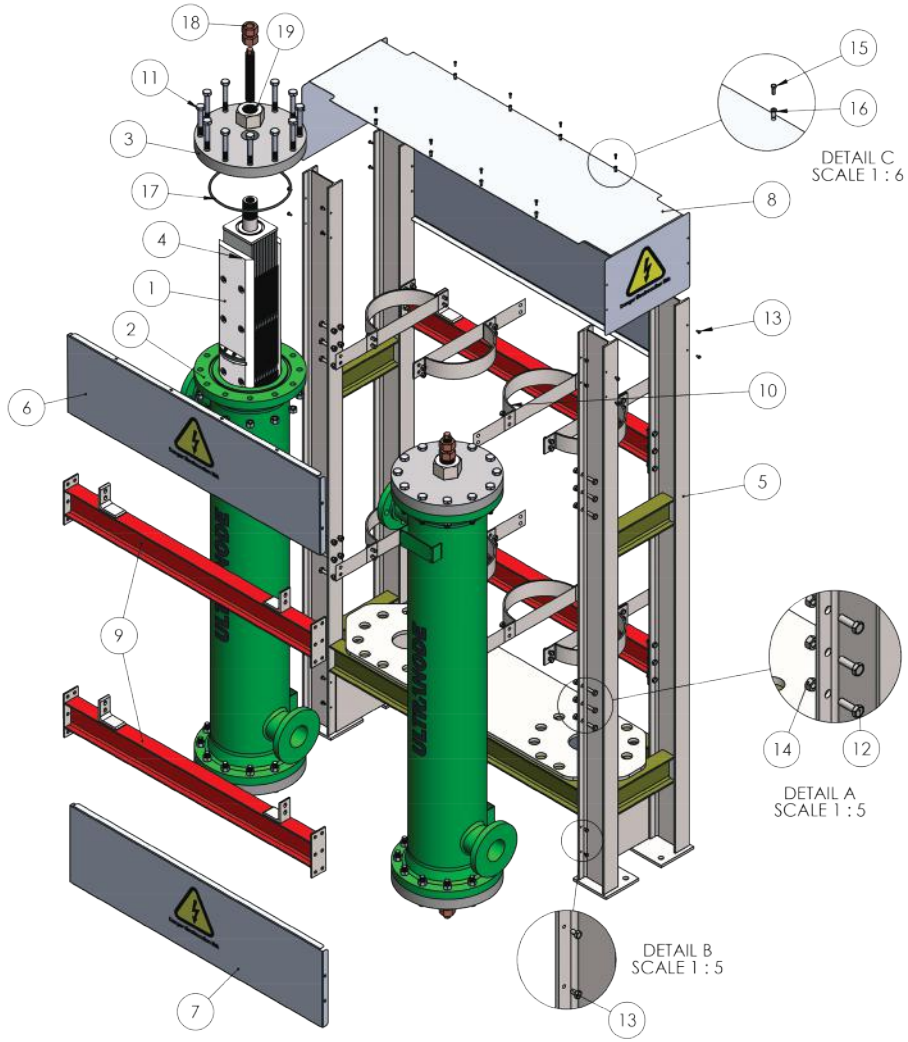
MODEL	PRODUCTION ($kgCl_2/h$)	AMOUNT OF PROCESS WATER TO BE TREATED AT 1ppm (m^3/h)	OUTPUT CONCENTRATION (ppm)	BRINE FLOWRATT (lit/h)	ELECTRICITY CONSUMPTION ($kWh/kgCl_2$)
UL-BR-0.1	0.1	100	8000	12.5	4.8
UL-BR-0.5	0.5	500	8000	62.5	4.8
UL-BR-01	1	1000	8000	125	4.8
UL-BR-05	5	5000	8000	625	4.8
UL-BR-10	10	10000	8000	1250	4.8
UL-BR-20	20	20000	8000	2500	4.8
UL-BR-30	30	30000	8000	3750	4.8
UL-BR-40	40	40000	8000	5000	4.8
UL-BR-50	50	50000	8000	6250	4.8
UL-BR-100	100	100000	8000	12500	4.8

Notice: The capacities could be customized based on your requirements

SEAWATER ELECTROCHLORINATION

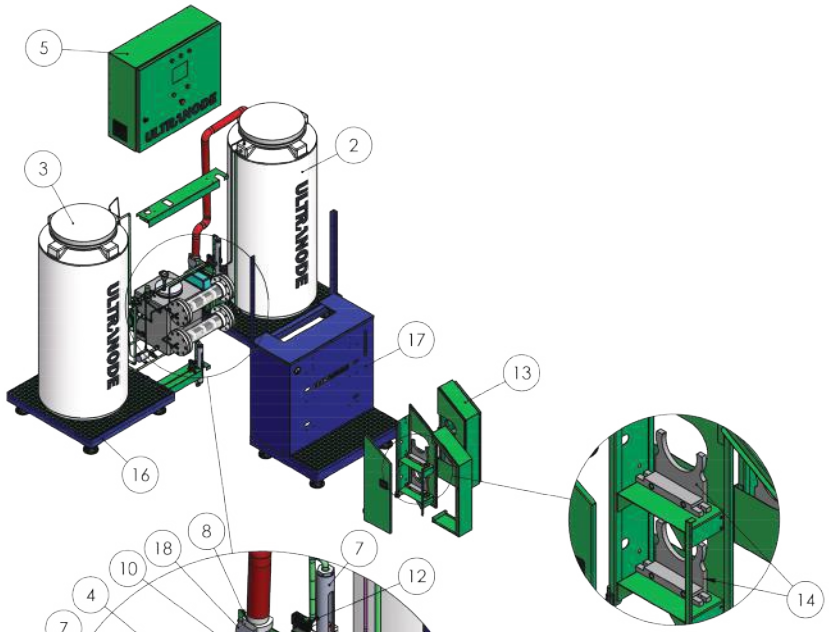
ITEM NO.	PART NAME
1	ELECTROLYZER
2	SPOOL
3	BLIND FLANGE
4	BLIND FLANGE O-RING
5	SKID STRUCTURE
6	UPPER DOOR
7	BOTTOM DOOR
8	UPPER SHEET
9	HOLDER BEAM
10	SADDLE
11	BOLT, M16x110
12	BOLT, M6x25
13	BOLT, M6x10
14	LOCK NUT, M6
15	BOLT, M5x14
16	RIVET, M5
17	TERMINAL O-RING
18	COPPER NUT, M30
19	STEEL NUT, M48





The electrolyzers could be designed and installed vertically or horizontally, depending on your condition.

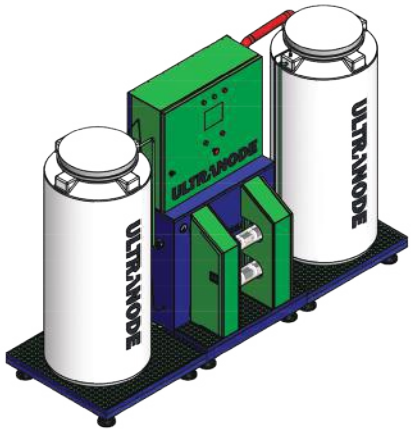
BRINE ELECTROCHLORINATION



DETAIL B
SCALE 1 : 10

DETAIL A
SCALE 1 : 10

ITEM NO.	PART NAME
1	ELECTROLYZER
2	DEGASSING TANK
3	SALT SATURATOR TANK
4	ACID TANK
5	ELECTRICAL PANEL
6	REGULATOR
7	FLOW METER
8	FAN CONNECTOR
9	BRINE DOSING PUMP
10	HYPOCHLORITE DOSING PUMP
11	ACID PUMP
12	SOLENOID VALVE
13	TERMINAL PROTECTOR
14	CLAMP
15	GRATING
16	CHASSIS
17	INSTRUMENTS PROTECTOR
18	AIR FAN



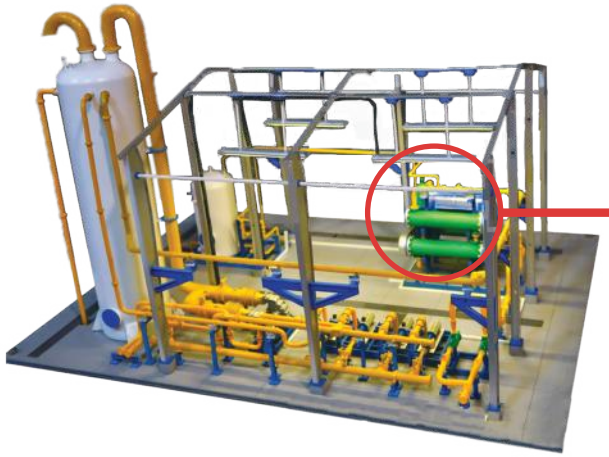
The electrolyzers could be designed and installed vertically or horizontally, depending on your condition.

What We Do?

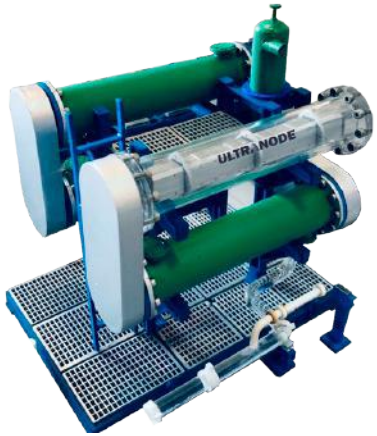
A to Z

The scope of our Job

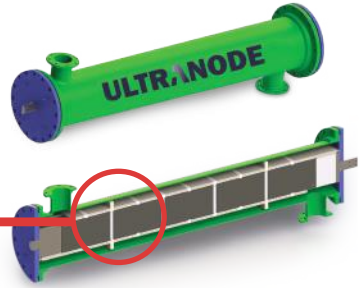
1. Feasibility Study
2. Design and Engineering
3. Manufacturing
4. Installation & Commissioning
5. Operation & Maintenance
6. Refurbishment and recoating of Electrodes
7. Electrode, and electrolyzer cells Replacement equivalent to other OEM electrolyzer cells.
8. Replacement of chlorine gas based



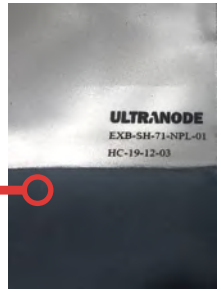
ELECTROCHLORINATION PLANT
EPC-TURNKEY



ELECTROCHLORINATION PACKAGE (GENERATOR)
SKID MOUNTED



AN ELECTROLYZER CELL



AN ANODE PLATE (ELECTRODE)

MIXED METAL OXIDE COATING (MMO)

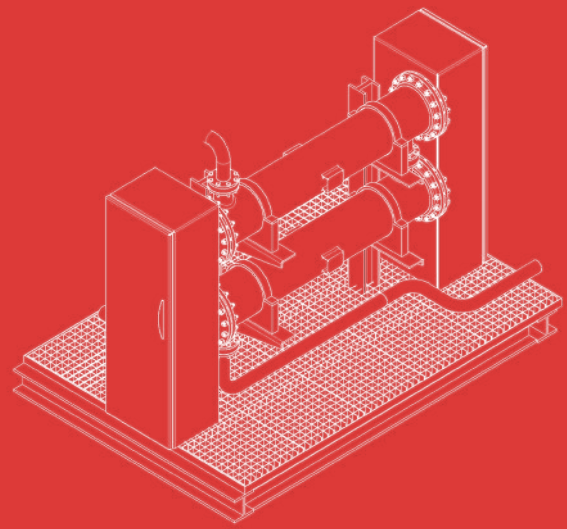
ULTRANODE PROPOSES EPCC SOLUTION:

Engineering

Procurement

Construction and

Commissioning services



UMMO

A MIRACLE OF METALS

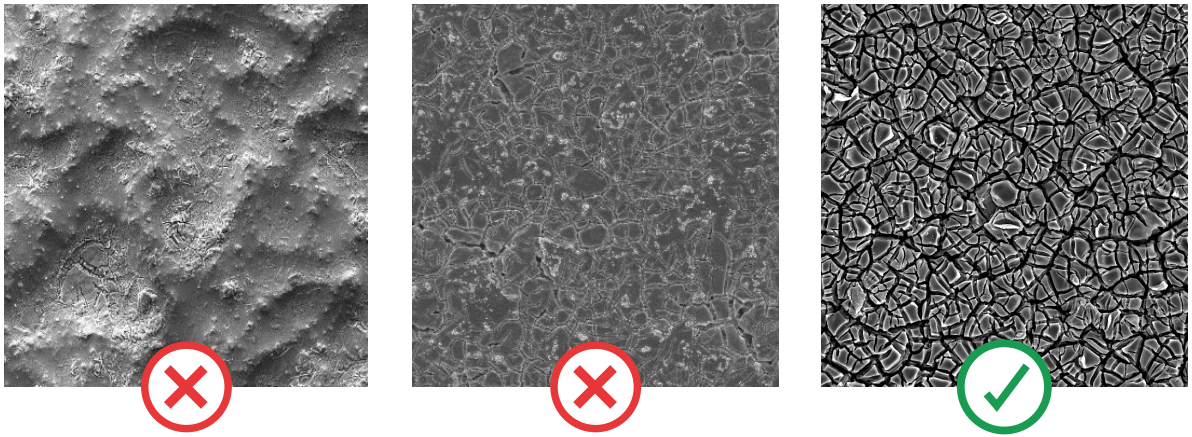
At ULTRANODE, we are honored to manufacture MMO (MIXED METAL OXIDE) anodes under the trademark of UMMO. It is well known that MMO anodes are the beating heart of any Electrochlorination plan. UMMO is constructed of a titanium substrate and a special mixed metal oxide coating. This coating improves the longevity and efficacy of the Anodes against the corrosion of the Electrolysis process.

MMO anodes are incorporated inside the cells with particular design and order to get the capacity.

Our UMMO are guaranteed up to 5 years of high efficiency.

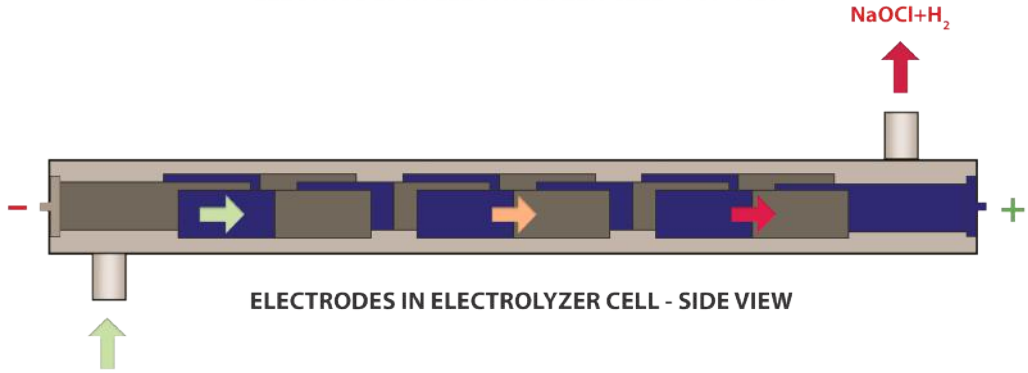
MODEL	SEA WATER CLASS UL-SW	BRINE CLASS UL-BR
EXPECTED MMO ANODE LIFETIME	5 – 9 YEARS	7 – 10 YEARS

SPECIFIC MMO COATING - HIGH EFFICIENCY



SEM MAG: 1.00 kx / WD: 3.66 mm / View Field: 207 µm / Det: InBeam / BI: 7.00

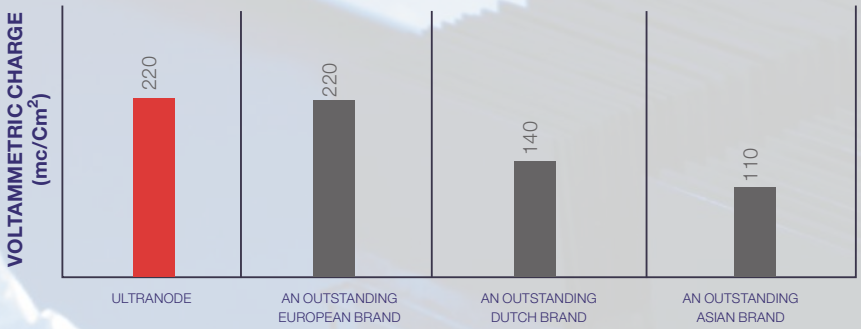
ELECTRODES IN ELECTROLYZER CELL - TOP VIEW



ELECTRODES IN ELECTROLYZER CELL - SIDE VIEW

COMPETITIVE ADVANTAGE

VOLTAMMETRIC CHARGE (mc/Cm^2) EFFICIENCY CRITERION



ACCELERATED LIFETIME (hr) INSPIRED BY NACE TM-0108 AND PROCEDURES

MODEL	SEA WATER CLASS UL-SW	BRINE CLASS UL-BR
FREE CHLORINE CONCENTRATION	UP TO 2000 PPM	UP TO 8000 PPM
CHLORINE PRODUCTION CAPACITY	0.05 TO 70 kgCl_2/h (FOR AN ELECTROLYSER CELL)	
POWER CONSUMPTION	3.8 - 5.0 kWh/ kgCl_2 (DC)	
WATER CONSUMPTION	SEA WATER	min 125 lit/kgCl_2 (FRESH WATER)
SALT CONSUMPTION	NO SALT REQUIRED	3.5 kg (NaCl/ kg Cl_2)

SERVICES

Reliable
WATER ENGINEERING
solutions

Laboratory Testing

Based on your customized anode accelerated life Test analysis of the coated anodes, technical reports conforming ASTM and various standards will be issued.

Consultancy/ Adviserships

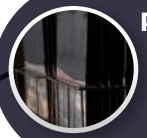
Our professional consultancy services open doors for your striking improvements.

Technical Training

We extend your knowledge, improve product handling and operator performance by holding seminars/-courses for the personnel.

Recoating and Refurbishment

We ensure the maximum performance and longevity of your plant by electrode refurbishment /recoating or electrode replacement.



Virtual Reality Simulation

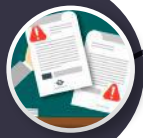
VR experience significantly saves costs and time. Our technology helps you with decreased replanning, and reworks. VR provides you with remote access to the site for any pre-inspection.

Onsite Inspection

We conduct an on-site inspection for your Electrochlorination plants to analyses whole-plant performance.

Operation and Maintenance agreement

We are responsive to your unforeseen requests via an inventory of critical components resulting in your O&M cost reduction.



Technology Retrofitting

By utilization of our latest generation technology, your outdated disinfection technology will be replaced/updated.

POST SALES SERVICES

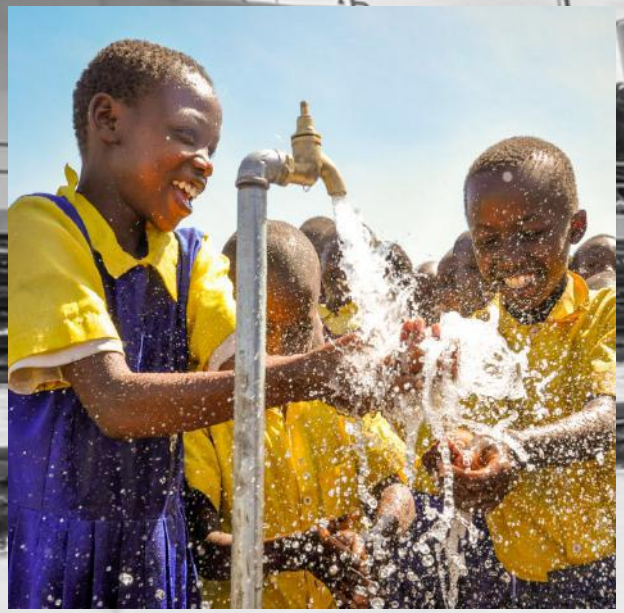
- Regular training service/seminars held for staff and customers.
- All of our plants are supported by the ULTRANODE service team and local engineering partner.
- Spare parts are available for immediate delivery.
- Our factory performs full acceptance testing on 100% of the equipment we manufacture prior dispatching to the site.
- Depending on the working conditions, if requested, periodic inspections of the whole package will be done.

GUARANTEE TERMS

- Cells are fully guaranteed regarding the design, manufacturing, and performance up to 5 years.
- Defects of equipment (supplied by ULTRANODE) attributable to the failure in our design or workmanship will be covered by our supply of substitutes.
- Guarantee of 12 months after commissioning or 18 months after delivery time for each equipment, whichever comes earlier.
- ULTRANODE provides services for any condition that might arise during the installation and commissioning stages.
- Instruction manuals including operation, maintenance and preservation manual will be given in order to have a proper equipment operation/maintenance.

SOCIAL RESPONSIBILITY

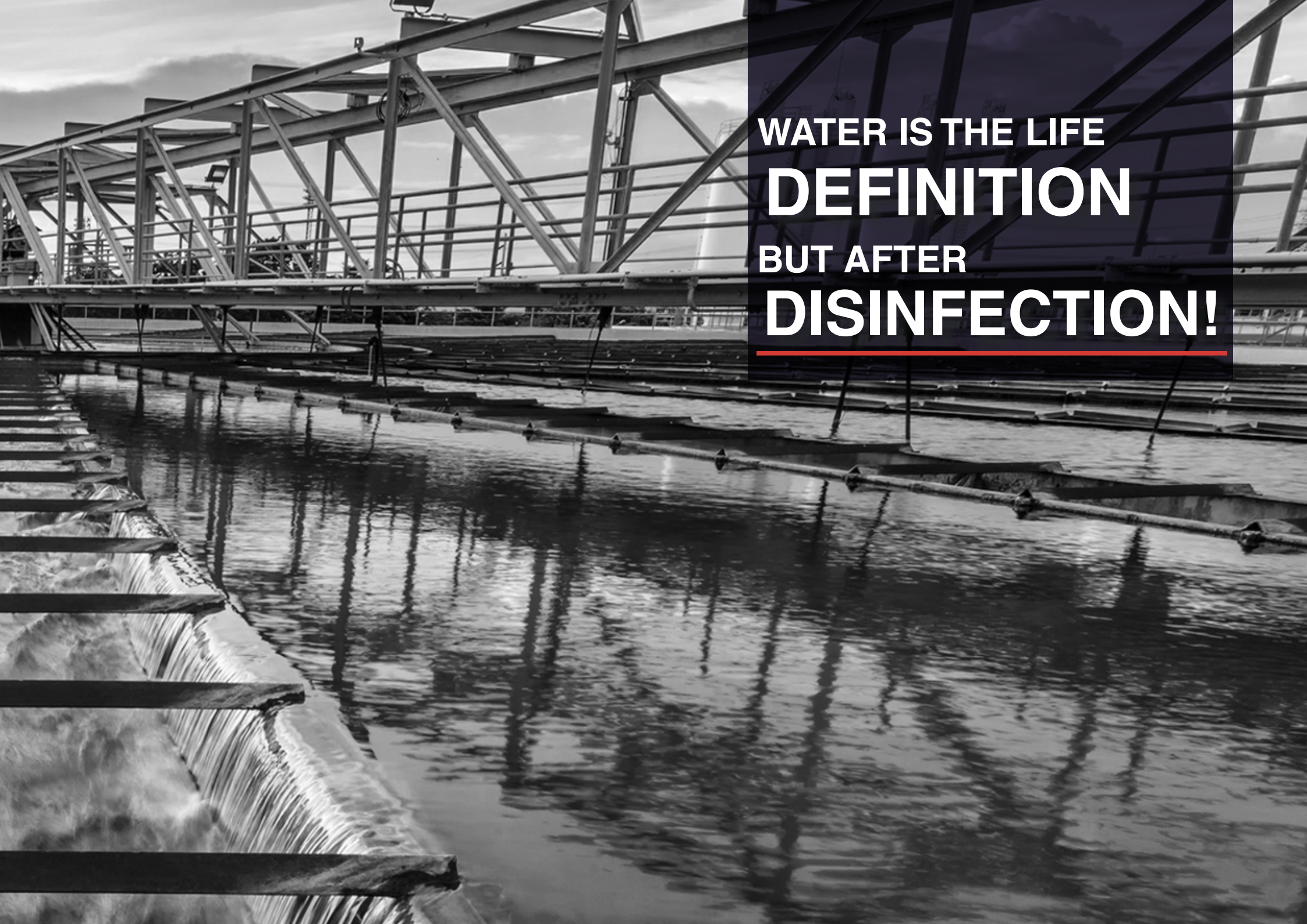
BUSINESS IS NOT ALWAYS ABOUT BUSINESS

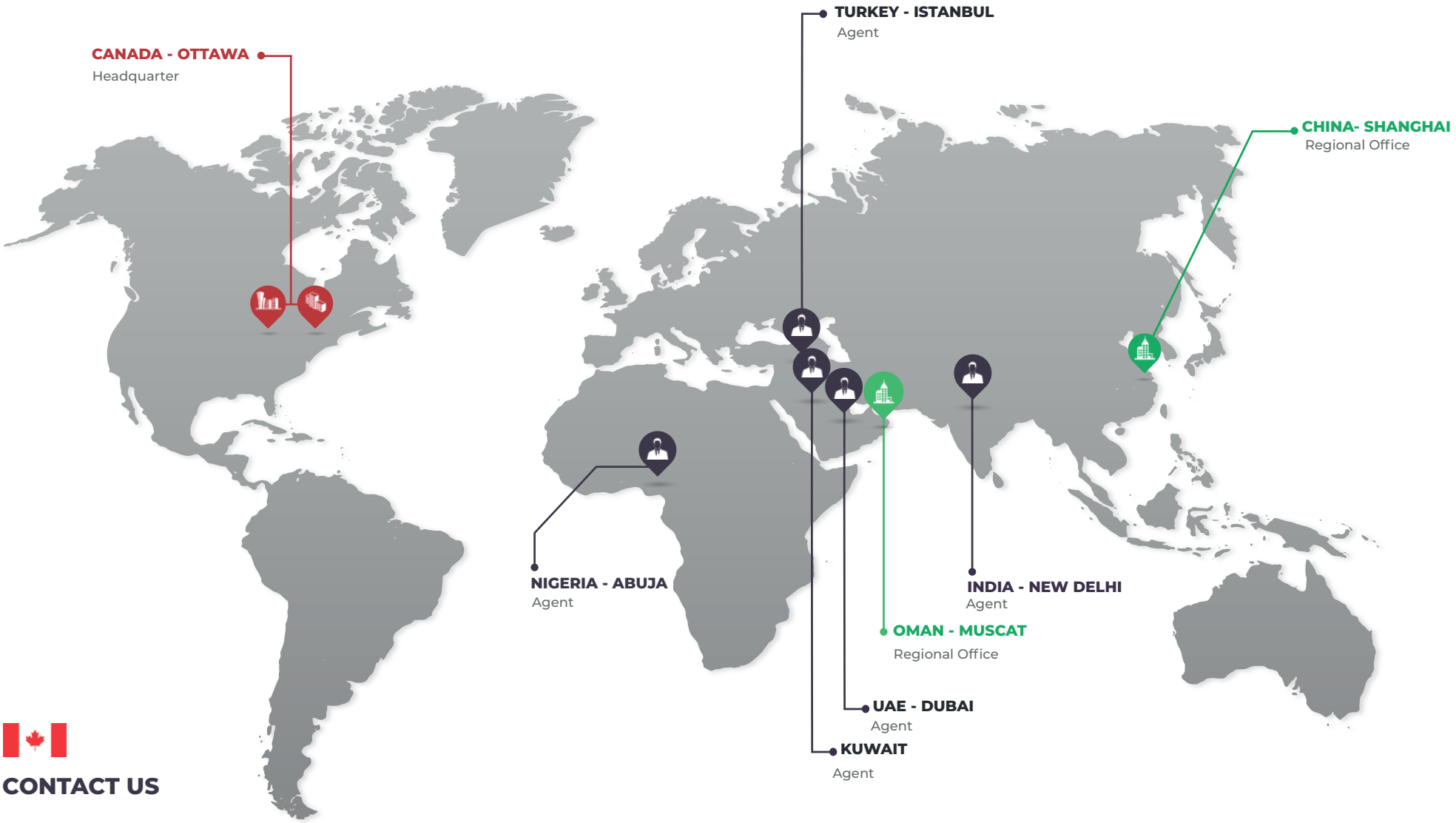


Social responsibility means that we are responsible for what happens in our society and more generally in the world. As a water company, we fulfilled various projects in different parts of the world which was a positive impact on the development of the local societies. We do try to walk with our responsibilities all the time. In this manner, our company is trying to address the water challenges in Africa and non-devel oped areas.

During the Covid 19 Pandemic, WHO has considered surface disinfection as a necessity to cut the chain of infection. A practical solution is the utilization of Sodium Hypochlorite: Bleach. However, our handy Covid Product has been designed and manufactured so that you could do the disinfection for small surfaces at home or office. In this way, we made sure that we are going to help in the big fight against the Corona.

Water is always a big challenge for countries and or communities that have low precipitation per year, particularly in far-flung areas or areas far from the city centers. We are always ready to manufacture and supply small skid-mounted packages to treat / disinfect the brackish water and bring potable water to rural or deprived areas. These portable packages could be equipped with Solar Panels to remove the power requirements.


WATER IS THE LIFE
DEFINITION
BUT AFTER
DISINFECTION!



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