

The logo for HealthySwam, featuring the word "healthyswam" in a sans-serif font. "healthys" is in white and "swam" is in blue. The "sw" is stylized with a wave pattern, and the "am" is in white with a blue water drop icon above the "a". A registered trademark symbol (®) is at the end.

healthyswam®

BEHIND THE SCIENCE

Learn about the science behind
the world's leading advanced water
treatment technologies!

OCG
(ONSITE CHLORINE GENERATION)

RAISING THE BAR

Congratulations on taking the first step in learning about the importance of this advanced water treatment technology and how it can benefit your pool or centre.

HealthySwim, as a leading authoritative body in the Aquatic and Leisure Industry, has the purpose of ensuring that families and industry staff are swimming in safe, clean and healthy water – protected from waterborne pathogens.

We are proud to be able to provide this review for you.

Thank you for investing the time to learn more about this world leading technology. Your investment will be worth it.

Regards,

John Morrison

HEALTHYSWIM

BEHIND THE SCIENCE

Let's discover the science behind this world leading advanced water treatment technology.

TECHNOLOGY

OCG (On-site Chlorine Generation) via Electrolysis.

CATEGORY

Primary Sanitation/Disinfectant Systems.

PURPOSE

Consistent supply of chlorine to maintain stable free chlorine levels without the storage and handling of dangerous chemicals.

INDUSTRIES

Aquatic, Drinking Water, Wastewater Treatment, Cooling Towers.

BY TECHNICAL EXPERT

John Morrison BSc

Bachelor of Science degree, double major; Marine Biology, Sustainable Resource Management.

Over 10+ years' experience in the aquatic industry, providing advice and training to Councils, Health Departments and professionals in the industry.

Experience working in both the water testing and water treatment industry.

Research experience in the laboratory as well as out in the field, contributing to research with NSW Fisheries that was later published in scientific journals.

What is Onsite Chlorine Generation (OCG)?

OCG uses sodium chloride (salt) or minerals and water as feedstock. When electricity is applied to the feedstock, a disinfecting oxidant solution is produced. This disinfecting oxidant solution is then distributed directly into the body of water to keep it clean and bacteria free.

Electrochemical generation has a number of applications for disinfection and can be a safe way to replace chlorine gas, bulk sodium hypochlorite, calcium hypochlorite, chlorine dioxide, bromine, glutaraldehyde and other traditional biocides.

How Does OCG Work?

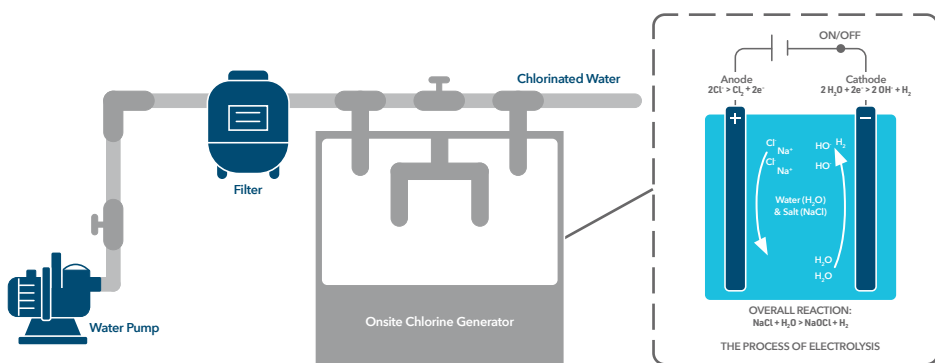
The electrolytic cell, where the oxidants are produced, is central to the OCG process.

Electrolytic cells consist of two electrodes, the anode and cathode. Electrolytic cells are designed to have proprietary electrode geometries, electrolytic scheme, and solution flow characteristics in order to optimise disinfection chemistry and oxidant production efficiency.

When the OCG is energised, an electrical current flows through the cell. In turn, this current causes chemical reactions on the surfaces of both electrodes that eventually produce the oxidant solution.

As the cell operates, calcium and magnesium scales will build up on the cell electrodes, reducing the efficiency of the OCG system. Traditionally, a manual acid washing procedure is employed to remove these scales.

Many manufacturers have developed their own proprietary reverse polarity mechanism which can safely clean electrode surfaces. Instead of using an external acid, the direction the current passes through the cell is reversed, so positive becomes negative and negative becomes positive. When this occurs, scales are rejected from the surface of the electrodes and removed from the OCG. This automatic process dramatically reduces the need for external acid washing.



Electrochemical Generation of Sodium Hypochlorite (Liquid Chlorine)

The overall chemical equation for reaction of salt (NaCl) and water (H₂O) to form sodium hypochlorite (NaOCl) is:



Oxidation reactions are carried out at the anode where two chloride ions (Cl⁻) are stripped of one electron each to produce molecular chlorine:



Depending on the physical and working parameters of the cell (e.g. electrode to electrode spacing, cell applied potential, etc.), it is also possible to produce oxidants other than chlorine, which can provide enhanced removal of microbiological contaminants from water and other benefits. After it is produced, the molecular chlorine dissolves in water to produce hypochlorous acid (HOCl) in the same way that bulk chlorine gas from cylinders acts:



Chlorine production is balanced by the reduction reactions that occur at the cathode where water (H₂O) is converted into hydroxide ions (OH⁻) and hydrogen gas (H₂):



During electrolysis, hydrogen gas is produced as bubbles and must later be removed from the produced oxidant solution to prevent build-up of the gas. The hydroxide ions produced at the cathode then react with the hypochlorous acid produced at the anode, creating the hypochlorite anion (ClO⁻), which is charge balanced with sodium cations (Na⁺) that originally came from the salt:



Pages 4-7 are adapted from Electrochemical Generation. The Applications and scientific mechanisms of disinfectants generated onsite using salt, water and electricity.

By Andrew Boal, Ph.D.

Electrochemical Generation of Mixed Oxidant Solution (MOS)

MOS is a disinfectant that is produced through the electrochemical process. OCG equipment producing MOS is optimized for the highest levels of bacteria inactivation efficacy through proprietary cell design, control of power, and cell geometry.

MOS is highly effective at controlling microbial populations, biofouling, and biofilm formation in water treatment applications across multiple applications and industries.

Numerous laboratory studies and customer experiences prove that MOS is a much more effective biocide than chlorine alone, a property that is a result of the synergistic antimicrobial action of the multiple oxidants contained within MOS - predominantly sodium hypochlorite with trace hydrogen peroxide.

Benefits of MOS

- Faster and more thorough microbiological inactivation (2-3 times more effective than chlorine at same FAC dose and application pH)
- Superior biofilm removal
- Elimination of Legionella counts
- Enhanced micro flocculation reducing coagulant demand by up to 40%
- Effective iron and manganese oxidation, enabling removal by flocculation and filtration
- Lower required dose
- Longer residual carry in distribution systems with longer detention time
- Reduction in disinfection by-product (DBP) formation
- Elimination of chloramine boosters
- Improves filter runs
- Lowers final turbidity
- Aids in eliminate taste and odour problems
- Rapidly oxidizes hydrogen sulfide

OCG vs Traditional Chlorine Dosing

	OCG	Traditional Chlorine Dosing
Operator Safety	Safe	Hazardous
Water Chemistry	Stable TDS & Hardness	Increases TDS & Hardness
Water Dumping	Reduced	Wasteful
Greener Applications	Environment Friendly	Toxic
Cost Savings	Low Cost	High Cost

OCG Highlights Within The Aquatic Industry

There are five principal highlights from the use of an OCG system:

- 1 Improved operator safety
- 2 Better water chemistry
- 3 Less water dumping
- 4 Greener application
- 5 Cost savings

IMPROVED OPERATOR SAFETY

Chemicals traditionally used in water disinfection pose a variety of hazards to the operator. Chlorine gas and chlorine dioxide are probably the most hazardous disinfectants used for water treatment.

Chlorine gas is toxic upon uncontrolled release and the use of chlorine gas cylinders also pose a pressure hazard for explosion or fire. Chlorine dioxide utilizes precursors - acid combined on site with chlorite or chlorate - both of which are health hazards.

BETTER WATER CHEMISTRY

With traditional chemicals factors such as time in storage, storage temperature, and exposure to sunlight can accelerate hypochlorite loss through these chemical degradation pathways.

As a result of this degradation, aged hypochlorite solutions will contain less and less free available chlorine (FAC) and more degradation products, effectively increasing the per-kg cost of chlorine available for treatment applications.

Liquid chlorine and calcium hypochlorite dosing constantly increases Total Dissolved Solids (TDS) and water hardness. High TDS levels and increased water hardness results in cloudier water and irritation to swimmers' skin and eyes.

LESS WATER DUMPING

With traditional chlorine dosing water dumping is required to reduce TDS levels and hardness. As the TDS levels and hardness is stable when using OCG equipment this reduces the need to dump water which is a wasteful practice.

GREENER APPLICATION

OCG are more environmentally friendly compared to delivered chemicals. In addition to the elimination of the use and potential accidental release of extremely toxic chlorine gas, precursor explosion, accidental inhalation or chemical burn, transportation of chemicals from factories to the point of application is reduced.

COST SAVINGS

The cost of bulk chemicals depends on market prices, while the cost of operating an OCG system is tied to the cost of salt and power. In general, the lifecycle cost of OCG is very competitive with chlorine gas alternatives and is typically substantially less than delivered hypochlorite.

OCG typically produce chlorine at a much lower cost than traditional delivery methods, primarily because there is no need to continuously purchase expensive chemicals. There are also labour cost savings associated with OCG as there are no longer requirements to order, store, and dose water with chemicals.

Research Into OCG (Onsite Chlorine Generation)

The following are a selection of research papers that show the effectiveness of OCG in the treatment of water.

TITLE

On-Site Sodium Hypochlorite Generation

PAPER BY

Leonard W. Casson and James W. Bess, Jr.



Read technical paper by scanning QR Code

TITLE

Electrochemical Platforms for Sodium Hypochlorite Generation in Developing Countries

PAPER BY

Enrico Chinello



Read technical paper by scanning QR Code



"The science comprehensively shows that using OCG to produce disinfection chemistry on-demand, is more effective than traditional oxidizing and non-oxidizing biocides."

John Morrison - BSc, HealthySwim

OCG In The Field

More case studies are available on request.



MANUFACTURER

Brauer Swim

FACILITY

John Carew Swim School

EQUIPMENT

Brauer Swim Onsite Chlorine Generator (Salt, Mineral) via Electrolysis



Watch the video by scanning QR Code

5 Major Benefits

1 CONSISTENT LEVELS OF FREE CHLORINE!

No more fluctuations in Free Chlorine levels leading to cloudy water and susceptibility of swimmers to infections.

2 REDUCED LABOUR AND MAINTENANCE!

Prioritise time better by spending it elsewhere with no more chlorine drums to top up and no more injection points to clean and maintain.

3 DON'T BUY CHLORINE, MAKE YOUR OWN!

Invest your savings elsewhere in the business with the fast return on investment (ROI) that this product offers.

4 LOW LEVELS OF TOTAL DISSOLVED SOLIDS (TDS) REQUIRED!

No need to add large volumes of salt to maintain a high enough TDS level to produce chlorine. Correctly sized chlorine generators can run effectively on as low as 1200ppm TDS. That means you can install on your existing pool of water and it will start producing chlorine without adding any salt to the water. It can also serve in reducing your existing high level of TDS to adhere to health regulations/guidelines (less than 1500ppm above source water).

5 REDUCE OHS&W ISSUES!

No more storing, handling and potential hazardous spills of chlorine.

Commonly Asked Questions

DO I NEED TO ADD SALT TO MY EXISTING POOL FOR IT TO WORK?

No, if you have a TDS level higher than the recommended TDS eg. above 1200ppm for freshwater pools and 3,500 ppm for mineral/salt pools.

CAN I USE A MINERAL SALT SUCH AS MAGNESIUM?

Yes. If your TDS level is lower than the recommended TDS eg. lower than 1200ppm for freshwater pools and 3,500 ppm for mineral/salt pools, then minerals/salt can be added to the water to increase the TDS level.

WHAT RESULTS CAN I EXPECT TO ACHIEVE IN WATER QUALITY?

By maintaining a consistently stable Free chlorine level you can avoid the build-up of biofilm and algae outbreaks in your pool. If the pH level is also maintained consistently at the ideal range, then you should also maintain clear water and not experience any cloudy haze to the water.

WHAT IS THE WARRANTY PERIOD?

Chlorine generators are normally 3 years. Electrolysis cell will need to be replaced every 2-5 years based on production time and water chemistry. Therefore, professional system sizing is very important.

CAN IT BE EASILY RETROFITTED TO MY EXISTING PLANT ROOM?

Yes. It's installed on the return line back to the pool.

GOLD (CERTIFIED)



CERTIFIED PRODUCT

Brauer Swim B-Protected Onsite Chlorine Generator (Salt, Mineral and Fresh) via Electrolysis

MANUFACTURER

Brauer Swim

APPROVED MODELS

S Series, M Series and F Series

WARRANTY PERIOD

Minimum 36 months warranty on Chlorine Generator

CONDITIONS

Chlorine Generator System must be sized by the Manufacturer or a HealthySwim Certified Professional.

Brauer Swim are the pioneers in developing advanced water treatment technologies, commencing manufacturing in 2006.

Brauer Swim's in-house research and development team have developed a number of significant international patents that are used within our technologies and allow the equipment to deliver unrivalled results.

Their onsite inline chlorinate generators utilising Brauer's proprietary knowhow and technology to create the most effective and efficient means of primary sanitation within the aquatic industry.

HealthySwim has Certified this product based on systems (units) meeting the subsequent specifications:

REGULATED CONTROL

Provide a connection between the unit and the pool chemical controller to automatically operate when the ORP level drops below the set point level.

REVERSE POLARITY

Provide units with a reverse polarity power supply to allow for self-cleaning of the chlorinator units.

CELL OBSERVATION

Provide units with clear cell casings or viewing windows to allow the electrolysis cells to be observed for scaling without having to disassemble the cells.

PROPORTIONAL OUTPUT

Provide units with adjustable output levels to allow the chlorinator output to be adjusted between 1% and 100% of maximum output.

SYSTEM CONTROL

Provide a unit that contains a digital screen and control system for operating and controlling the functions of the chlorinator.

EXTERNAL CONTROL

Provide a unit that contains an external contact to allow for chemical controller operation of the chlorinator function without switching the supply power on and off.

INTEGRATED FLOW SWITCH

Provide a unit with an integrated flow switch to prevent the chlorinator operating whilst no flow is present in the cells.

CELL LIFESPAN

Provide a unit with an expected cell life of at least 5 years at 5000 ppm TDS, operating on average at 8 hours per day.



PHONE: 1300 696 631



For more information scan QR Code

MISSION

Our mission is to be the leading in water quality education and certification support for high risk pools.

PURPOSE

Our purpose is to ensure families and industry staff swim in safe, clean and healthy water – protected from chlorine-resistant parasites.

SOCIAL RESPONSIBILITY

Our social responsibility is to provide support to individuals and organisations connected to the Aquatic Industry that are enriching our core values.

CORE VALUES

Our core values are:

- Pursue environmental sustainability.
- Support inclusion and diversity.
- Create safe environments.
- Provide industry leadership.
- Promote innovation.



“We need to work together as an Industry to ensure that our customers and staff are swimming in safe, clean, healthy water. This is why I am an Advocate for HealthySwim”.

Laurie Lawrence, Advocate

BOARD OF ADVISORS

Our board of advisors are:

PUBLIC HEALTH

John Morrison
Technical Expert

LEARN TO SWIM

Laurie Lawrence
Learn to swim & water safety

LEISURE

Cath Bellchambers
Industry Consultant

INCLUSION

Melissa Rickwood
Industry Specialist

ADVOCATE

Ross Gage
All things swimming

ENVIRONMENTAL

Daniel Saw
Environmental Advisor

PARTNERS

BRAUER SWIM

Brauer Swim is committed to providing the industry with access to informed quality education in connection to water management. Brauer Swim is an industry leading in water quality research and development with various patented technologies and new innovative advancements. Call 1300 696 631

AUSTRALIAN SWIM SCHOOLS ASSOCIATION

Australian Swim Schools Association is driving and evolving the Swim School industry towards a uniform standard of World’s best practice – resulting in an ever-increasing number of Australians enjoying first-class educational and enriching experiences, and a nation of safer, lifelong swimmers.



“We want to help our customers create the best possible water environment for their customers and staff. This is why we continue to invest in effective long term sustainable technologies that will benefit the Aquatic Industry into the future.”

David Brauer, Brauer Swim



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