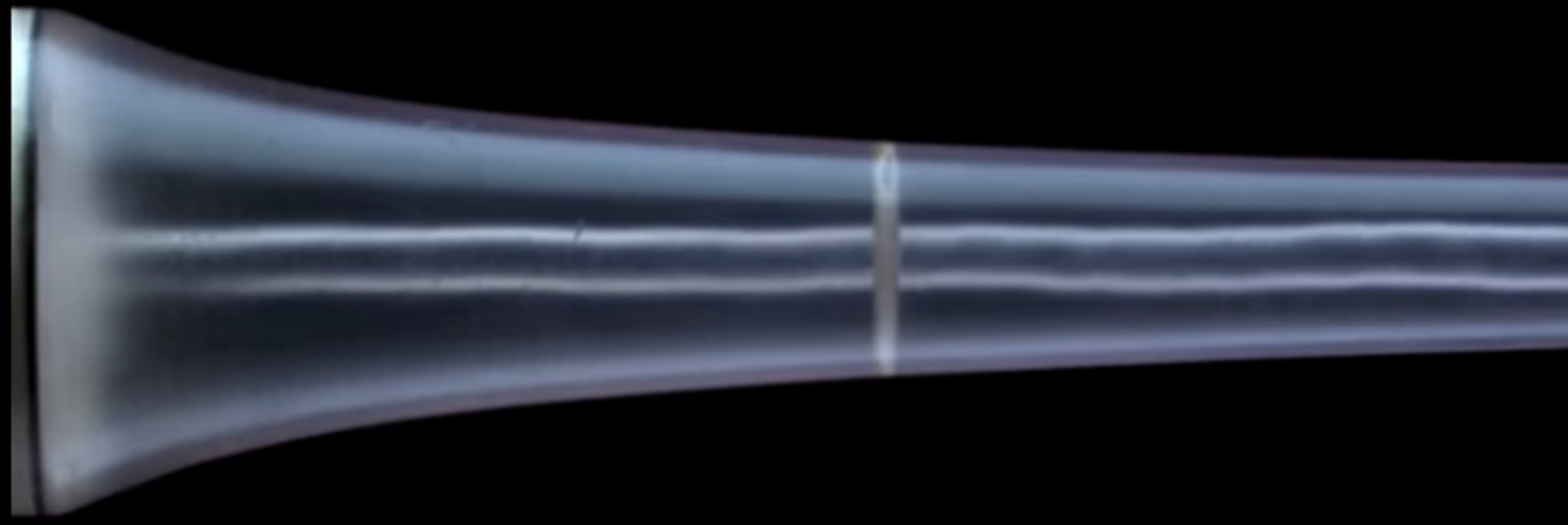
h2o vortex

BIOMIMETIC
WATER TREATMENT SOLUTIONS
FOR INDUSTRIAL APPLICATIONS

OBSERVE AND BE INSPIRED BY NATURE

BIOMIMICRY?

A method of innovation which consists, when encountering a technical problem, to look at the models observed in nature for inspiration. The living has almost all the answers to the challenges that man has to face today.



"Nature is an infinite source of inspiration for engineering and the solutions we develop"

Our values

Our orientations and actions are in favor of responsible and sustainable development

Integrator of innovative technical solutions in the field of green technologies

Expertise

Water treatment - Waste management
Technical maintenance
Cooling towers
Regulations

Clients

Tailor-made solutions adapted to everyone's specific needs

H2ovortex offers solutions
that meet the environmental and financial challenges
industries face in the management of water consuming installations

Better managing your manufacturing facilities is:

Saving water

- The natural resources of rivers and aquifers are reduced
- 17 billion m3 / year used to cool power plants
- 3 billion m3 / year used for industry

Anticipating the increase in the cost of water

- The use of water in the processes represents an important item of expenditure which tends to increase
- The reduction in usage will lead to a reduction in expenditure

Reducing energy costs

- The increase in the cost of energy and the energy transition will lead manufacturers to turn to less energy-consuming solutions

Respecting regulations

- Stringent health and environmental regulations
- Specific features of ICPE 2921 (France) with regard to legionella risks

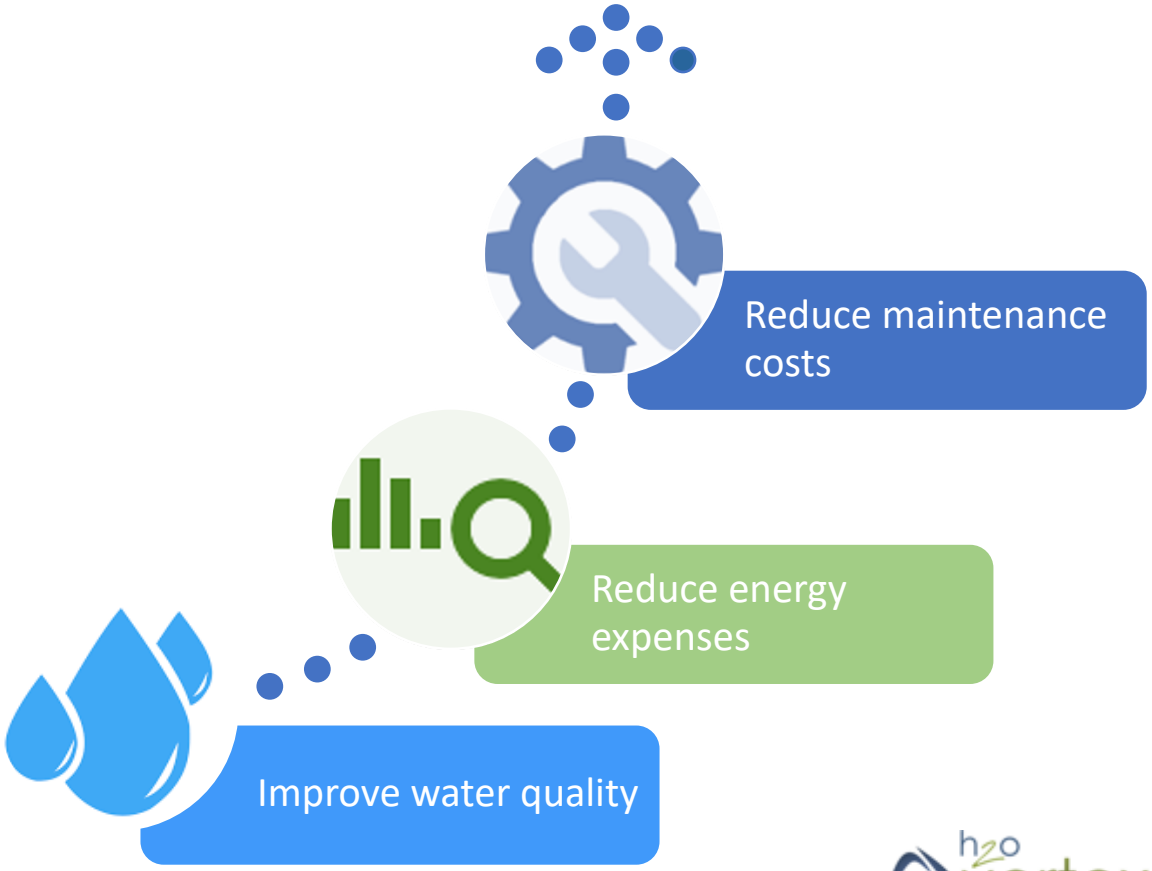
Reducing the use of chemicals

- Reducing the use of treatment products allows significant savings
- Reduce the release of pollutants

Optimizing maintenance

- Optimization of preventive and curative maintenance operations for installations
- Reduced cost of contracts

By means of our biomimetic technologies we enable you to increase the environmental and economic performance of your business



Patented, certified and awarded solutions in several countries

SWEDAC Certified

Pathema
Most Sustainable Water Cooling Treatments Provider 2019 Western Europe

Areas of application of our solutions

COMMERCIAL INDUSTRY

Cooling towers
Power stations
Industrial water treatment

ICE MAKING

Skating rinks
Food industry

AGRICULTURE

Irrigation
Crops
Aquaculture
Breeding
Slurry treatment

COMMUNITIES

Rivers, ponds
Treatment plants

WATER TREATMENT

Potable water
Performance improvement

Development, distribution
Certification, recognitions

Development and distribution

Developed in Sweden by Watreco AB Sweden
International patents

Distributed worldwide by H2oVortex Luxembourg (www.h2ovortex.com)

North American partners Cypress Ltd, European partners Pathema

Certifications, recognitions

- European Commission Horizon 2020 Matching Program
- Swedac Certified
- EPRI - Electric Power Research Institute study report: conducts research for the United States' power generation industry. It is an independent, non-profit organization, which was created by American industrialists in the energy sector. It accepts international participations. This institute is interested in all the technical aspects relating to the production, transport and use of electricity.
- Report "The Use of Additives in Open Recirculating Cooling Systems" from the Dutch Ministry of Water
- DAkkS - Deutsche Akkreditierungstelle - accreditation on drinking water tests
- Certificate of conformity for food use - Food and Drug Administration
- IVG Cooling Tower Approved for Utility Incentives in USA
- Certificate: BioCompatibility test Following EC / ISO 10993-1

Swedac

Rapport ERPR 2020

Rapport Use add NL

DAkkS

FDA

SWEDAC Certified

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Rijkswaterstaat
Ministerie van Infrastructuur en Waterstaat

DAkkS Deutsche Akkreditierungsstelle

HORIZON 2020

MATChING

Certifications, recognitions

- 2020: Approved by DVGW W270 certification for its compliance with the PA2200 test
- 2020: Accepted in the European Horizon 2020 program for innovations in air-cooling towers

- 2019: Pathema: Receives the “Energy Innovator Award 2019” - the most virtuous supplier in the field of air-cooling towers in Western Europe

- 2015: REALice is referenced as part of the Utility Incentives in the USA and Canada - Recognized among the Top 20 Innovations by Esource

- 2011: Nominated for the “WWF Climate Solver”

- 2009: Nominated at the “Clean Tech Awards” in Sweden

Our solutions are recognized by energy producers in North America and approved for manufacturers to qualify for subsidies

CLEANTECH HUBS
INNOVATIONS BY SWEDEN
Sweden
Sverige

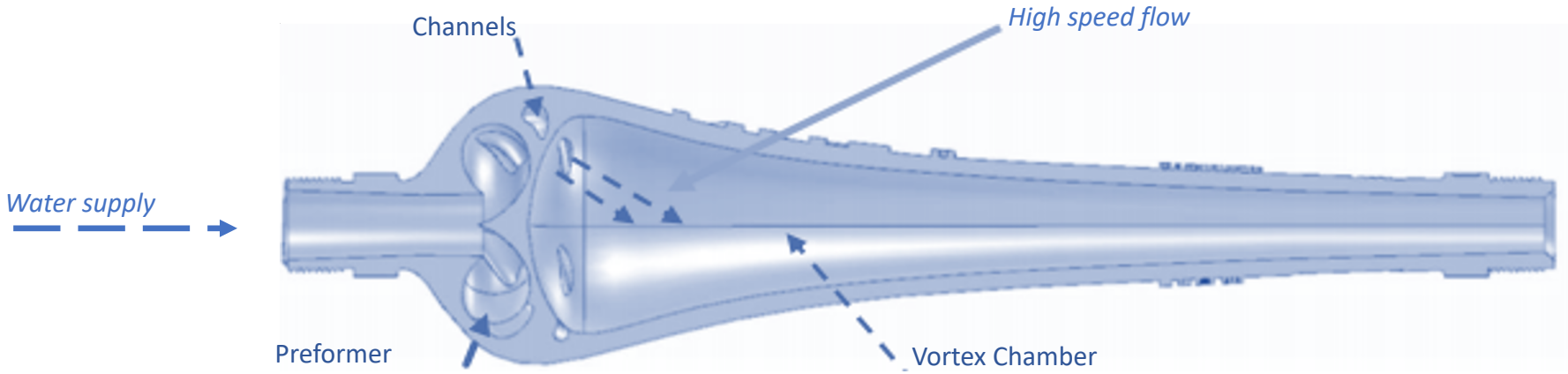
CV ENERGY INNOVATOR AWARDS 2019
Pathema
Most Sustainable Water Cooling Treatments Provider 2019 Western Europe

nationalgrid
NYSEG
TACOMA POWER
Xcel Energy
TORONTO HYDRO
BC Hydro Power smart
SoCalGas
A Sempra Energy utility
Efficiency Vermont
CenterPoint Energy
PSE PUGET SOUND ENERGY
EVERSOURCE

Vortex Process Technology

Vortex Process Technology - VPT: The vortex shapes the flow of water passing through it

The technology creates a large vortex movement within the liquid with high pressure gradients and very low central pressure. Cavitation is performed in a controlled environment



Pre-former

Inlet of the vortex generator provides smooth outward direction of the flow through toroidal motion toward a set of well-defined channels.

Channels

The fluid is directed through a set of channels, each with vortex-forming geometry. Each channel delivers a very high velocity stream of vortex flow tangentially into a vortex chamber

Vortex chamber

Vortices from the channels form a strong and stable vortex flow causing a strongly reduced pressure along the vortex axis with a very low central pressure There is very high pressure at the periphery and almost vacuum in the center

VPT Techno

Focus on VPT: Transformation of the water inside the vortex chamber

STEP 1

The microbubbles in water are sucked into the chamber at very low pressure, they migrate to the center where the pressure is lowest, then are accelerated due to the pressure gradient.

The bubbles expand and combine in the center, which has very little pressure.

A powerful hydrodynamic force creates cavitation which changes the balance of the water and affects the calcium crystals in the water.

STEP 2

Controlled cavitation leads to the formation of limestone particles.

The process produces a micro zone at low pressure and high temperature (the solubility of $CaCO_3$ decreases), causing the reaction of calcium ions and dissolved carbonate and the formation of crystals of colloidal calcium carbonate. The cavitation phenomenon acts on the pH by increasing it.

STEP 3

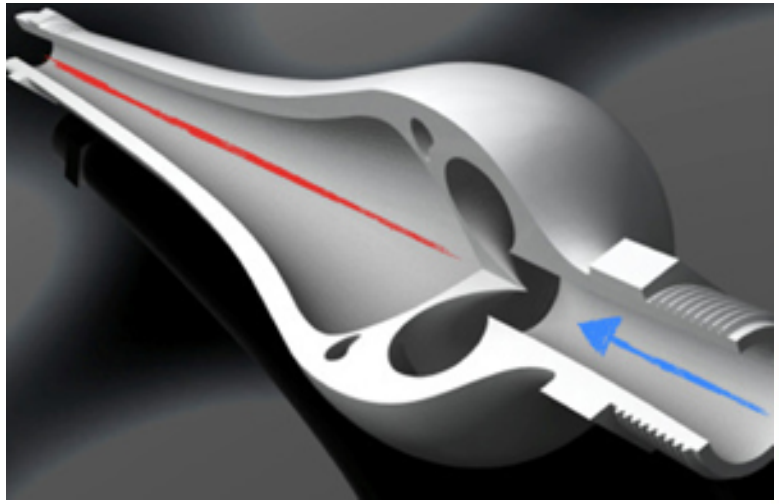
This phenomenon allows the particles to act as incubators so that the dissolved calcium and carbonate ions aggregate rather than attach to metal surfaces.

The limestone particles already formed fragment when they pass through pressure gradients undergoing shear forces.

STEP 4

Calcium bicarbonate ($CaHCO_3$) in water is forced to precipitate as calcite ($CaCO_3$) - mainly aragonite crystals with minimal scaling properties - do not crystallize on hot surfaces.

Vortex Process Technology - VPT



Efficiency

- Degas and eliminate microbubbles
- Degassing test: https://youtu.be/hPvBOmLx3gE
- Decrease in viscosity
- Increase in conductivity
- Increase thermal capacity
- Precipitation of calcium in non-adherent crystals
- Reduced corrosion

https://www.youtube.com/watch?v=ZWcBEPlj2-I

Installation Maintenance

- Mounted on existing plug and play installations
- No moving parts
- Minimal or no need to increase energy sources
- Temperature and pressure resistant materials (test reports available)

Integrated solutions

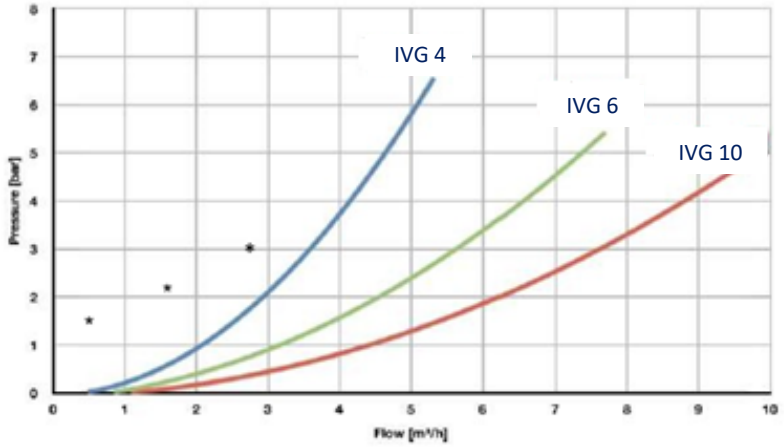
- Complementary technologies: UV lamps, electrolysis without chemicals, bactericidal filters, nanofiltration…
- Ventilation: Used to inject gaseous substances into the cavitation center of the fluid line / ex.
- The addition of an air hose provides a vacuum effect to draw the gases (or liquids) into the cavitation. The device acts as a combined static mixer and venturi type injector

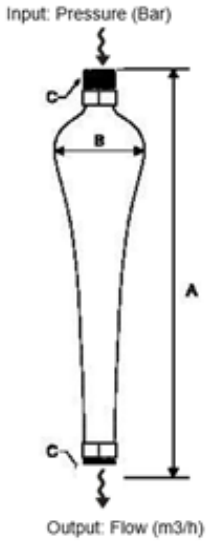
Solutions by application area

IVG INDUSTRY

Solutions for industry, skating rinks, swimming pools

A range of standard solutions for multiple applications





	Watreco IVG 4	Watreco IVG 6	Watreco IVG 10
			
Max pressure - 20°C	16 bar/232 PSI (PN16)	16 bar/232 PSI (PN16)	16 bar/232 PSI (PN16)
normal flow 3-5 bar	4m3/h / 1057 gal/h	6m3/h / 1585 gal/h	10m3/h / 2642 gal/h
max temperature	80°C / 176 F	80°C / 176 F	80°C / 176 F
Length (A)	376 mm	461 mm	544 mm
Diametre (B)	82 mm	96 mm	120 mm
Weight	0,32 kg	0,46 kg	0,93 kg
Connected to (C)	ISO 228-G1°	ISO 228-G1°	ISO 228-G1/4°

Easily integrated into processes and sized for the specific needs of the installation

- Vortex Process Technology (VPT) are made of PA2200 based on polyamide 12
- Standardized product range for a wide range of applications
- High resistance of equipment to pressure
- Usual service temperature -40C to + 80C (maximum mechanical resistance)
- Good chemical resistance * (report on request)
- Excellent consistent long-term behavior

- Equipment containing stabilizers against oxidation
- Numerous finishing possibilities (powder painting, metallization)
- Bio-compatible according to EN ISO 10993-1 and USP level 121C
- Approved for direct food contact European Directive 2002/72 / EC
- Freeform ® Manufacturing process

Examples of applications

ICE MAKING - Ice rinks

REALice

> 750 customers in the US and Canada

40% reduction in the operating cost of an ice rink

The REALIce © system is based on Industrial Vortex Generator (IVG) technology

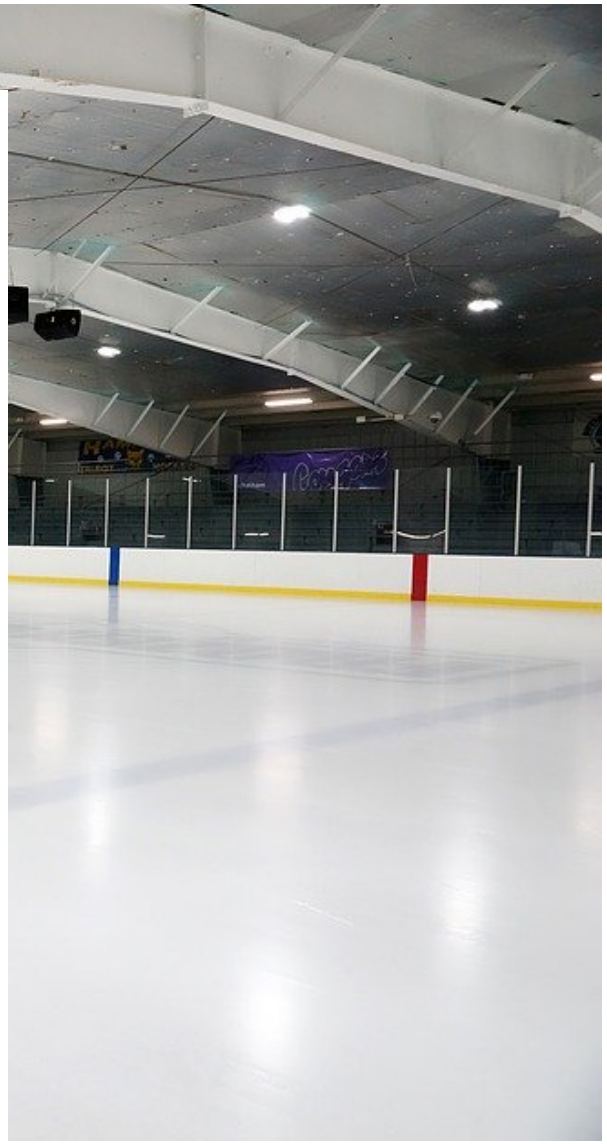
Environmentally friendly solution
No chemicals, filters, membranes, or additional energy sources

Economical solution
The water treated by the REALice system for resurfacing can be used at room temperature (instead of heating it to 75 ° C) which allows to stabilize the temperature of the ice surface around -2 ° C (instead of -10 ° C)

Benefits

- Use cold water instead of hot water to make ice
- Produces harder, faster and safer ice cream
- Reduced maintenance of the ice resurfacer
- Reduction of energy consumption
- Compressor load reduction
- Reduction of lime deposits
- The flowing water is easily put in place

https://youtu.be/aUGoDghXWW8



Examples of applications

AGRICULTURE - Irrigation

IVG Irrigation allows plants to use water more efficiently:
By pumping water through a nozzle inside the Industrial Vortex Generator (GVI), the water is continuously treated.

Up to 25 % increase in production yield

Environmentally friendly solution

- The use of fertilizers and chemical treatments are reduced
- Improved processes and efficiency
- Microbubbles of air present in water considerably affect its properties
- The water treated with the generator is vitalized, its viscosity is lowered and its molecules are structured so that plants absorb it more effectively
- Pipe clogging is reduced
- Lower viscosity allows for better flow and reduces pressure on the irrigation system
- Efficient Clean-Tech solution, with reduced costs and better operational economy
- Easy to install and adaptable to irrigation systems of different sizes

IVG CT

Applications for Cooling Towers

IVG-CT (Industrial Vortex Generator applied to Cooling Towers)

In the cooling, production or freezing process, a cooling tower is an essential element

The efficiency of water treatment directly influences (financial) performance

Our solution is integrated into the process and makes it possible to deal with the usual and recurring problems of these installations.

The circulating water is very corrosive and contains microorganisms and lime

Impurities cause scaling and reduce thermal efficiency

Impurities clog networks

Circulation pumps are used more and consume more energy

Treatment solutions include adding chemicals to control scaling, corrosion

Induce large quantities of pollutant releases and waste,

The manipulations are dangerous, their storage represents a high risk

Annual consumption and costs are significant

- **The IVG CT solution, Integrated into the existing equipment, allows water to be physically treated without risk of discharges and benefits the environment**
- **It improves the efficiency, the lifespan of the installations and makes it possible to reduce energy consumption**

IVG-CT solution enables use of cooling water without chemicals

Technology provides water treatment and optimizes consumption and operation

- No more inhibitors or chemicals to prevent scaling, corrosion, bacterial growth
- The combination of several techniques guarantees perfect management of the installations

Technology increases cooling capacity

- By constantly degassing the cooling water, the Vortex increases the cooling capacity of the system by improving the heat capacity of the water and reducing its viscosity.

The guarantee of increasing the economic and environmental performance of your site

Feedback and benefits observed on installations equipped with IVG-CT

The solution is deployed in > 70 chemical-free installations in the Benelux, United States and United Arab Emirates

15 to 40%
Water savings

- Operation of higher COC within cooling towers
- Water savings thanks to lower make-up water volume
- Up to 100% purge water can be reused for other purposes such as irrigation, and reduced discharge into sewers

4 to 6 %
Energy savings

- Optimization of heat exchanges
- Maintenance reduction and prevention of components of cooling towers
- Onboard energy: additional kWh / kW upstream / downstream the savings made by reducing pumping and water treatment

50 to 95%
Reduction in chemical usage

- Reduction of operational costs related to the purchase of chemicals and reduction of maintenance costs (cleaning)
- Reduction of toxic elements in purge water
- More sustainable: tends towards a circular economy

Management of installations

- Monitoring and control system integrated with additional technologies
- Complies with best practices
- Web access and dissemination of monitoring reports

Feedback and benefits observed on IVG-CT equipped installations according to a study by the Dutch Ministry of Water - extract

	Food processing	Data Center	Petro-chemical	Pharmaceutical
Type of Cooling Tower	Closed	Adiabatic	Open	Open
Existing Installation	Yes	Yes	Yes	Yes
Installation date of IVG solution	2015	2014	2019	2016
Size of Cooling Tower	24 MW	12 MW	30 MW	20 MW
Water consumption	68 m3/h	17 m3/h	59 m3/h	62 m3/h
Chemicals used	0 kg currently / 28 000 kg before	0 kg currently / 6 800 kg before	3400 kg currently / 66 000 kg before	0 kg currently / 26 000 kg before
Pay Back period	2,2 years	2,1 years	2,2 years	3 years
Water savings	39%	75%	24%	15%
Energy savings	3%	not calculated	not calculated	7%
COC	10	4,5	8	7,8

Rijkswaterstaat
Ministerie van Verkeer en Waterstaat

Results measured by EPRI * (Electric Power Research Institute) as part of a study aimed at demonstrating the relevance of IVGI-CT technology on cooling towers in relation to the reduction of water consumption, energy and elimination of chemical use

- Study carried out from July 2016 to April 2020 in California on two sites equipped with cooling towers:
  A large hotel and pharmaceutical factory where water treatment was representative of standard practices

- The IVG-CT system has been demonstrated and evaluated in terms of water, chemical and energy savings

- The measurement and verification plan followed the international performance measurement and verification protocol and consisted of equipment monitoring before and after the installation of IVG-CT technology.

- Main findings of the field assessment
  The solution offers an environmentally friendly water treatment option that requires a minimum of chemicals, water and energy,
  Provides significant water savings compared to traditional chemical water treatment by increasing cooling tower concentration cycles (COC)

	Hotel site	Pharmaceutical Manufacturing site
Water consumption reduction	30%	15%
COC	From 2,3 to 5,9	From 3,6 to 7,8
Chemicals reduction	30%	45%
Energy reduction	5,40%	6,40%
Maintenance feedback	Coils and piping are much cleaner after IVG CT installation The monitoring system provides an additional benefit by informing of maintenance requirements	

* The Electric Power Research Institute (EPRI) is an institute that conducts research for the power generation industry in the United States. It is an independent, non-profit organization, which was created by American industrialists in the energy sector. It accepts international participations. This institute is interested in all technical aspects relating to the production, transport and use of electricity.

Feedback and benefits observed on installations equipped with IVG-CT

Lamb Weston Meijer – IVG 20-CT Pro skid

Type of industry: Food industry - Potato processing

2nd largest world producer of frozen potatoes (800,000 tons in Europe and 4 million tons worldwide per year)

Type of cooling and cooling towers: Evaporative condensers for ammonia cooling

IVG technology: 3 x IVG 20-CT - Power consumption: 12 kw

	Before installation	After installation
Evaporation capacity in MW	24 MW	24 MW
Water evaporation	37,20 m3/h	37,20 m3/h
Water consumption	68,20 m3/h	42,51 m3/h
Cooling water thickening	Factor 2,2	Factor 10
Chemicals used	28 640 kg	0 kg
Reduction in chemicals		100%
Pay Back		2,2 years

Objective: to become circular by 2025

The target for 2025 is a 50% reduction in direct water consumption and a 30% reduction in direct energy consumption per ton of final product.

Lamb Weston Meijer has decided to no longer use process chemicals at the site.

In 2019, a third IVG 20 CT was deployed for the final cooling towers to allow all facilities to operate without the use of chemicals.

Feedback and benefits observed on installations equipped with IVG-CT

SmartDC – IVG 10-CT skid

Type of industry: DATA CENTER

Type of cooling and cooling towers: Adiabatic coolers for server rooms

IVG technology: IVG 10-CT - Power consumption: 2.2 kw

Wastewater discharge: Discharge into the rainwater network

	Before installation	After installation
Evaporation capacity in MW	12 MW	MW
Water evaporation	18,6 m3/h	18,6 m3/h
Water consumption	16,91 m3/h	5,31m3/h
Cooling water thickening	Factor 2,1	Factor 4,5
Chemicals used	6 840 kg	0 kg
Reduction in chemicals		100%
Pay Back		2,1 years

Triple R Objective: Reduce, Reuse & Recycle

The integration of the solution made it possible to:

No longer use water treatment products,

Reduce water consumption by 75%,

Discharge water into the rainwater network,

Reduce energy consumption by degassing the cooling water.

Feedback and benefits observed on installations equipped with IVG-CT

Grolsch – IVG 10-CT + Nano skid

Type of industry: Brewery

IVG technology: IVG10-C + NanoFiltration Water skid

Absorbed power: 6 KW

Wastewater discharge: Treatment of wastewater by sprinkling

	Before installation	After installation
Evaporation capacity in MW	8,9 MW	8,9 MW
Water evaporation	13,85 m3/h	13,85 m3/h
Water consumption	23,74 m3/h	15,38 m3/h
Cooling water thickening	2,4	5
Chemicals used	1 760 kg	0 kg
Reduction in chemicals		100%
Pay Back		Operational leasing, 37% cost reduction

Objective: Solve recurring water treatment problems during hot periods

The integration of the solution made it possible to:

100% treatment of cooling water without chemicals,

Recycle water for irrigation,

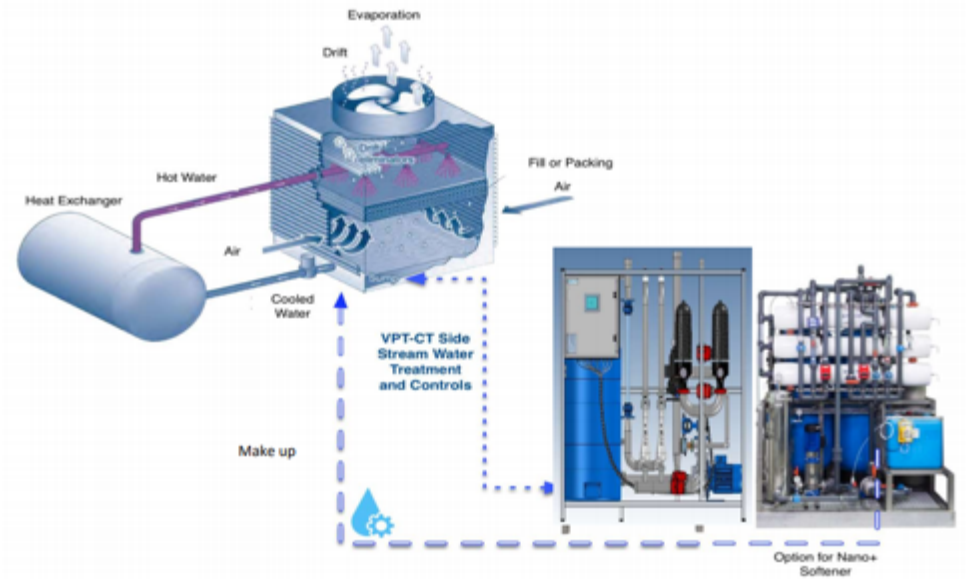
Increase safety when cleaning cooling towers,

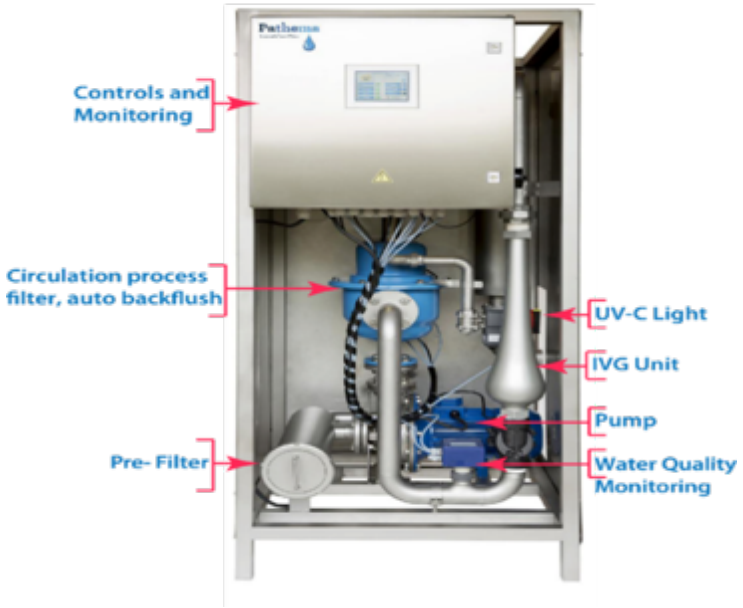
Stop corrosion and microbiological development.

https://youtu.be/XelDxzrb2II

IVG-CT - Technical description

IVG-CT - Technical description (1)





Sizing

- Collection of installation input data:

check list TAR

- Sizing and simulation carried out by our design office

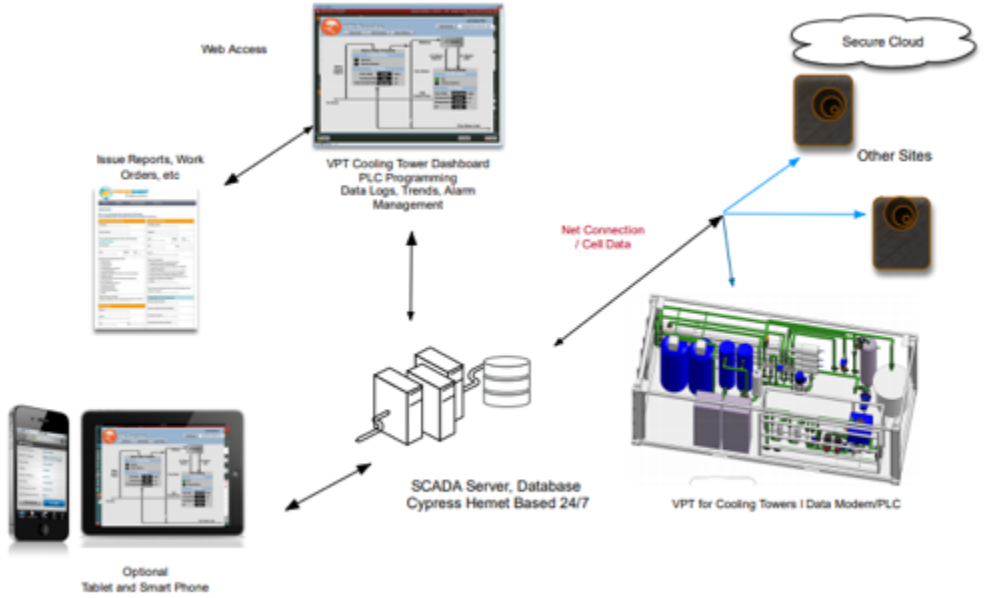
Typical configuration

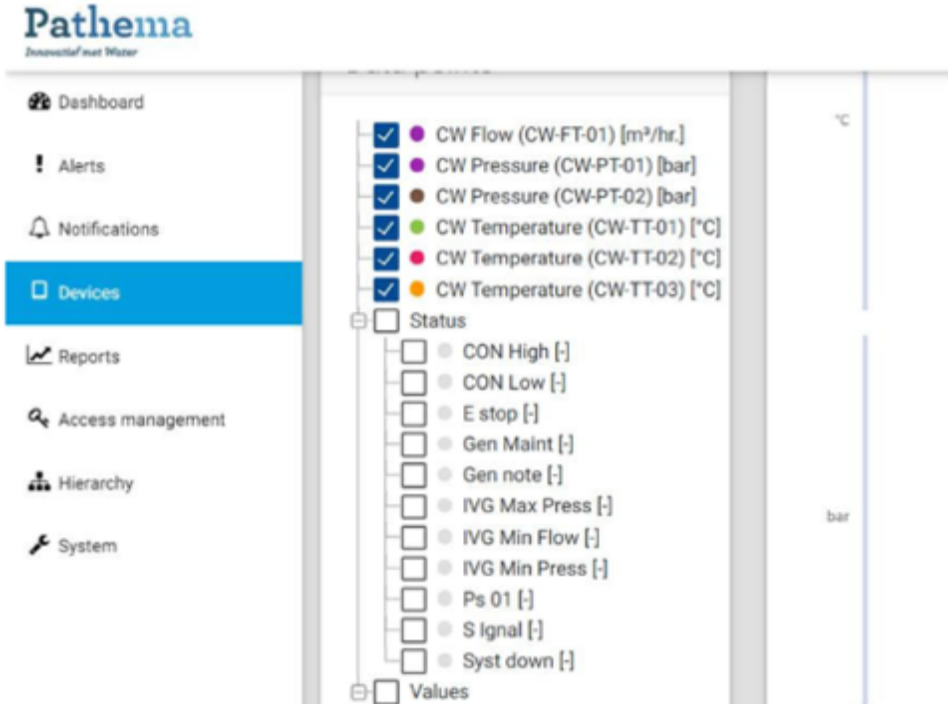
- The box dimensioned specifically for the installation is connected to the cooling tower (and / or together),
- It is equipped with filter, pump, suitable VGI, UV treatments, monitoring equipment.

Commissioning and monitoring

- Installation and settings on site
- Parameter and result monitoring
- Energy efficient installation
- Low maintenance

IVG-CT - Technical description (2)





Continuous monitoring

- Instrumentation of equipment, configuration and training of technicians,
- Secure data,
- Compatible with most building management solutions,
- We use Siemens PLC for information control of SCADA system or, via Mudbus, of customers SCADA system
- The points that are mainly controlled are the pH value, flow rate, pressure and UV-C
- The points which are mainly controlled are the pH value, the flow rate, the pressure and the UV-C

Pathema
Most Sustainable Water Cooling Treatments Provider 2019 Western Europe

They trust us - testimonials

Références Clients

Heineken, NL

Huntsmann, NL

Friesland Campina,

AMGEN, USA

Vriesoord, Den Bosch, NL

LambWeston SEEING POSSIBILITIES IN POTATOES, Kruiningen, NL

Firma, Oostende, Belgium

Vitelco, Den Bosch, NL

flevolof, PuYen

Van Soest, Rijkevorsel, Belgium

Van Soest, Kesteren, NL

Community Icerink, Breda, NL

City of Hope, USA

VCA, Asten, NL

MARRIOT Hotels, USA

SMART DC, NL

Grolsch, NL

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