

The Growing Challenge of Water Management in Industrial & Commercial Infrastructure

Focus on Cooling Tower Applications

**Unleashing the power of nature to
revolutionize industrial processes**

Challenges

The Global Water Challenge

- Increasing infrastructure = water intensive processes
- Climate change is intensifying water stress globally
- Water scarcity is a critical challenge in industrial operations

Regulatory Landscape

- New EU Standards:

- Stringent CSRD requirements for sustainability
- Industries pushed towards more sustainability

- Traditional Cooling Systems:

- Resource-heavy, inefficient, and increasingly unsustainable

Key Point: Industries must act now to comply with regulatory changes



The Impact of Cooling Towers

Cooling towers vital for industrial cooling but pose significant challenges:

15-20% of Total Industrial Water Usage: In industrial settings, cooling towers account for significant water consumption (**up to 8% of total fresh water usage**)

Current systems lead to pollution, waste and inefficiency

Cooling Towers as a Critical Component of Infrastructure

- Necessary for maintaining industrial processing
- Major contributor to water usage and pollution
- Heavily dependent on chemicals
- Large contributors to CO₂ emissions

Environmental and Cost Pressures:

- Rising operational costs due to water scarcity.
- Increased scrutiny due to environmental regulations
- Further research in chemical evaporation concerns



The Need for Innovative Solutions

Water Savings as a Priority

New technologies are essential to optimize water use in cooling systems, directly improving sustainability KPIs

Urgent Action Required

Tackle cooling tower challenges to ensure long-term environmental and operational sustainability

- Drastically reduce water use in cooling operations
- Align with regulatory standards and enhance sustainability KPIs
- Minimize dependency on chemicals

Next Steps for Industry

- Adopt innovative cooling technologies
- Ensure compliance while conserving water



Harnessing Nature to improve industrial processes

Industrial Vortex Generator (IVG)



Scalable – Modular IVG-CT solution:

Point-of-source wastewater treatment for reuse

Fully Modular water treatment application based on patented Vortex Process technology (VPT) for improving sustainability of Industrial Water processes.



Plug and play
Ease of deployment



Cost Savings
ROI < 3 years



Water quality and
quantity agnostic



Chemical-free
in-situ process



Long life-span
15+ years
Reduced maintenance



Local assembly
Easy maintenance



24/7 Monitoring
Full remote control



Space Savings
Small footprint



Industry agnostic

Industrial Vortex Generator IVG – CT

Nature-Driven Solutions for a Sustainable Industry.



Unleash the Force of Nature Harnessing the Power of the Vortex

Feedback and benefits observed on installations equipped with IVG-CT

The solution is deployed in > 150 chemical-free installations in the BeNeLux and United States

Up to 50%
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



6 to 8 %
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



100%
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



Substantial operational cost reductions (ROI < 3 years)

- ☞ No chemical costs
- ☞ As no chemicals - no discharge costs
- ☞ Reduced maintenance costs
Increase of life expectancy of installation
- ☞ Compliance with ESG reporting
- ☞ Increase in sustainability
- ☞ Substantial reduction of CO2 footprint



Client References

+150 commercial deployments in BeNeLux and US

Currently 50% of new business is repeat sales with existing customers

MoU signed with AirProducts - LambWeston

Current Pipeline > 50 installations by 2028 (based on only 2 clients)

Conversation rate:
100 % retrofit installations
100% chemical free



Feedback and benefits observed on installations equipped with IVG-CT

Lamb Weston Meijer – IVG20-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 IVG20-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.

Since 2019, several additional IVG-CT have been deployed for the final cooling towers to allow all facilities to operate without the use of chemicals. We are currently in the process of installing our 8th application.

Given the fantastic results we were able to achieve, Lamb Weston has requested that by Q4 2023 their 50 sites should start to be equipped with our IVG-CT application (deployment in progress)

Datacenter AMSTERDAM

IVG-CT 60	Before	After
Evaporative power in MW	35	35
Evaporation in M ³ /h	55	55
Water usage in M ³ /h	95	62
COC	2.0-3.5	6.0-8.0
Chemical use in kg / year	15.780,00	0 kg
Blowdown on	sewage	surface water



Water savings

-35,0%



ROI

2.7



CHEMical savings

100%



CO2 drop

83%



Amgen – IVG20-C NANO12 Pro CoolWater skid



Type of industry

Pharmaceutical

Cooling type and cooling towers:

open coolingtowers for cooling chillers

Before IVG installation

Evaporative capacity in MW

20 MW

Water evaporation

31,00 m³/hr

Water consumption

62,00 m³/hr

Cooling water thickening (COC)

Factor 2.0

Chemical consumption (annual)

26.040,00 kg

Discharge waste water on:

Sewage connection WWTP

After IVG installation

Evaporative capacity in MW

20 MW

Water evaporation in m³ / hr

31,00 m³/hr

Water consumption in m³ / hr

34,44 m³/hr

Decrease water consumption in%

- 44,44%

Cooling water thickening (COC)

Factor 10.0

Chemical consumption

0,00 kg

Decrease chemical consumption in%

- 100%

Return on Investment

3 years

IVG technology

Absorbed power

22 kW

Discharge waste water

Rainwater drainage without discharge costs



90 BILLION LSAVEED ANNUALLY



90 BILLION
LITERS ANNUALLY



**ENOUGH FRESH WATER ANNUALLY
FOR THE POPULATION OF LONDON**

IVG-CT

The Impact of 10,000 IVG-CT Cooling Towers installations

**Annual Water Savings:
90 Billion Liters**

**Annual supply for 4.5 million
households
equivalent to Paris or London!**

**That's 36,000 Olympic - sized swimming
pools of water saved!**



**Certifications,
Recognitions
Assessment results**





MATCHING or "Materials & Technologies for Performance Improvement of Cooling Systems in Power Plants" is a collaborative project, funded by the EU Horizon 2020 program, aims to reduce the cooling water demand in the energy sector.



CAN WE REDUCE THE COOLING WATER DEMAND IN THE ENERGY SECTOR?

Power generation is a sector requiring great amounts of water. Cooling water for energy production accounts, for 45% of total water abstraction in the European Union, second only to agriculture. Water is fundamental for electricity production and with water becoming increasingly scarce, the power industry cannot afford the risk of having to compete for water resources with other industries including agriculture and household uses.

This document shows the results of the part of the MATCHING project focusing on the implementation of water treatment technologies for reduction of water use in wet cooling towers at fossil fueled power plants. A broad set of technologies are proposed acting on intake, blowdown, and evaporated water.



This project has received funding from the European Union's Horizon 2020 program under Grant Agreement no. 686031

Cooling Tower Water Treatment Using Industrial Vortex Generator Technology EPIC/EPRI – Energy and Water Savings

ET17SCE1020



Prepared by:

Electric Power Research Institute (EPRI)
Cypress, Ltd.
H2oVortex S.A.R.L. Luxembourg

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Certifications, recognitions

- ❖ European Commission Horizon 2020 Matching Program
- ❖ Swedac Certified
- ❖ EPRI - Electric Power Research Institute study report: Study carried out from July 2016 to April 2020 in California on two sites equipped with cooling towers: <https://www.etcc-ca.com/reports/cooling-tower-water-use-optimization-epicepri>
- ❖ Report "The Use of Additives in Open Recirculating Cooling Systems" from the Dutch Ministry of Water
- ❖ DAkkS - Deutsche Akkreditierungsstelle - 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



Rijkswaterstaat
Ministerie van Infrastructuur en Waterstaat



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



Most Sustainable Water Cooling Treatments Provider 2019 Western Europe



Various Areas of Application of our Vortex Process Technology (VPT)

Each individual vertical application is disruptive in nature as it provides game changing enhancements



INDUSTRIAL & COMMERCIAL IVG -CT (Cooling towers)

Data Centers, Utilities
All Industrial: Oil & Gas, ...
Manufacturing: F&B, ...
Hotels, Residential & Commercial



ICE MAKING -REALIce®

Ice rinks



COMMUNITIES FlowMixer

Rivers, ponds, lakes
Treatment plants
Aquaculture

Various Areas of Application of our Vortex Process Technology (VPT)

Each individual vertical application is disruptive in nature as it provides game changing enhancements



AGRICULTURE IVG-IR

Irrigation - Greenhouses
Crops, Cannabis
Indoor-Vertical Farming
Slurry treatment - Biogas



WATER TREATMENT IVG-PW

Potable water
Desalination



WATER TREATMENT IVG-AS (Anti Scaling)

Residential & Commercial

H2oVortex Group organisation

- **H2oVortex Group organization is a combination of three individual companies working together in full symbiosis/partnership model.**
- **Overall HQ based in Luxembourg - incorporated in 2008**
- **Activities: Sales & Marketing, Business Development, Strategy, Projecting**
- **Research & Development**
- **In Sweden executed through Watreco**
- **In the Netherlands through Pathema**
- **Manufacturing of IVG in Sweden under Watreco through 3D printing process**
- **Engineering in the Netherlands executed by Pathema**
- **Assembly performed by Turbine in the Netherlands.**
- **Ease of assembly facilitates relocation to local markets**
- **H2oVortex' main activity is to substantially enhance sustainability KPIs by Saving Water, Energy & Chemicals**

CORE TEAM

Present team is comprised of a total of 17 people spread over 3 locations: Luxembourg – Tilburg (Netherlands) – Malmö (Sweden)



Håkan Grönlund

- **Born 1959: Head of International Business & Co-founder H2oVortex**
- During his professional career worked both nationally and internationally in areas of IT and Telecom. Holding different executive management positions such as CEO, Marketing & Sales Director. Has been with companies like WM-Data, Owell/IBM and ComputerLand.
- Since 2008 active in a number of company projects within environmental technology/cleantech as well as building the distribution network of H2ovortex
- Qualifications: BAC Economy, Marketing. Military Background in the Swedish Paratroopers as Captain Speaks, Swedish, English, French and German.



Alain Mestat

- **Born 1966: Business development, Marketing, Finance**
- Over 25 years of experience within the financial industry. For 13 years he was a Director with the Edmond de Rothschild Group in Luxembourg. Prior to this Founder and Managing Director of Advena Management (Boston-Jeddah) multi family office.
- Since 2012 Alain has set up various financial advisory companies with a primary focus within sustainable Green Finance. Active private investor in several Swedish based clean tech companies where he held various Executive Board positions
- Bachelor and Masters from Brandeis University (Boston) in International Economic and Finance. Alumni of INSEAD. Alain is a certified Independent Board Director (NED) and sits on several international boards.
- Speaks English, French, German and Luxembourgish.



Mark Boeren

- **CEO Pathema – H2ovortex Head of Engineering - CTO**
- After studying Knowledge Engineering at the University of Maastricht, Mark Boeren founded Pathema BV in 2008 together with his uncle and father. After several innovation awards, Pathema BV finally won the 'Water innovator of the year award' in 2017 with its chemical free VPT technology cooling water treatment, as well for 2019. Extensive technical knowledge in Water and Engineering.
- Since 2014 Mark and his team of 12 engineers have been the quasi exclusive engineering and implementation partners of H2ovortex.



Anders Lindskog

- **Born 1959: CEO, Chairman & Co-founder Watreco**
- Worked both nationally and internationally in areas of telecom, media, IT/internet, holding different executive management positions such as CEO, VP, Marketing & Sales Director, Area Director and Transaction Director.
- Has been with companies like Telia, Ericsson Mobile Communication, Netch Technologies, NST, Topcom and Skarpa.
- Since 2002 Anders has been active in a number of company projects within environmental technology/cleantech.
- Qualifications: BEE, European Diploma Marketing, MBA and Corporate Governance from University of Lund.
- Speaks, Swedish, English and German