

1. What is it?

Mellifiq supplies self-contained, complete ozone disinfection and water treatment technology for sanitation in the industrial sector.

The RENA Vivo™ system is designed to effectively disinfect water and process equipment as well as removal and oxidation of chemical substances.

The system produces aqueous ozone in-situ, on demand with very low operational cost. The technology leaves no organic by-products, suspended solids or salts since it naturally decomposes.

The system includes a state-of-the-art logic control with a human-machine-interface which monitors and controls vital system parameters. It can be connected to an external control system or SCADA.

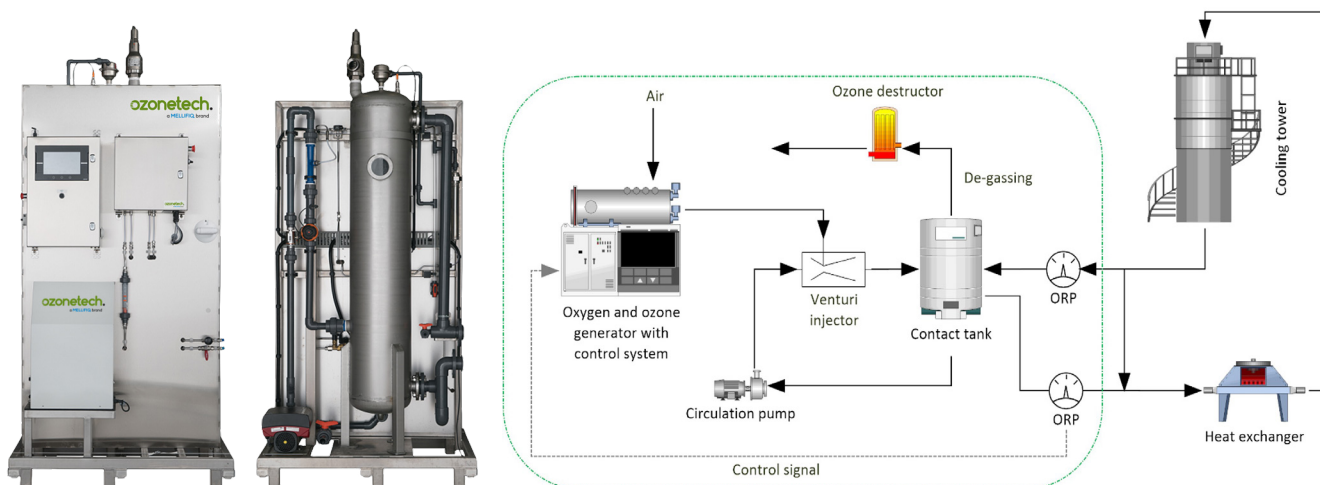


Figure 1.
Left: Layout of actual RENA Vivo system.
Right: Process flow diagram for off-shore.

Elektravägen 53
SE-126 30 Hägersten, Sweden
+46 10 252 30 00
www.mellifiq.com

2. Operational benefits to the business

The application of the system leads to cost savings, reduced down-time and maintenance:

- **Reduction of scale and corrosion formation**
- **Deactivation of sulphate-reducing (SBR) bacteria** → no hydrogen sulfide formation.
- Eliminate logistics and **costs for transporting chemicals** to site.
- No handling of chemicals and **reduced storage space**.
- Most effective continuous **prevention of legionella outbreaks**.
- **Reduced blow-off water** in cooling system. Reduced volumes for fresh water refill.
- Guaranteed sanitized drinking water supply.
- Prolonged **life time of process equipment** such as tanks, pipes, valves and heat exchangers.
- Comply with regulation pertaining to discharge of water from cooling system blow-off.
- **Maintain heat transfer efficiency in heat exchangers** → save energy.

3. What can it be used for?

Ozonetech RENA Vivo keeps all types of water systems, including drinking water supply, **clear from all bacteria, viruses, algae, including sulphate-reducing bacteria (SBR) and archaea which may cause corrosive environments**. Wastewater streams can be treated to reduce BOD and COD.

Elektravägen 53
SE-126 30 Hägersten, Sweden
+46 10 252 30 00
www.mellifig.com



4. Applicable base: bio-fouling and corrosion control

Ozone application **overcomes bio-fouling and corrosion problems** in circulating water systems thanks to its natural oxygen decomposition.

- Avoid scaling and corrosion by avoiding hydrogen sulfide formation from SBR and elimination of chemical build-up
- No pH differential which prevents corrosion
- Preventive legionella control
- Eliminate use of other biocides and corrosion inhibitors

The table below shows a brief comparison of CT values for various disinfectants. Oxidizes effectively organic matter and can be shown to inactivate all types of microorganisms as opposed to traditional means, without causing microbial resistance.

Table 1. CT values (mg/L.min) for 99% inactivation at 5 deg C. (WHO and JG Jacangelo, et. al.)

Microorganism	Free chlorine	Preformed chloramines	Chlorine dioxide	Ozone
E. coli	0.034-0.05	95-180	0.4-0.75	0.02
Rotavirus	0.01-0.05	3810-6480	0.2-2.1	0.006-0.06
G. muris cysts	30-630	1400	7.2-18.5	1.8-2.0
L. pneumophelia	4	15	Data not available	0.5

Elektravägen 53
SE-126 30 Hägersten, Sweden
+46 10 252 30 00
www.mellifiq.com



It was recently proved that ozone completely **kills off** and is several times more efficient than hypochlorite and formaldehyde – without leaving harmful residues (Akban and Iliyasu, 2015).

Lockheed-Martin undertook a comparison study in 1995, where a **600 ton cooling tower system was upgraded to ozone treatment** and compared to previous chemical treatment where chlorine gas, biocides and corrosion inhibitors were used. See Table 2 below.

In addition to operational cost savings, it was reported that scaling was reduced by 90% and bacterial count was reduced thousand-fold.

Table 2. Annual operation costs after upgrade to ozone system compared to chemical treatment at Lockheed-Martin, Ocala, Florida. (US Department of Energy, 1995).

Item	Chemical treatment (\$)	Ozone treatment (\$)
Electrical operation	0	2,592
Chemicals	18,613	0
Labor	9,360	2,808
Blowdown hauling	45,360	4,536
Chlorine gas	6,120	0
Power	118,715	45,479
Total	198,168	57,414

5. References

World Health Organization: Water Treatment and Pathogen Control: Process Efficiency in Achieving Safe Drinking Water. 2004. IWA Publishing, London, UK.

JG Jacangelo, NL Patania, RR Rhodes: Inactivation of Waterborne Emerging Pathogens by Selected Disinfectants. 2002. AWWA Research Foundation and Americans Water Works Association.

Akpan, Godwin and Mohammed Iliyasu: Biocidal Effects of Ozone, Sodium Hypochlorite and Formaldehyde, on Sulphate Reducing Bacteria Isolated from Biofilms of Corroded Oil Pipelines in the Niger Delta, Nigeria. *Donnish Journal of Microbiology and Biotechnology Research* Vol 2(2) pp. 008-014 October, 2015.

U.S. Department of Energy: Ozone Treatment for Cooling Towers. 1995.

Elektravägen 53
SE-126 30 Hägersten, Sweden
+46 10 252 30 00
www.mellifiq.com

