

RAZONE Project

The project officially started on December 1st, 2012 and has a duration of 24 months. Razione has received funding from the European Unions's 7th Framework program managed by REA – Research and Executive Agency (<http://ec.europa.eu/research/rea> (FP7/2007-2013)) under grant agreement no 314981. [You can read more about the project at www.razone.no](http://www.razone.no).

Project Beneficiaries:



Normex AS: Supplier of water treatment equipment, SME Coordinator (Norway)



Statiflo Int. Ltd: Supplier of static mixers, SME Participant (UK)



ASIO, Ltd: Supplier of technologies for water and wastewater treatment, SME Participant (Czech Republic)



EDUR-Pumpenfabrik Eduard Redlien GmbH & Co. KG: Supplier of multiphase pumps, SME Participant (Germany)



Salmar Settefisk AS: world producer of smolt. End-user participant (Norway)



Anglesey Aquaculture limited (AAL): Supplier of sea bass to the UK market. End – user participant (UK)



Primozone production AB: Supplier of ozone generators, SME Participant (Sweden)



Teknologisk Institutt AS: RTD Performer (Norway)



The University of Liverpool: RTD Performer (UK)



Fraunhofer IGB: RTD Performer (Germany)

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RAZONE

Development of sustainable and cost effective water quality management technology for the aquaculture industry



RAZONE Project description

The RAZone project goal is to develop a technology that enhances cost efficiency and safety in the use of ozone for management of water quality in the aquaculture sector, including Recirculation Aquaculture Systems (RAS). RAZone will address application of ozone in farms of both fresh and saltwater species.

RAS recycle the water to the farm several times. Recycling the water using RAS technology involves processing and improving the quality of the effluent water from the fish tanks and returning the purified water back to the inlet of the fish tank for re-use. This technology is gaining increasing interest in the Europe and has many advantages:

- flexibility in site selection
- reduced water usage
- lower effluent volumes
- reduction of disease outbreaks
- better environmental control

A crucial element for ensuring the stability and functionality of a RAS system is an effective water treatment. Ozone, introduced to RAS via protein skimmers, is a key tool in processing the farm water to remove impurities .

State-of-the-art issues with ozone technology, which the RAZone project is aiming to solve:

- Poorly designed equipment for ozone feeding
- Inefficient configuration of skimmers
- Lack of controlled ozone dosage
- Poor understanding of ozonation system

RAZONE Project results

Our RAZone technology will overcome the limitations of current ozone technology in the aquaculture sector. The intelligently controlled ozonation process in RAZone will contribute to significantly improved water quality management , reduced disease outbreak and increased production in aquaculture, particularly RAS.

Expected project results:

- development of improved ozone delivery and dispersion system
- Development of flotation - reaction chamber for flocs separation
- control of the ozonation process for optimum ozone dosage
- cost effective application of ozone technology
- understanding of the impact of ozone on water chemistry and livestock

The RAZone consortium includes partners actively involved in the commercial aquaculture sector who are pioneering commercial RAS technology. Collectively, the consortium has all the appropriate knowledge and skills to design an improved ozonation system to meet the precise needs of international aquaculture sector.

RAZONE Project progress and further plans

The scientific investigations performed have a number of findings that benefit the aquaculture industry in management of water quality, especially in RAS:

- Ozonation improved water quality by enhanced removal of dissolved organics (lower TOC and DOC) through improved fractionation.
- Rapid nitrite removal has been attained by ozonation
- Ozone removes also iodide rapidly. Supplementation may be required as this is essential for normal growth of the fish.
- Ozonation enhanced the removal of copper but not much of zinc
- Fine particles with sizes < 20 μ make up ca. 75% of particulate substances in RAS. These are almost difficult to remove with existing methods

The RAZone prototype is currently being tested using seawater and fresh water RAS built at Liverpool University. Preliminary results have shown significant development in relation to SOA ozonation of seawater in RAS:

- The design of the ozone feeding unit allows enhanced contact between ozone and water/pollutants.
- The prototype is found to remove TOC, DOC and colour much more rapidly (10% in 5 hours) than the conventional protein skimmer system (10% over 12 days).
- The redox potential in the flotation unit rose to 500 mV but it remained low in the sump and the fish tanks, suggesting that there is scope to further increase the rate of ozonation and further increase the removal efficiency of TOC/DOC, and nitrite without significantly changing the redox potential in the fish tanks.
- The ozone consumption in RAZone is significantly lower in conventional protein skimmers

