

# TERRAGON REPORTER

## No Waste News

### A Message to Our Readers

DECEMBER 2015

Dear Readers,

Welcome to the first edition of the **Terragon Reporter** - No Waste News! The Terragon Reporter is a quarterly newsletter chronicling global environmental events and trends as well as the progress of Terragon Environmental Technologies Inc. in its mission of enabling the zero waste discharge habitat. This quarter has seen numerous exciting events such as the development of the new Version 8 Micro Auto Gasification System (MAGS™), and the movement towards commercialization of the first Waste Water Electrochemical Treatment Technology product; the WETT-O™, which you can read about in this newsletter.

In order to bring our readers up to speed with the company, this quarter focuses on the present accomplishments, undertakings and developments at Terragon, as well as better management options for resources often considered “waste” such as used water or municipal garbage. So join our revolution by sharing and following us on Facebook and LinkedIn and visiting our website!



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## NEWS

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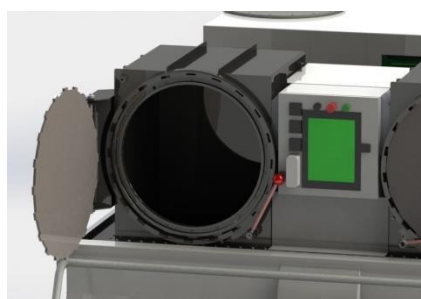
### The Next Generation MAGS V8

It's finally here; Terragon has been developing the next iteration of MAGS, the version 8; which will be available for delivery starting in December 2015. The V8 still employs Terragon's patented Auto Gasification process, but has many new advancements and upgrades at a reduced cost which enhances the cost-benefit analysis, all while delivering the same clean environmental performance.

The entire system is smaller, lighter, and more rugged. The redesigned loading drum can now accept larger bags, and the drop mechanism has been fully automated. The drum door itself is no longer of a dogged-design, but instead is based on a simple lever, which greatly decreases the time required by an operator to load waste. The mechanism by which waste is dropped is now that of a sliding-gate rather than the rotational drum design of the previous model.

The system is now capable of 24-hour operation, essentially doubling the daily capacity. This is in part due to the automatic biochar removal system. A separate chamber and auger removes the biochar to a bin, which makes handling safe, clean, and efficient.

Finally, one of the most notable improvements is the increase in energy MAGS will generate. The energy output has increased from a range of 70-80 kW to approximately 100-140 kW – with no additional resources required on the energy input (maintained at 22 kW nominally).



MAGS redesigned loading drum



MAGS biochar removal system



## Protecting our Waters: WETT-O Commercialization

Protecting water is synonymous with protecting life. Terragon is pleased to have developed an appliance with this mission in mind. The WETT-O, Wastewater Electrochemical Treatment Technology for oily water, is being introduced to the marine market in early 2016 for the treatment of ship-generated bilgewater. This oily water cannot be discharged overboard without removal of the hydrocarbons to low levels. The operating and maintenance costs associated with existing oily water separators are high, and port disposal is even costlier. The WETT-O is looking to address these issues with its novel approach designed to provide robust, reliable and efficient treatment.

WETT-O is the only shipboard bilgewater treatment system based on electrocoagulation. It requires less than 1kW of electricity to operate, and has no consumable filters, media or membranes typically associated with high maintenance costs.

Following years of in-house development and testing, the WETT-O has completed several shipboard trials. It performed exceptionally well, and produces treated effluent with oil content below 5 ppm for ship-generated bilgewater and for MEPC.107(49) standard test fluids. Certifications for the US Coast Guard and Transport Canada are underway. WETT-O is scheduled to be tested by Le Group Océan Inc., a Québec city company. Once the certifications hereinabove mentioned have been obtained, this commercial prototype trial will begin in January 2016 aboard one of their vessels, and trials with several other companies are presently being planned.



## The New Wave of Water Conservation: “Fit-for-Purpose” Reuse

As water use increases at more than twice the rate of population growth, solutions for conservation are in dire need. Terragon has been developing for several years a trio of innovative WETT™ wastewater treatment technologies which are specific to the type of wastewater being generated for treatment and reuse, or safe discharge into the environment. When 1.8 billion people are expected to be living in regions of absolute water scarcity by 2025, the time for action is now.

Approaches to diminish demands placed on Earth’s limited fresh water resources include seawater desalination and water recycling and reuse, not only in arid regions but also in cities and industrial environments. Seawater desalination requires a significant amount of energy, and is generally more costly than producing recycled water, which is increasingly viewed as a more sustainable and cost-effective alternative.

Water reuse strategies depend on the nature of water to be treated as well as the ultimate use of the treated water. The most complex situation arises when it is desired to convert heavily contaminated water, such as sewage, into potable or drinking-quality water. Typically, multiple filtration, oxidation, disinfection, and polishing stages are required. The treatment train may be simplified if either the wastewater is not highly contaminated (e.g., greywater) and/or the end use does not require potable water (e.g., irrigation). In all these water reuse scenarios, the concept of treating used wastewater to make it fit-for-purpose is at play.

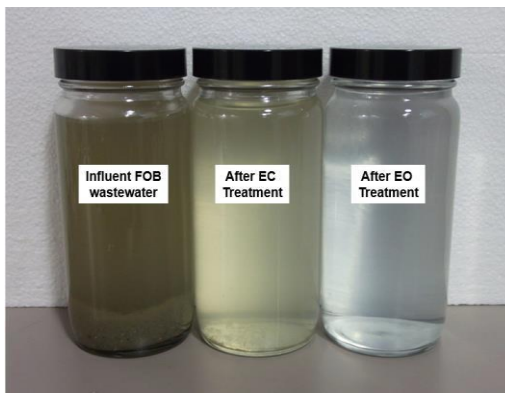
Terragon’s WETT technology is compatible with the need for fit-for-purpose solutions to water reuse strategies. A trio of products have been developed over the past 8 years that are specific to the level of water contamination and the end use of the treated water: WETT-O for oily and bilgewater treatment, WETT-G for greywater reuse; and WETT-S for sewage treatment and disinfection. Using cutting-edge and proprietary electrochemical technologies including electrocoagulation, electroflotation, electro-oxidation and electro-decomposition of oxidants, WETT does not require the use of chemical addition, biological treatment, consumable filters or membranes which involve significant maintenance.

Many demonstrations of the WETT technologies have now taken place including on commercial and Coast Guard ships, in a remote LEED-certified eco-chalet and in trials evaluated by the US Army and the US Navy. The WETT-O will be certified to International Maritime Organization (IMO) standards in late 2015, and will become the first of the suite of WETT products available commercially in 2016.

The WETT technologies will also be part of Terragon's exciting effort to develop zero-waste discharge habitats and will be integrated with Terragon's MAGS (see previous article).



WETT in a Tricon - developed for  
US Army Platoon FOB



WETT water treatment results

## UPDATE: MAGS for Marine Applications



2015 has been an excellent year for Terragon and the MAGS technology within the maritime sector. Two additional MV7 systems have gone into the market – one with an anchor handling towing supply vessel (AHTS) vessel and the other onboard a Jones Act container ship. A third order, and for the very first V8 system, has been contracted and will be installed in January 2016 on a special mission vessel owned by the US Government. IMO has also agreed to the development of new regulation for gasification equipment, and MAGS received Type Approval from the United States Coast Guard (USCG) and the American Bureau of Shipping (ABS); adding to the existing certificates obtained from Lloyd’s Register and ClassNK.

The installation onboard the AHTS vessel was done while the vessel was underway with no out-of-service time. The installation on the container ship was completed during the ship’s planned dry-docking. Both systems have been performing well and have positive acceptance from both the shipboard crew and the company. We expect future orders and installations throughout each fleet and their new-build programs.

The International Maritime Organization (IMO) has reached a critical decision in May at the MEPC meeting in London. They approved and directed the Pollution Prevention and Response (PPR) Group 3, to begin work on developing a category and regulation for technologies like MAGS – potentially called, Shipboard Gasification Waste to Energy Systems. This new category would better suit technologies that use the gasification process, and have a greater environmental performance. The next MEPC and PPR meeting will be in early 2016, when Terragon will attend to get the latest update on the development.

Perhaps most importantly to ship-owners and operators, is that the new V8 MAGS will see a reduction in cost, enhancing the cost-benefit analysis. The V8s have many upgrades which include a smaller and lighter system, doubledaily capacity, automatic biochar removal system, and a larger lid to accept bigger bags of waste. These advancements coupled with the lower price, enable MAGS to be extremely competitive with all waste management equipment and processes offered to the market.

Of special note, Terragon won in the category of the “One to Watch” at the 2015 Ship Efficiency Awards in London England. This category is meant to underline the potential of a commercially viable technology which can lead to significant progress in advancing maritime energy efficiency and environmental impact reduction.



Dr. Peter Tsantrizos receiving the “One to Watch” Award