

# Transforming Waste into Energy for the Maritime Industry



## THE BEST WASTE MANAGEMENT SOLUTION FOR MARPOL ANNEX V REGULATIONS

**MAGS™ is a safe, simple technology with exceptionally clean emissions for treatment of solid waste and sludge; it is thoroughly validated and serviced globally**

### Practical, On-site Solution for Waste Elimination

- Type Approved
- Exceeds MARPOL regulations
- 95% waste volume reduction
- Reduced offloading, transportation and landfilling
- 50 kg/hr treatment for solid waste
- 15-20 L/hr treatment for oily sludges
- Simple to operate and maintain



### Cost Effective and Energy Efficient Solution

- Savings from shore disposal costs
- Self-fueling process
- Over 100 kWh/h generated
- Lower operating costs vs incinerators
- Reduced reliance on fossil fuels



### MAGS Influencing IMO Regulations

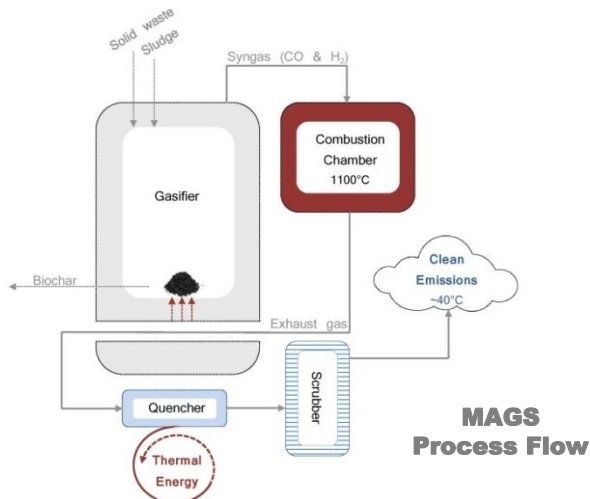
The exceptional environmental performance of MAGS has initiated a drive towards a change on the regulatory framework for sea and landbased applications. In May 2015, the International Maritime Organization (IMO) approved the Pollution and Prevention (PPR) Group 3 to begin work on developing a new category, standard, and Type Approval testing plan for Shipboard Gasification Waste to Energy Systems, allowing ship owners and operators to select cleaner and more energy efficient technology to meet MARPOL requirements.

## *MAGS is fuelled by a variety of combustibile material*

**Municipal Solid Waste • Biomedical Waste • Pharmaceuticals • Illicit Drugs • Hazardous Waste  
Sewage Sludge • Contaminated Packaging • Oily Sludge • Solvents • Confidential Waste**

MAGS was developed and tested over the past 10 years with support from the US Office of Naval Research, the Canadian Navy and Sustainable Development Technology Canada.

MAGS uses Terragon's patented technology, the *Auto Gasification Process*, to thermally break down hydrocarbons in waste and transform them into a small volume (5%) of harmless residue (bio-char) and energy.



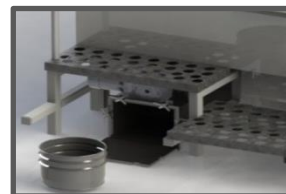
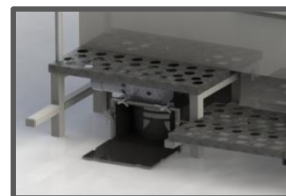
In MAGS, the syngas becomes the main fuel, thus minimizing the need for external fuel sources and rendering the appliance virtually self-sustainable. Efficient combustion of the syngas is accomplished in a combustion chamber operating at 1,100°C (2,012°F), under controlled temperature and air flow conditions. Once the hot exhaust gases transfer energy to the gasifiers, they are quenched with water to a temperature of less than 80°C (176°F), eliminating the potential for the formation of dioxins and furans and then cleaned to remove particulates and acid gases prior to discharge.

MAGS is a compact omnivorous appliance that gasifies all combustibile waste, including paper, plastic, cardboard, food, used oils, sludge, oily rags, wood pallets and others. Compared to conventional waste management approaches, such as incinerators, MAGS consumes very little fuel, has clean emissions, improves efficiency, and reduces greenhouse gases.

### **Version 8 Advancements**

Terragon is proud to introduce its latest model of MAGS. The Version 8 offers the following upgrades compared to previous units:

- *Increased solid waste capacity (> 100 lb/hr)*
- *Automatic biochar removal system*
- *Increased thermal energy output (> 100 kWh per hour)*
- *Smaller, lighter, and more compact*
- *Faster and more automated solid waste loading*
- *Accepts larger garbage bag sizes*
- *Reduced priced*



## MAGS – Field proven in remote locations and extreme climates

MAGS continues to be a leader in the industry as a technology that has very clean emissions, produces energy, and is simple enough to be operated by anyone. From every kilogram of waste processed by MAGS, over 2 kWh of thermal energy is produced. Thermal energy is extremely simple to use in the most rugged environments in the form of warm air. This warm air can condition living and working quarters, displacing the energy used by stand-alone Environmental Control Units (ECU) and reducing overall maintenance and energy burden.

MAGS units are currently operating in a number of sites, including commercial ships, Arctic communities and industrial facilities.



## MAGS™ V8 Accreditations & Achievements

MAGS is certified in compliance with IMO resolution MEPC.244(66) – replacing MEPC.76(40) – Standard Specifications of Shipboard Incinerators, and IMO MARPOL Annex VI. Until new regulation is adopted and ratified to properly class Shipboard Gasification Waste to Energy Systems, Terragon will maintain Type Approvals from ABS, USCG, LR, and DNV-GL. These certificates will typically satisfy other classification societies.



Terragon has received numerous awards for its innovative MAGS technology over the past several years, including the prestigious 2012 GLOBE Award for Best Emerging Technology, the 2014 North American Lloyd's List Award for Technical Innovation, and the 2015 Ship Efficiency Award for The One to Watch.



## Environmental Stewardship • Improved Economics • Safety

Elimination of shipboard garbage, hazardous waste, and sludge oils	Exceptionally clean emissions enabling operation at sea and in port	Simple operation with minimal training and remote monitoring	Exhaust can be released through a small duct without an exhaust fan
Reliable, Type Approved system requiring minimal maintenance		Over 95% volume reduction of waste with non-hazardous by-products	Generation of 70-80 kW of energy as heat or refrigeration
Improves energy efficiency		No operator needed for the treatment of oily sludge	Elimination of discharge at sea and compliance with MARPOL Annex V
			Maintaining a safe, clean and sanitary habitat

### Terragon Delivers

Terragon is committed to offering exceptional service to its customers and strives to ensure the highest degree of client satisfaction by continuously improving the quality of its products and services. A fully assembled MAGS, stand-alone or containerized, can be delivered within 4 months of receipt of order. Training, remote monitoring and a 12-month warranty is included with all orders. MAGS is available for purchase or lease, and Terragon can also provide tailored services for certain applications.

MAGS is being sold to various clients within a number of market sectors, including the maritime sector, isolated communities, special/hazardous waste applications and the military. With the support of its commercialization partners, Terragon has a proven track record delivering to all customers globally.



### Our Partners

