BY CAPT. ANDY GOLDSMITH, MARITIME PROGRESS

GARBAGE TIME BOMB

Big changes are in store for handling waste onboard starting January 1, 2013

Photo: NOAA

The exponential increase in the world's population and, in particular, its concentration in urban areas has lead to the expression "Population Time Bomb." This, in just three words, describes the seriousness of the environmental threat caused by overcrowding and the ever increasing industrialization of regions, previously devoted to agriculture. The resulting increase of waste material and its management and disposal are a growing concern for national and international bodies.

The environmental impact of this "Garbage Time Bomb" is being felt in our oceans. In the world's oceans there are five regions of circulating ocean currents known as gyres in which floating debris tends to accumulate. In the Pacific Ocean there are two vast regions of marine litter caused by the dumping, either collectively or individually of mainly plastic material. Known as the Great Pacific Garbage Patches, they are characterized by exceptionally high concentrations of plastics, chemical sludge and other debris trapped by the currents of the North and South Pacific Gyres. The scale of the problem is horrifying. While the exact size is not known, some estimates have reported that the Great Pacific Garbage Patch is the size of Texas and contains roughly 3.5 million tonnes of rubbish consisting of old fishing nets, plastic bottles, crisp packets, plastic containers, plastic components of all descriptions, ice cream tubs and lumps of polystyrene.

Until the mid- to late-70's, it was generally believed that the oceans could absorb anything that was thrown into them. After leaving port and once out of sight of land, the ship's crew felt it was free to dispose of all manor of garbage over the stern rail. It is true that in those days the amount of packaging was far less than it is now and plastics were not as prominent.

Research has shown that a small piece of paper will only take two to four weeks to dissolve at sea, but a piece of painted wood will take 13 years, a tin can 100 years and a plastic bottle 450 years. Therefore, much of the litter disposed of into the seas during the last century is still affecting the marine environment today.

Ships are not the only source of garbage affecting the marine environment; the increase in tourism and land-based industrial activity has contributed over the years. However in some areas of the world most of the rubbish found in the ocean and on the beaches comes from passing ships that throw trash overboard rather than dispose of it in port. In previous decades and in some areas of the world today the lack of garbage reception facilities in port has left the mariner with very little choice but to dispose of garbage overboard. I recall some port authorities being aghast to find a vessel wanting to land rubbish and the ship's agent not understanding why it wasn't disposed of prior to arrival. These situations and attitudes have changed and many ports now allow for both general and recyclable garbage.

DELAYING THE TIME BOMB

Persuading people on land and afloat not to use the oceans as a rubbish bin is a matter of education. For the Marine industry 1988 saw the introduction of MARPOL Annex V, which sought to eliminate and reduce the amount of garbage being dumped into the sea from ships. The Annex disallowed the dumping of plastics anywhere at sea and severely restricted the disposal of other forms of

Rethinking waste

Starting in January 1, 2013, there are big changes coming in the way waste will be handled on board ships that will place more of a burden on a ship's master. "We need to change the way we think about waste," says Dr. Panayotis (Peter) Tsantrizos, President, Chief Executive Officer, and Director of Montreal-based Terragon Environmental Technologies Inc.

Tsantrizos says Terragon Environmental's approach to waste was to eliminate the need to store it and haul it away. "We wanted to come up with a solution where everyone could handle their own waste. It's about changing people's minds about how they see waste."

Established in 2004, Terragon Environmental Technologies believes it has developed an innovative, "zero-waste discharge management solution to handle solid waste for shipboard or land applications.

Called the Micro Auto Gasification System (MAGS), it is compact, environmentally friendly solid-waste treatment appliance. Terragon developed the award-winning technology with the support of the US Navy and Canada's Department of Defense for use in naval vessels and isolated communities.

Terragon Environmental Technologies' President Peter Tsantizos with a MAGS unit at the company's factory in Montreal

For example, MAGS was installed and succesfully tested on the *HMCS Protecteur* in early 2011 and used for six months by the U.S. Marines at Camp Smith for evaluation by the U.S. Department of Defense. MAGS is expected to be used in future Canadian and U.S. Coast Guard and Navy vessels and the U.S. Marines, says Tsantrizos. Terragon Environmental has also received orders for commercial shipboard and platform applications.

MAGs has the ability to convert all organic waste, such a plastic, paper, food, wood used oil, sludge, etc. into an ash-like substance called bio-char, water and syngas. Metals and glass are sanitized for recycling. And an added benefit is that MAGS actually uses the syngas as its main source of energy.

What Terragon Environmental was very conscious of in the development process was to create a practical, easy-to-use appliance, like an everyday household appliance, says Tsantrizos.

A simple push of a button initiates a carefully controlled thermal treatment process that "cooks" the waste in a high-temperature (750°C), low-oxygen, environment. In a single hour, MAGS can process up to 40 kg of as-received waste. The waste is generally reduced to about 5-8% of its total weight in biochar.

Once more, MAGS is energy efficient and extremely clean, complying with air emission regulations for incinerators worldwide.

Terragon has also developed an appliance for handling liquid waste streams. Working with Sustainable Development Technology Canada (SDTC), the Canadian Department of Defence (DRDC) and the U.S. Navy (US ONR). The system is called Wastewater Electrochemical Treatment Technology (WETT) and is designed to handle specifically:

- sewage
- gray water from showers, kitchens, laundry and cleaning
- oily water
- greasy water

The WETT system is designed with the same approach as MAGS—compact and simple to use. It can remove bulk and suspended solids, and dissolved solids. It also inactivates pathogens such as bacteria, viruses, molds and spores.

WETT combines a variety of physical separation approaches and advanced wastewater treatment processes based on electrochemistry. **ML**

garbage depending on geographical area, type of garbage and distance from the coast. It also obliged governments to provide garbage reception facilities for visiting ships. Since introduction there has been a reduction in the amount of garbage; however recent surveys have produced up to 10 tons of garbage per mile of coastline and it is clear more needs to be done.

STOPPING THE TIME BOMB

The United Nations recognized that more needed to be done. The International Maritime Organization (IMO) was invited to review MARPOL Annex V and to assess its effectiveness in addressing sea-based sources of marine debris. The review commenced in October 2006 and the IMO consulted with relevant organizations and bodies from around the world. The Marine Environment Protection Committee (MEPC) approved amendments to the Annex in the autumn of 2010 and adopted them at the 62nd session of MEPC in July 2011. The amendments have fundamentally changed the Annex as highlighted here:

- Discharge of all garbage into the sea is prohibited, except as expressly provided otherwise.
- The number of categories of garbage has been increased including a definition for cargo residues.
- Some cargo residues and cleaning agents can be discharged as long as they are not harmful to the marine environment.
- It is incumbent on the owner/master to prove that discharged material is not harmful to the environment.
- The requirements covering

Marine wildlife, such as this sea turtle, can become entangled in discarded nets, leading to injury, illness and possible death

Photo: NOAA

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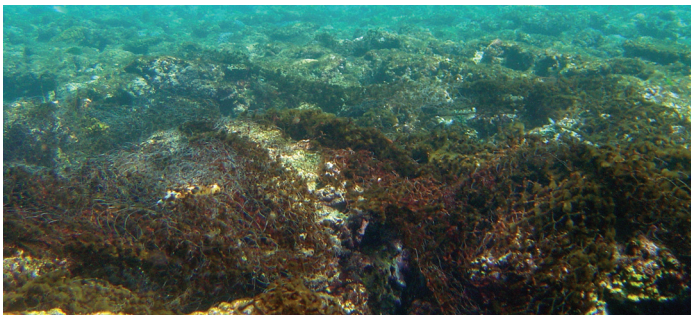

Photo: NOAA

placards, garbage record books and Garbage Management Plans have changed. Waste minimization is the key to putting a stop to garbage pollution. The following maxim sums it up: "Avoidance before Reduction before Recycling before Disposal."

Enforcement Perspective of the problems have certainly improved in recent times but the old idea that the sea can cope with anything still prevails to some extent and it is therefore important to ensure vigorous enforcement of regulations such as Annex V. Port control officers are empowered to inspect ships for compliance and where there is clear evidence that the master and crew are not familiar with procedures, relating to the prevention of pollution by garbage, the ship can be detained until this is rectified. It is therefore essential to not only follow the regulations but also provide evidence that this is the case onboard.

THE BURDEN OF PROOF

The combination of increased garbage categories, clearer definition and the declaration that the discharge of all garbage is prohibited unless expressly allowed has burdened the ship with additional responsibility. Garbage that fits into a specified category can only be disposed of under certain circumstances; conversely garbage that does not fit a categorization cannot possibly be discharged into the ocean. The burden of proof has shifted so that the master must now be able to prove that any discharge from his vessel will not cause harm to the marine environment. The revised annex has also made changes with regard to the size and type of vessel required to comply with certain regulations contained within it. Ship owners and operators are advised to prepare for this change of emphasis with regard to marine garbage disposal by reviewing the current onboard placards, log books and manuals.

Further advice can be obtained from IMO, Flag state and specialist marine publishers such as Maritime Progress Ltd.

PLACARDS

Annex V requires every ship of 12 meters or more in length to display placards notifying passengers and crew of the disposal requirements of the regulation. The placards should be written in the working language of the ship's crew and where necessary in English, French or Spanish for ships travelling to other States' ports or offshore terminals.

GARBAGE RECORD BOOK

Every ship of 400 gross tons and above, every ship certified to carry 15

or more passengers engaged in voyages to ports or offshore terminals under the jurisdiction of another party to the convention and every fixed or floating platform shall be provided with a Garbage Record Book unless specifically excused by the administration. This log book will be used to record all instances of garbage disposal both at sea and to port reception facilities.

Vessels that can adequately account for all their garbage are unlikely to be wrongly penalized for dumping garbage when they have not done so.

GARBAGE MANAGEMENT PLAN

The requirement to carry a garbage management plan has been extended to all ships of 100 gross tons and above, every ship certified to carry 15 persons or more and fixed or floating platforms shall carry a Garbage Management Plan. The plan is required to have written procedures for minimizing, collecting, storing, processing and disposing of garbage, including the use of equipment on board and will designate the person or persons onboard in charge of carrying out the plan.

ATTITUDES AND PROCEDURES NEED TO CHANGE

In the previous version of Annex V, ships could under certain circumstances dispose of general garbage overboard in the revised annex this is now expressly forbidden. The disposal of dunnage is a good example of how this amendment will require the marine industry to make some swift changes.

Dunnage previously categorized as general garbage that will float could be discharged outside of special areas and more than 25 miles from the coast.

Under the new Annex V, this is not possible and it appears the master has two options open to him either incinerate or transfer ashore. Many existing ships will not be able to physically handle the volume requiring incineration and many port reception facilities will not be capable of handling a large intake of dunnage without considerable investment and planning. With no option but to comply with the regulations it is likely the cost of disposal will have to be met by the shipper with the cost taken into account at the time of signing the charter party.

Managers of ships and port authorities need to act swiftly as these amendments enter into force on the 1st of January 2013. New posters, garbage management plans and record books relating to these changes will be available during the second half of 2012 from some marine publishers. It would be advantageous to ensure that management and ships' crews have this information to hand in good time.

ABOUT THE AUTHOR

Capt. Andy Goldsmith is the Marine Technical Manager of Maritime Progress, manufacturer of marine signage and specialized publisher of marine books and posters.

Married for more than 30 years with three children and an active member of the Nautical Institute, Goldsmith spent a number of years at sea, including 10 with Texaco and another 19 years with Smit International both at sea and ashore. **ML**