



Eco-innovation 

WHEN BUSINESS MEETS THE ENVIRONMENT

Networking and Lobbying

The main objective of our networking is to understand the current status of the marine litter problem and how it is being dealt with in the Mediterranean and Baltic countries, and to make practical recommendations in view of the Regional Strategy for the Sustainable Management of Marine Litter in the Mediterranean. It is essential that governments, local/port authorities, the maritime industry and other stakeholders enhance their cooperation in order to address all remaining problems regarding the availability of port reception facilities, and the collection, treatment and disposal of waste. This need is more urgent in the case of smaller fishing harbours and marinas where even greater problems exist.

The MarineClean project is not only offering technical solutions for the

decrease of marine litter but is also raising awareness about the marine litter problem, its presence worldwide and in certain countries, its main sources and presents possible routes to tackle this problem. The majority of marine litter is of plastic materials. One way of spreading info about marine litter is the networking of all stakeholders in this area: producers of plastics (especially of packaging material), users of plastics, marine biology research organizations, non-governmental ecological organizations, decision makers on the national and EU level, operators of ports and marinas, hotel/resort managers etc.

The MarineClean consortium is active also in lobbying: its target is to reach stricter national and EU legislation in the field of waste return from ships and the promotion of usage of biodegradable

packaging on ships and in coastal areas. The same proposal will be presented in different countries. National decision makers as well as EU will have to consider passing on a legislation change. Joint forces of several European nations and their representatives are needed to gain success and this is covered by participation of the three European countries, Slovenia, Lithuania and Croatia. All three countries have access to the sea and are aware of the marine litter problem, because they have to face its consequences: direct (entanglement, injuries) and indirect (intoxications, carcinogenesis) damage to marine organisms and humans, negative influence on tourism (debris floating in the coastal sea and stranded on shores), etc.

Partners in project



**KLAIPĖDA SCIENCE AND
TECHNOLOGY PARK**

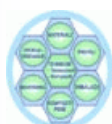


AIR POLLUTION
FROM SHIPS
RESEARCH
LABORATORY



DRAVA

VODNOGOSPODARSKO PODJETJE PTUJ, d.d.



**Tehnološki center
POLI-EKO**



University of Zagreb
Faculty of Mechanical Engineering
and Naval Architecture



Development of marine litter removing equipment

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The project MarineClean deals with decreasing marine litter – one of the major ecological threats.

The MarineClean consortium aims to launch on the market two innovative products:

- marine litter removal equipment that is easily trawled with only one vessel and

- edible and in marine conditions biodegradable packaging

Turna d.o.o. together with Technology Center Poli-Eko initiated idea of the MarineClean project, gathered a consortium around it and prepared project proposal that was submitted to the CIP Eco-Innovation call in the year 2010. The main purpose of the Eco-Innovation call is to finance first market application and market replication projects with innovative character which will achieve significant environmental improvements, provide significant replication and demonstrate an European added value. The project proposal MarineClean was recognized as such. The project started in autumn 2011 and will end in 2014. After two and a half years eight partners from Slovenia, Croatia and Lithuania had made significant progress in the project, including in development of marine litter removing equipment, which is one of three products developed in the MarineClean project. Turna and Poli-Eko are the main developers of this equipment and Turna is planning to start with its production. Development phase of the project was relatively short; only final improvements were done in the first half of the project as significant efforts towards the equipment development were taken before the project proposal submission. Since then different project partners are testing equipment in laboratories as well as in practical use on inland waters and on the sea. MarineClean's equipment has several advantages in comparison to competitive products due to its lightness and ease of operation. Only one boat is needed for the equipment trawling, resulting in the possibility to use it in tight areas such as marinas and around piers. Marketing activities and presentations to possible users are currently on-going as this is eligible under the Eco-Innovation programme. Besides, MarineClean is also heavily focusing on lobbying on national and international level with the goal to implement stricter legislation about releasing waste from ships into sea and to increase level of delivered waste in ports.

Litter removing equipment



Trawling net, Turna



Trawling net testing in the marine environment - Piran

TC PoliEko and Turna have developed a very light and easy to operate trawling net for the collection of litter on sea and inland waters. Turna is planning to launch production and market entry with the new litter removing equipment, while TC PoliEko is research organization.

The equipment is being tested by three project partners: KU-APS (measuring air pollution during usage of MarineClean trawling equipment), Drava (testing behaviour of trawling the nets in different weather and water conditions), and UZ FMENA (mechanical testing). These partners are all involved also in demonstration and marketing activities to support Turna.

The MarineClean trawling net is equipped with side elements (slides) that enable steering and trawling of the net with only one vessel. The equipment is very light and therefore especially useful for cleaning in tight spaces such as harbours, ports, small bays, etc. Equipment without side elements can be used as stationary prevention of swimming areas in sea or lakes as well as prevention net on streams and rivers.

Marine Litter Removal Equipment market

As most competitive products are heavy and difficult to operate (at least a few men are needed and two boats with heavy machines), the consortium has decided to focus on development and production of lighter equipment intended to be used in castal waters, in marinas, in front of hotels and camping beaches. The main goal is equipment that can be operate with only one boat or even a boat and a person walking on the strand. Such equipment has much lower production costs and much less material is needed, which results in a lower price in comparison to competitive products that are mainly intended to be used on a large surfaces and need plenty of space to operate with.



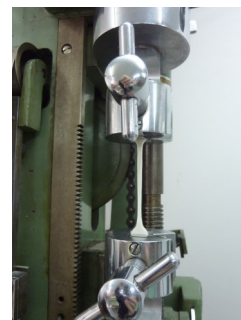
Processing and properties of marine biodegradable plastics

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From the point of environmental protection, the protection of rivers, lakes, seas and oceans is very important. The general problem in the seas and oceans are the discarded plastic products, floating or sunk. Much of the plastics found in the marine environment comes from industrial products, consumed or used before being thrown away with their packaging. Plastics are a big threat to the ocean environment for two main reasons. First, because of their volume – they represent 75-80% of marine litter. But also, because of their advantages: light weight – they are easily carried by currents; and resistance to biodegradation – they build up over time. The need to reduce the quantities of discarded non-degradable plastics in the seas has led to the development of marine degradable materials that degrade completely after a certain time after having been discarded into water. The paper analyses the possibility of processing the marine degradable material using the injection moulding process, the testing of mechanical properties, and the applicability of the material for manufacturing of products that come into close contact with food.



Testing of tensile properties at FMENA, Zagreb

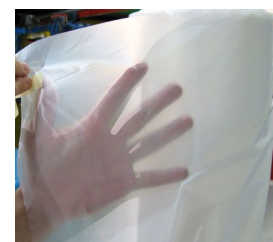
Testing the biodegradability of plastics in the marine environment

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Plastic has achieved a pivotal status worldwide with extensive commercial, industrial, medical and municipal applications. With a growing production of plastic, the release of its products and wastes in the environment increased as well. Seas and oceans represent one of the major accumulation points of these materials and plastics became one of the most important contaminants with significant negative influence on the marine environment, causing direct physical damages (e.g. entanglements and internal injuries) and toxic effects (e.g. carcinogenesis and endocrine disruption) to marine organisms. One way to reduce these crucial problems is by replacing classic non-degradable plastic with biodegradable materials. However, each new material that is introduced in the environment needs to be tested. Different tests of a new plastic, biodegradable in marine environment (EcoOcean) were performed in the laboratory as well as in situ in the marine environment, as a part of the Eco Innovation project MarineClean (Grant Agreement ECO/10/277396/SI2.601543). These tests included photochemical and microbial degradation in microcosm experiments, as well as degradation in biologically more complex systems with different marine animals, such as aquaria or in situ in the coastal sea. The microbial dynamics was followed using microscopic and molecular techniques to determine the succession rates and species composition of microbial community, and possible differences compared to non-degradable plastics. At the same time, the degradation was followed using infrared spectroscopy (FTIR) and elemental analyses. Preliminary results show that the degradation occurred on the time scale from weeks to months. In the FTIR spectra the degradation of studied material was indicated by decreasing absorption intensities of aliphatic stretching ($2800-3000\text{ cm}^{-1}$) and ester $\text{C}=\text{O}$ stretching (1755 cm^{-1}). The used plastic material was photochemically very stable at environmentally significant wavelengths, but its degradation was very fast at shorter wavelengths (UVC light). During the aquarium experiment, the biodegradable plastic completely decomposed within two weeks. In addition, some of the animals (fish, crabs) were feeding on this decomposing material. Preliminary results of bacterial community structure analyses and microscope observations suggest a fast biofouling and a relevant importance of complex living communities of bacteria and eukaryotes for efficient decomposition of biodegradable plastic material. Furthermore, these preliminary results suggest a large possible impact of biodegradable plastic on the ambient bacterial community structure and consequently on the ecosystem functioning.

The use of biodegradable and/or edible packaging materials is one promising approach to reduce the accumulation and negative impact of marine debris. Of the two, biodegradable plastics are more technically advanced and in a better position for near term commercial use.



*EcoOcean bag
EcoCortec*

Pages 1-3 Abstracts of three papers that were presented at the GOF2014 conference in Šibenik, Croatia, 5 - 7 May 2014



*MarineClean bag
EcoCortec*

Biodegradable Packaging market

The use of biodegradable and/or edible packaging materials is one promising approach to reduce the accumulation and negative impact of marine debris. Of the two, biodegradable plastics are more technically advanced and in a better position for near term commercial use. However, these materials still have a significant cost disadvantage relative to conventional plastics. It is likely that widespread commercial adoption will require some combination of legislative restrictions of conventional plastics and/or economic incentives for use of biodegradable plastics. With the development of a significant market, and ongoing technical innovations, biodegradable plastics should become more cost and performance competitive over time.

Meetings of project consortium



PROJECT TITLE:
Marine debris removal
and preventing further
litter entry
PROJECT ACRONYM:
MarineClean
START DATE:
01/11/2011
END DATE:
31/10/2014
**TOTAL
PROJECT DURATION:**
36 months
**EC TOTAL
CONTRIBUTION:**
584.995 €

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M18 meeting – Piran, 9 - 10 April 2013



M28 meeting – Klaipeda, 8 October 2013



M31 meeting – Šibenik, 5 - 7 May 2014