

## MarineClean-Project summary

**Project MarineClean  
(11/2011 – 10/2014)  
involves partners from  
Slovenia, Croatia and  
Lithuania.**

The project deals with decreasing of marine litter – one of the major ecological threats – in four areas of action:

Collection of marine litter with new light equipment produced at Turna;

Edible and biodegradable packaging produced at EcoCortec that will help to reduce the quantities of marine litter due to degradability;

Fishing nets produced at Turna and TC PoliEko that can be

easily traced, collected and recycled when lost;

Networking of products' users and lobbying at national and EU decision-makers to promote and enlarge eco-friendly products usage as well as for intensified surveillance in the return of ship waste and for grants and/or discounts with edible and biodegradable packaging will be formed. Proposed solutions will have positive effect on marine ecology: decreasing of marine litter in

tested areas, higher number of cleaning groups/areas, higher share of edible/biodegradable packaging on ships, and a few of law changing proposals. All project products will be widely disseminated through web platforms and demonstration sessions in each participating country.



## Partners in project

### In this newsletter:

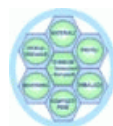
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**KLAIPĖDA SCIENCE AND  
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**Tehnološki center  
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University of Zagreb  
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and Naval Architecture



## Testing in the sea



EcoOcean testing

We placed the testing EcoOcean material specimen in the littoral zone of the Slovenian



sea on 25th May 2012. We've put two pieces in few meters of depth, fastened on the hard structures. Together we placed also a few plastic bags made of

EcoOcean plastics. The bags were left suspended in the water column, approx. 1 m above seafloor. The temperature of the seawater was around 15°C.

After one month the situation in the sea was as follows: one bag was torn and was laying on the seafloor and two bags were still floating in the water column. All the bags and also the epruvets were covered by a biofilm of different marine bacteria, plants and specimens.

The bag on the seafloor was evidently the most degraded and torn in pieces.

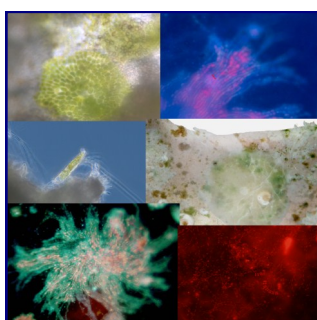
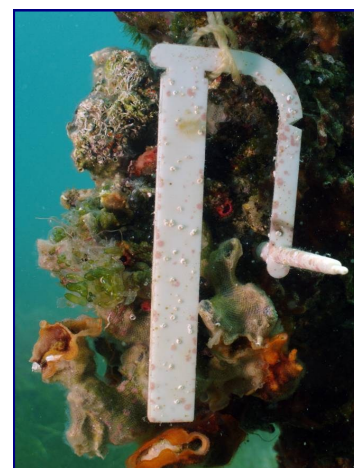


The bags that were suspended in the water column were more intact, but the organisms on their surface were more abundant.

*"Project MarineClean (11/2011 – 10/2014) involves partners from Slovenia, Croatia and Lithuania. The project deals with decreasing of marine litter – one of the major ecological threats"*



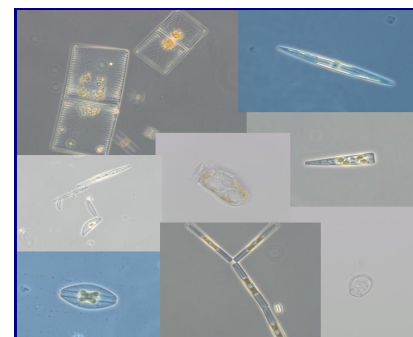
Bacteria, benthic microalgae, of which mostly diatoms, and some animals constituted the biofilm on plastics in the first month.



Through the microscope



After two months, the biofilm becomes more diverse, with cyanobacteria, macroalgae and bryozoans overgrowing the plastics.



Seen under the microscope, the microalgae in the biofilm are very diverse, consisting of diatoms, dinoflagellates and nanoflagellates.

## Testing in the laboratory

Parallel to the test in the sea, we performed some pilot testing also in the laboratory. We put one specimen in non-filtered seawater, and pieces of plastic bags in three bottles: one with seawater with almost all organisms removed, one seawater with phytoplankton and bigger organisms removed, and one with intact seawater.

After one month at constant temperature of 14 °C there was “snow” material in the bottles

with the epruvet, indicating the bacterial growth.



The pieces of soft plastic bags were still intact after one month in the laboratory, with no evident degradation.

Only after two months when

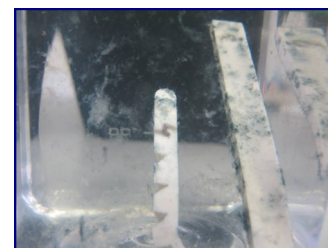
the water was left in the air temperature, allowing to fluctuate with growing temperatures, plastics in the bottle with non-filtered water begin to degrade.

Only after almost four months the plastic piece in the bottle with non filtered water degraded almost entirely to small pieces.

The hard plastic did not degrade till now, but was interestingly overgrown with mould.



Initial set-up



Current state

## EcoCortec capacities

EcoCortec® has world-class laboratory that can perform testing compliant to Military Specifications ASTM and EU standards. Mechanical properties and coefficient of friction are measured with Instron precision instrument. Water vapor transmission and Electrostatic Discharge (ESD) rates are determined using desiccant chamber designed for 0% RH. ESD films

are manufactured in compliance with Military Specification MIL-PRF-81705D. Each ESD production order is tested onsite for static decay and surface resistivity. Custom films are developed and tested on site. Specific strength, tear resistance, tackiness, and slip qualities can all be formulated according to the customer's needs.




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*“The amount of plastic floating in oceans is increasing; in some parts of oceans there are already 6 times more small plastic parts than planktons. “*

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## EcoOcean™

High renewable content: 77 % biobased content

Designed to biodegrade in marine environments, anaerobic digestion, natural soil and water environments, backyard composting systems and municipal composting facilities

BPI certified to meet ASTM

D6400 for compostable plastic

Marine biodegradable per ASTM D 7081 standard specification

100 % anaerobically digestible per ASTM D5511 standard test method

USDA BioPreferredSM certified material

Potential applications:

Community composting programs  
Anaerobic digestion programs  
Organic waste disposal  
Lawn & leaf bags  
Retail packaging  
T-shirt bags  
Agricultural films







Test specimen of biodegradable material EcoOcean is produced by injection moulding machine Boy



## Testing of biodegradable materials

Material Eco-Ocean shows good mechanical properties. Tensile strength is lower than that of conventional polymers, while strain is over 500 %. Given the high strain material Eco-Ocean is also highly flexible, and because of that it is not possible to calculate the flexural strength at break, but the testing is stopped at an agreed deflection of 6 mm.

Legislation: Regulation EC 1935/2004 on materials and articles intended to come into contact with food and Regulation EU 10/2011 plastic materials and articles intended to come into contact with food. Pyrolysis shows that EcoOcean material is polymer material based on crotonic acid and polyalcohol plasticized with 3-n-butyl acetyl citrate (ATBC) and adipate (DOA and DEHA). With this Regulation it is necessary to test microbiology purity and global migration.

For the microbiology purity – specimen match, but for the global migration – (HRN EN 1186-5, HRN EN 1186-14 (MDK < 10 mg/dm<sup>2</sup>)) contact with:

-acid solution (3 % acetic acid) within 10 days at 40°C - MDK = 181,8 ± 2 mg/dm<sup>2</sup> → no match

-neutral solution (distil water) within 10 days at 40°C - MDK = 9,7 ± 2 mg/dm<sup>2</sup> → match

-lipid solution (izo-octane) within 2 days at 20°C - MDK = 7,1 ± 3 mg/dm<sup>2</sup> → match

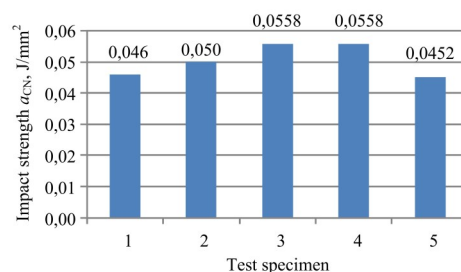


Diagram of impact strength

## MarineClean meeting in Beli Manastir

April 19 & 20, 2012

On April 19th, EcoCortec d.o.o., one of the most advanced manufacturers of biodegradable packaging in Europe, welcomed an international consortium of representatives of the Marine Clean project.

Two days of meetings covered progress reports on work that has been carried out in the first six months of the project. Plans for future work also have been set. After the official program, the first day of meeting a visit to the EcoCortec plant was organized. Boris Mikšić, owner and the President of the Bord, welcomed our guests and then presented biodegradable film production capabilities and EcoCortec's world-class laboratory. The evening ended in the famous Josic ethnic restaurant with live tamburitza music.

We were happy to receive a warm invitation

from the Mayor of City of Beli Manastir, Mr. Ivan Doboš, who welcomed us at his offices on April 20th. Valuable information on the investment opportunities in the business zone of Beli Manastir were exchanged.

The importance of the development of new technologies, and possibilities of contributing to economy growth, specifically in countries like Croatia, were discussed. The meeting coincided with The Green Day in Croatia, initiative during which the Government organized a major cleaning of nature collecting approximately 47000 kg of waste.

The whole event had great media coverage on national TV, regional radios station and daily newspapers identifying this important project for the region and also for the country of Croatia.



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