

From marine litter to marine fuel

Presentation of SINTOL prototype marGnet

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blue  **med**

Research and Innovation
for blue jobs and growth
in the Mediterranean Area

Marine Litter - definition

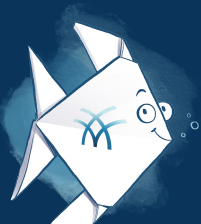
*“Marine litter consists of items that have been deliberately discarded, unintentionally lost, or transported by winds and rivers, into the sea and on beaches. It mainly consists of plastics, wood, metals, glass, rubber, clothing and paper” **

*“Marine litter is a growing global problem which poses an increasingly serious threat to the environment, the economy and health. To rid our coasts and seas of marine litter, we need to understand its various sources, forms and impacts and come up with imaginative, concrete and ambitious solutions. Meanwhile, we must all reflect on what we choose to buy and discard to reduce the amount of litter ending up at sea” ***



* European Commission

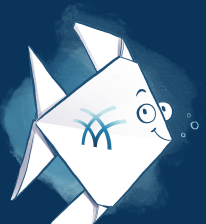
** K. Falkenberg Director-General for Environment European Commission



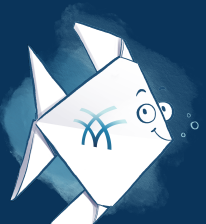
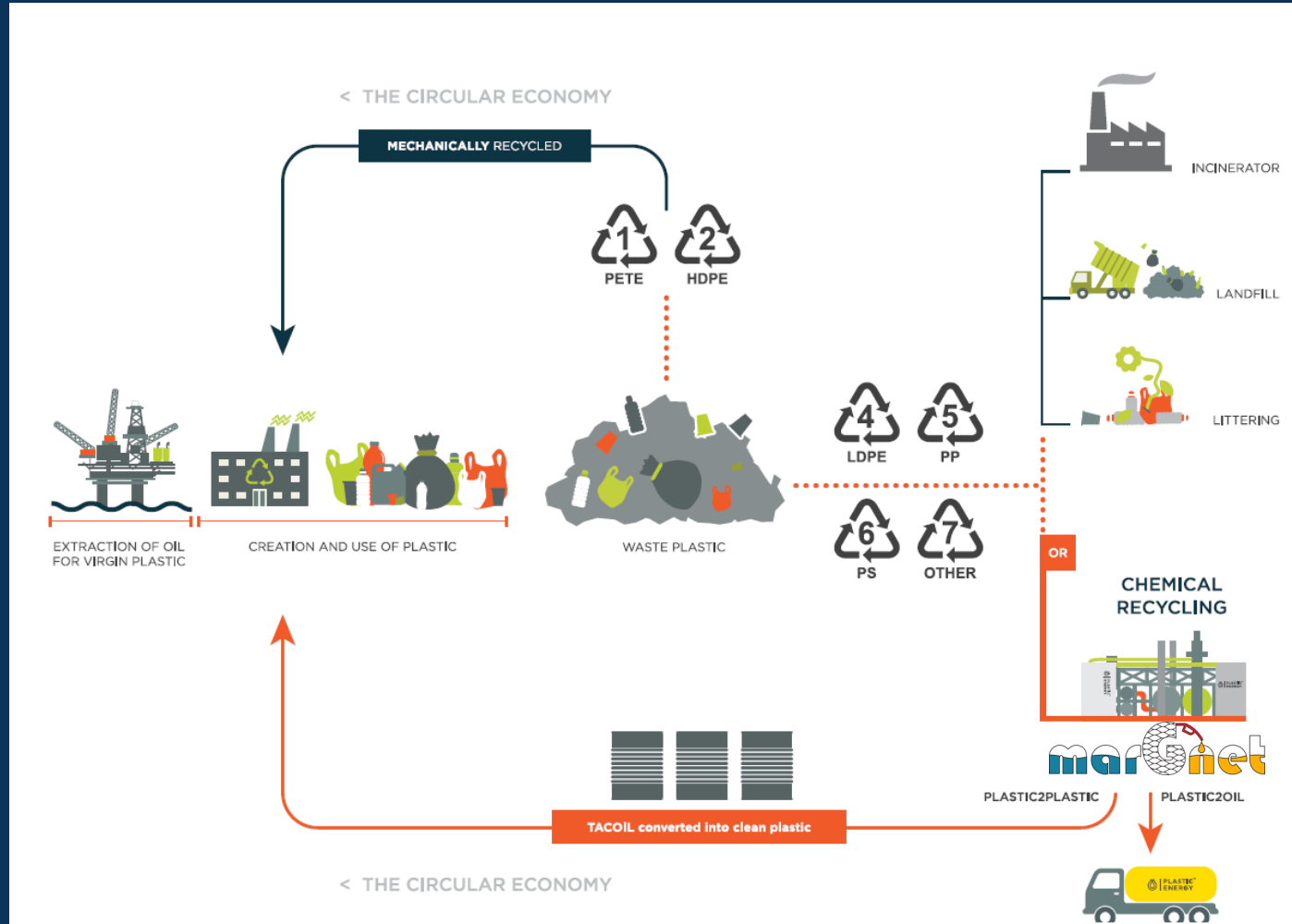
Marine litter – other definition

- ML is a “public bad”, the opposite of a “public good” that negatively affects our welfare in a non-excludable and non-rival manner. Non-excludable means that everyone suffers to a certain degree irrespective of whether he or she contributes to the marine litter problem, and non-rivalry means that the disutility experienced by any individual exposed to marine litter does not decrease the disutility experienced by others.*
- ML is a consequence of waste mismanagement
- As consequence, marine litter is an example of market failure.

* Oosterhuis, F., Papyrakis, E., & Boteler, B. (2014). Economic instruments and marine litter control. *Ocean & coastal management*, 102, 47-54.



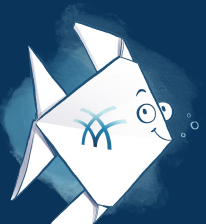
Circularity



Our “imaginative and concrete solution”: synthesis of standardised marine fuels

- Since conventional recycling methods (mechanical) are not effective for ML (from technical to economical points of view)*
- Since ML is retrieved accidentally during fishing activity (bycatch)
- Within marGnet we successfully converted ML into ISO8217 compliant marine fuels
- A pragmatic non idealistic approach to recycle “difficult” plastic materials
- Non monetary instrument to get stakeholders involved

* National Geographic Society: 7 things you don't know about plastic (and recycling)



Depollution cycle: concept

Turn ML into marine fuels



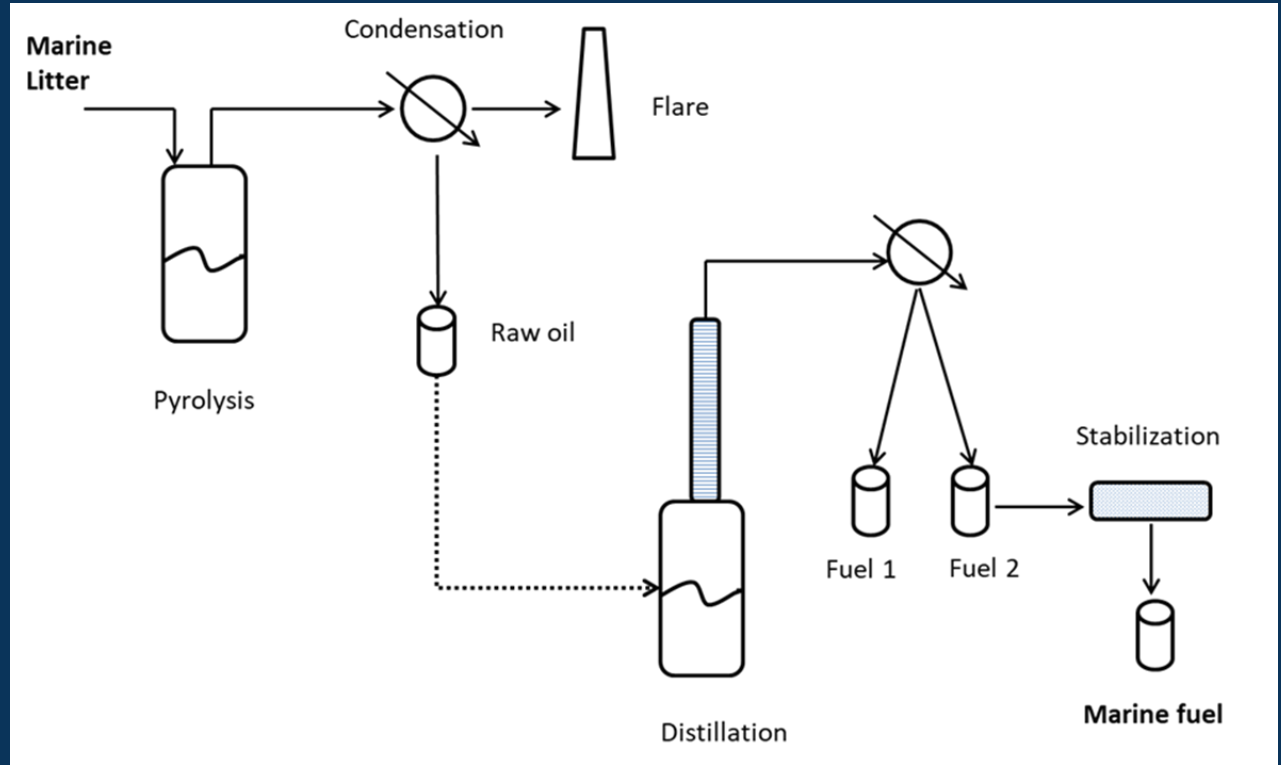
Use the fuels



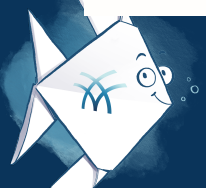
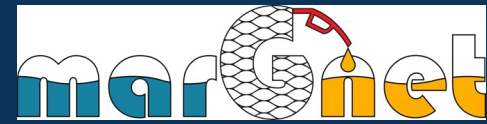
Reduce dispersed ML



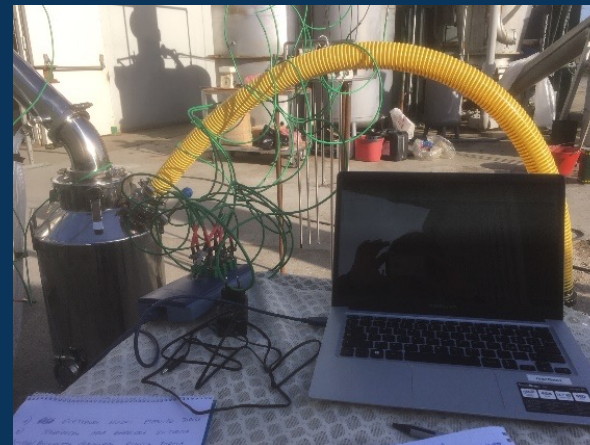
The prototype



Process: Pyrolysis (irreversible thermal decomposition without combustion) followed by distillation and upgrading



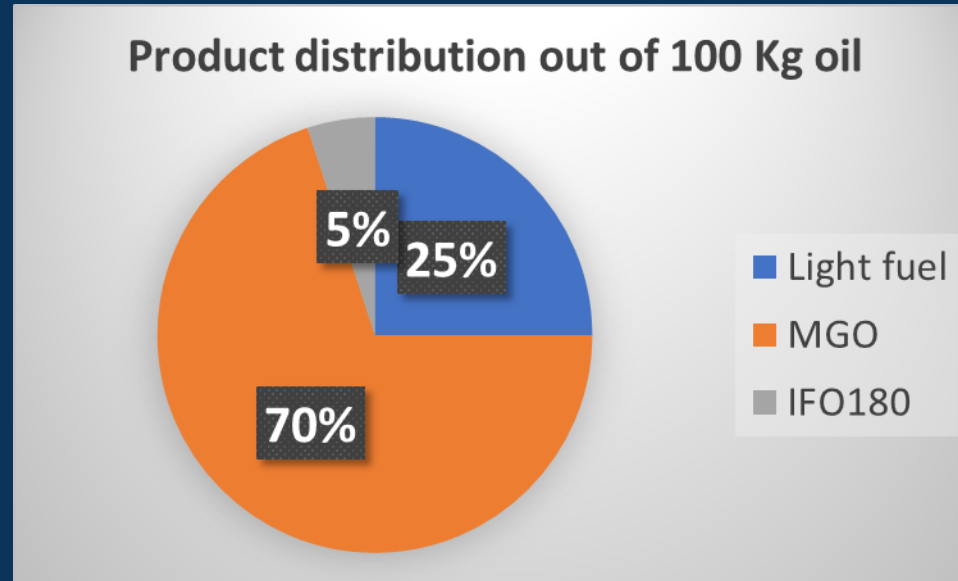
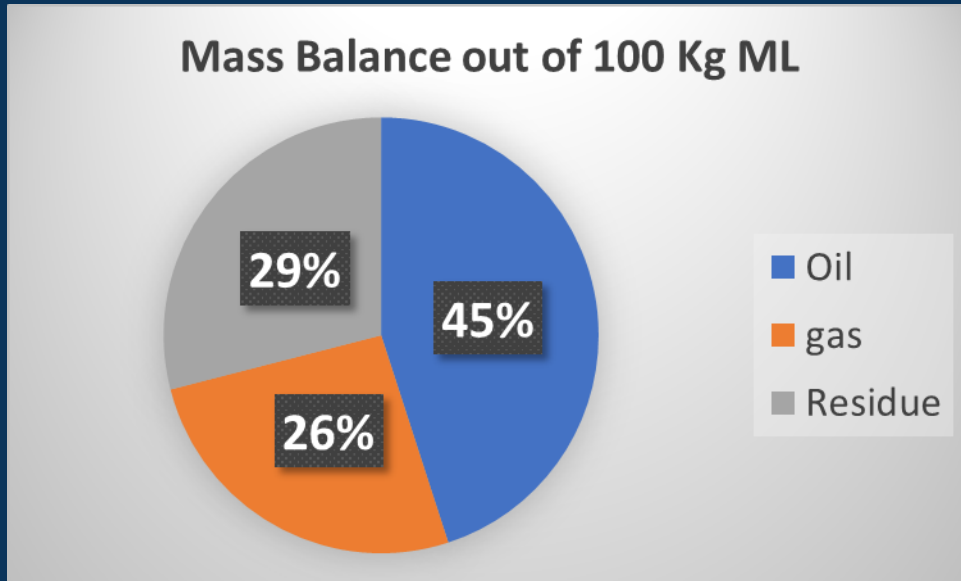
Testing the prototype with actual ML



for a Healthy, Plastic free Mediterranean Sea (Sep. 14, 2021)

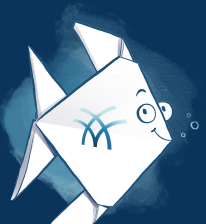


Results*

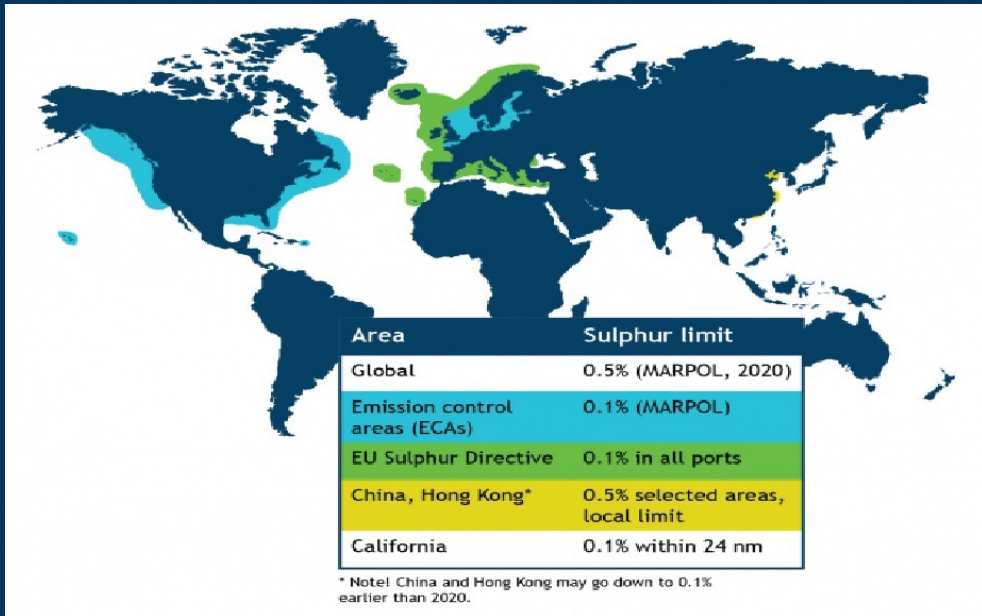


- ▶ Low Sulfur Marine Gas Oil (MGO) DMA ISO8217 compliant (~50/60 wt%)
- ▶ IFO180 (~5/8 wt%) RMF ISO8217 compliant

* Faussone, G.C.; Kržan, A.; Grilc, M. Conversion of Marine Litter from Venice Lagoon into Marine Fuels via Thermochemical Route: The Overview of Products, Their Yield, Quality and Environmental Impact. Sustainability 2021, 13, 9481. <https://doi.org/10.3390/su13169481>



Sulfur and CO2 reduction in marine fuels



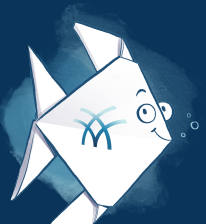
- Sulfur level of marGnet MGO: 0,0196 %
- Produced MGO of marGnet can be classified as "Ultra-low sulfur fuel oil" being below 0,1 %
- marGnet fuel can reduce S emission outside ECAs
- *Non-recycled-plastic-derived ULSD fuel could be considered at a minimum carbon neutral with the potential to offer a GHG reduction**
- Approx. avoidance of 0,5/0,75 ton CO2 per ton of marGnet MGO **



International Convention for the Prevention of Pollution from Ships (MARPOL)

* Benavides, Pahola Thathiana, et al. "Life-cycle analysis of fuels from post-use non-recycled plastics." Fuel 203 (2017): 11-22.

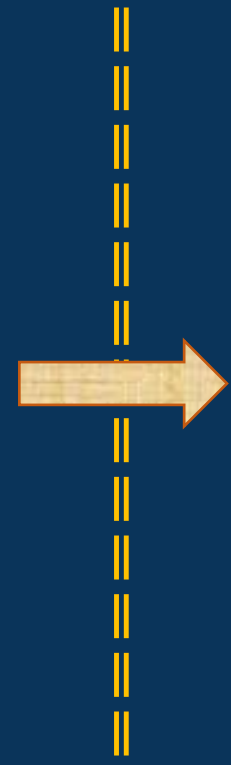
** From third party survey within marGnet project activity



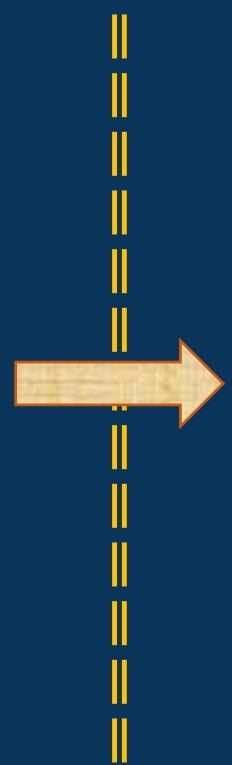
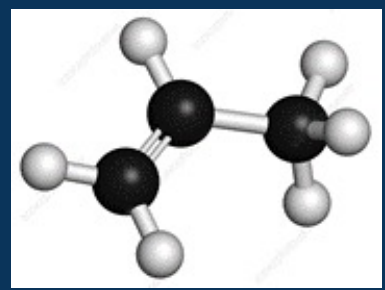
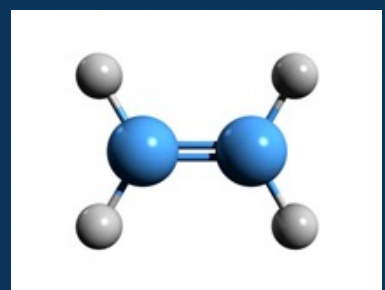
Future outlook: marine plastics to olefins



PRODUCTS FROM ML



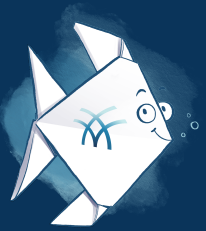
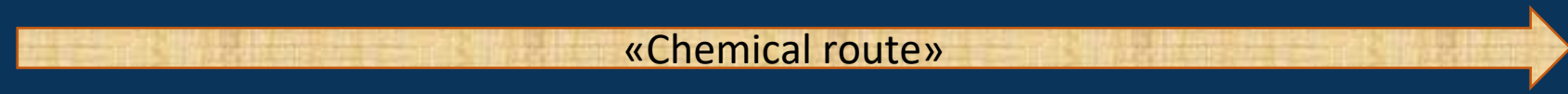
STEAM CRACKING



POLYMERIZATION

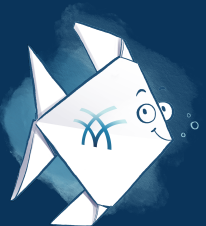


2 Generation raw polymers



Barriers (in Italy and beyond)

- Uncertainty on legal status of ML:
 - Which type of waste classification?
 - Which type of permit? (Italian decree “Salva Mare”)
 - Who pays?
- Uncertainty about chemical recycling regulatory framework
- End Of Waste: is the produced fuel a waste or a product?
 - If it is waste, permit from regulator authority required: fishing boats are equated to waste incinerators (!!)
- Authorized fuels (All. X d.lgs. 152/2006): second generation fuels are not included in the list
 - Even if compliant with ISO standards, they cannot be used



Thank you!

“There could be more plastic than fish in the ocean by 2050”*



Gian Claudio Fausone

SINTOL

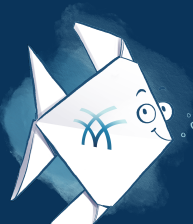
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marGnet has received funding from the European Union's EASME-EMFF funding program – Sustainable Blue Economy Call under agreement n. EASME/EMFF/2017/1.2.1.12/S2/05/SI2.789314



Sewage surfer © Justin Hofman.
Wildlife Photographer of the Year 2017



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