FP7 PROJECT KILL·SPILL: INTEGRATED BIOTECHNOLOGICAL SOLUTIONS FOR COMBATING MARINE OIL SPILLS

Nicolas Kalogerakis[1] and Philippe Corvini[2]

[1] Department of Environmental Engineering, Technical University of Crete, Polytechneioupolis, Chania 73100, Greece
E-mail: nicolas.kalogerakis@enveng.tuc.gr

[2] University of Applied Sciences and Arts Northwestern Switzerland, School of Life Sciences, Institute for Ecopreneurship, Gründenstrasse 40, 4132 Muttenz, Switzerland

Oil spill disasters are a worldwide problem and current technologies do not satisfactorily address the issue. It is important to recognize that 'miracle microorganisms' and 'magic elixirs' sprinkled on an oil spill will not do the job. An integrated approach considering at the same time: (1) metabolic requirements of biodegrading organisms alongside the properties of the oil, (2) environmental limitations on oil biodegradation and (3) innovative delivery mechanisms for agents that alleviate these bottlenecks is critical. This is the essence of the Kill●Spill project. It represents a European initiative fully committed to tackle oil spill disasters in an integrated and interdisciplinary fashion employing highly efficient remediation strategies.

The principal objective of Kill·Spill (http://www.killspill.eu/) is to develop highly efficient, economically and environmentally viable solutions for the clean-up of oil spills caused by maritime transport or offshore oil exploration and related processes, which have been fully validated in large mesocosm facilities under controlled conditions and by application to real life oil spills. In general, once crude oil is spilled, it takes at least one week before biodegradation processes begin to take effect. Kill·Spill aims to shorten this start up period to the absolute minimum by providing technologies for example, that provide the necessary nutrients together with hydrocarbon degrading consortia and/or enhancing compounds (biosurfactants) to both accelerate and maximize bioremediation rates from the time of application. In addition, when the use of dispersants is recommended, the previously mentioned biostimulation and bioaugmentation formulations will be applied together with specific compounds acting as dispersants that take the oil from the surface to the water column and ultimately to the sea floor. Taking into account that as we go deeper in the water column, the amount of dissolved oxygen is more difficult to replenish by diffusion, Kill·Spill also offers specific novel technologies (Oxygel™ and Aerobeads™) that release oxygen over longer periods of time. It maintains as a result greater bioremediation rates of dispersed oil in the water column, even when it reaches the sediments. In cases where it is not feasible, this approach will be complemented with the development of processes to stimulate oil biodegradation anaerobically in anoxic sediments. Once the dispersed oil reaches the sediments, bioremediation rates are substantially reduced due to the prevailing anoxic conditions. Kill·Spill provides a series of highly innovative technologies (e.g., 'Kill·Spill snorkel', 'Kill·Spill Robot', 'Kill·Spill Sed-Cleaner') that overcome this problem and induce enhanced biodegradation rates in the sediments. These technologies can also be used for the remediation of recurrently polluted sediments (from old oil spills) in all types of environments from the Eastern Mediterranean to Disko Bay in Greenland. In addition, several other innovative products will be developed, e.g., 'Kill·Spill All-in-One', 'Kill·Spill Deep-sea', 'Kill·Spill Bio-boom', besides the 'Kill·Spill Biosensor' for *in situ* monitoring of oil degradation.

The Kill●Spill project involves 14 universities, 4 research institutions, 14 SMEs and one spill industry trade association active in complementary areas, contributing to the development of innovative and integrated solutions and tailored strategies for the oil spill cleanup market. The solutions developing from the Kill●Spill project are evaluated against current industry solutions, and promoted to the European spill industry through conferences and seminars. Thus, Kill●Spill consortium will generate new industrially driven foreground and deliver innovative processes and services to policy makers and European citizens. The Kill●Spill project has also much to offer to the Marine Strategy Framework Directive (MSFD). For example, all the technologies developed for hydrocarbon polluted sediments can be part of the mitigation measures to return marine environments to Good Environmental Status (GES). Furthermore, the monitoring tools can be used by Member States in the requested initial assessment to identify current environmental status. Moreover, many of the Kill●Spill biostimulation strategies can be applied to sea areas faced with chronic pollution.

This project is supported by the European Commission in the 7th Framework Programme under Grant Agreement 312139 within FP7- KBBE.2012.3.5-01.