



PlasTEP

plasma for environment protection

Directives for using results of the project in the future

OP6-6.3

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1. Introduction

The aim of the WP6 of the PlasTEP project is developing a prototype of mobile device for destruction of oil and oil-type leakages in ports of the Baltic Sea. Following the WP6 schedule Partners from Greifswald in Germany (INP, PP#2), Mikkeli in Finland (LUT, PP#6), Gdańsk in Poland (IMP, PP#12) and Szczecin in Poland (ZUT, PP#13) are obliged to perform joint tests of their modules combined and matched after optimisation. The device has been build and tested in the field in November 19th, 2012. Results of those tests are described in the report OP6-6.1. Below are stated directives for further use of the device.

2. Directives

Since the only result of the WP6 realization is the plasma mobile device for oil slick destruction the directives concern only the device and they are as following:

- D1. The device must be equipped with a propulsion system. Recommendation is to install 2 electric engines at the end of each floats. Such a solution corresponds to one of key features of the device as whole which is low impact on the environment. The best case would be if those electric engines are supplied from the same source as other components of the mobile device. However, presently it is know that the power supply system has not enough electric capacity to do so. Thus, alternatively, electric engines may be powered from their own batteries.
- D2. Field test of the device have shown that not all oil slick is destructed using the device in the present shape. The reason for that is to wide drum of the oil-water separator causing that microwave plasma do not treat kerosene covering edges of the drum. This problem can be solved in two ways:
 - by making the drum even more narrow so that the microwave plasma covers the drum surface it its whole width (Fig. 1a),
 - or by changing the microwave plasma shape from cylindrical into brush-like (Fig. 1b).

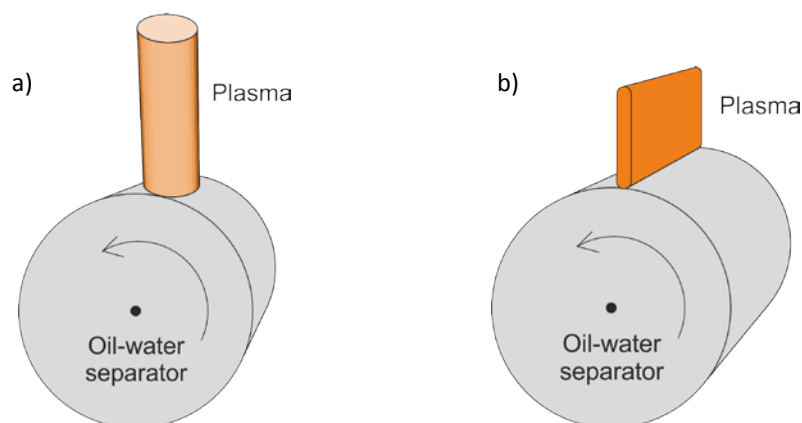


Fig. 1. Possible solutions of the problem of not efficient oil destruction. a) more narrow drum of oil-water separator, b) microwave plasma of brush-like geometry.



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- D3. Tests carried out in the laboratory proved that microwave plasma and dielectric discharge plasma efficiently decomposes kerosene and both plasmas as combined serially have potential to process much more oil than used in the tests. For the mobile device it means that oil-water separator must be changed to that which collects and delivers much more oil from water to the microwave plasma region. Presently manufactured oil skimmers are equipped with metal foil (similar to that used in our device) or polymeric oil separators which are not proper for the plasma device since microwave plasma has temperature of a few thousand Kelvin. Thus, new material or new approach to the problem must be proposed.
- D4. Presently used power supply system guarantees operation of the device for about 30 minutes after which it uses solar energy for 4 hours to charge batteries fully. For the use in real conditions the operation time must be longer, so the power supply system requires improvements.
- D5. The present prototype of the mobile device for destruction of oil slick is developed for the use in ports only. This is determined by the construction of oil-water separator which requires steady-state water level for the efficient operation. Any disturbances of the water level, caused for example by the wind or move of ships, may result in flooding the separator and consequently in processing water instead of kerosene. However, the idea based on using plasmas seems to be applicable for a new generation devices for combating oil slicks in open sea and oceans. Thus, the long term directive for using result of the WP6 PlasTEP project is development of plasma-based skimmer operational at any state of the water surface.

3. Conclusion

Directives stated above for the further use of results obtained in the WP6 of PlasTEP project can be summarized to the need of optimization of the mobile device using plasma for oil slick destruction on the sea. In order to realize full optimization a new strictly R&D project is required or/and involvement of a company producing oil skimmers like Ro-Clean Desmi, Denmark (this is the largest European company on the skimmers market).

