Bioremediation Treatment Optimization Study: Oilfields in the Persian Gulf area

C. Masini, F. Brogioli – DND Biotech (Italy)

BACKGROUND & OBJECTIVES

- Sandy soil 1-5% petroleum hydrocarbons (TPH), aged and scorched.
- Remediation target: 1% TPH within 6 months.
- Optimize efficiency/cost/duration of remediation treatment.
- Lab tests and field trials to define bioremediation treatment protocol.
- Metagenomic analysis as screening and monitoring tool.
- Deployment of field laboratory facilities, large scale biomass production & piloting system RoboNova®.

BIOREMEDIATION TREATMENT OPTIMIZATION: FIELD TRIALS

TEST-SCALE BIOMASS PRODUCTION SYSTEM

ACTIVITIES

- Baseline physio-chemical and microbiological characterisation of soils and contamination.
- Identification of bacterial taxonomies and dominant TPH-degrading enzymes in soils.
- Enrichment and mass production of an indigenous, competent culture for bioaugmentation.
- Comparison and study of bacterial community before and during treatment by metagenomic analysis.

ON-SITE SOIL TESTING & LAB FACILITY

ROBONOVA® PILOTING SYSTEM
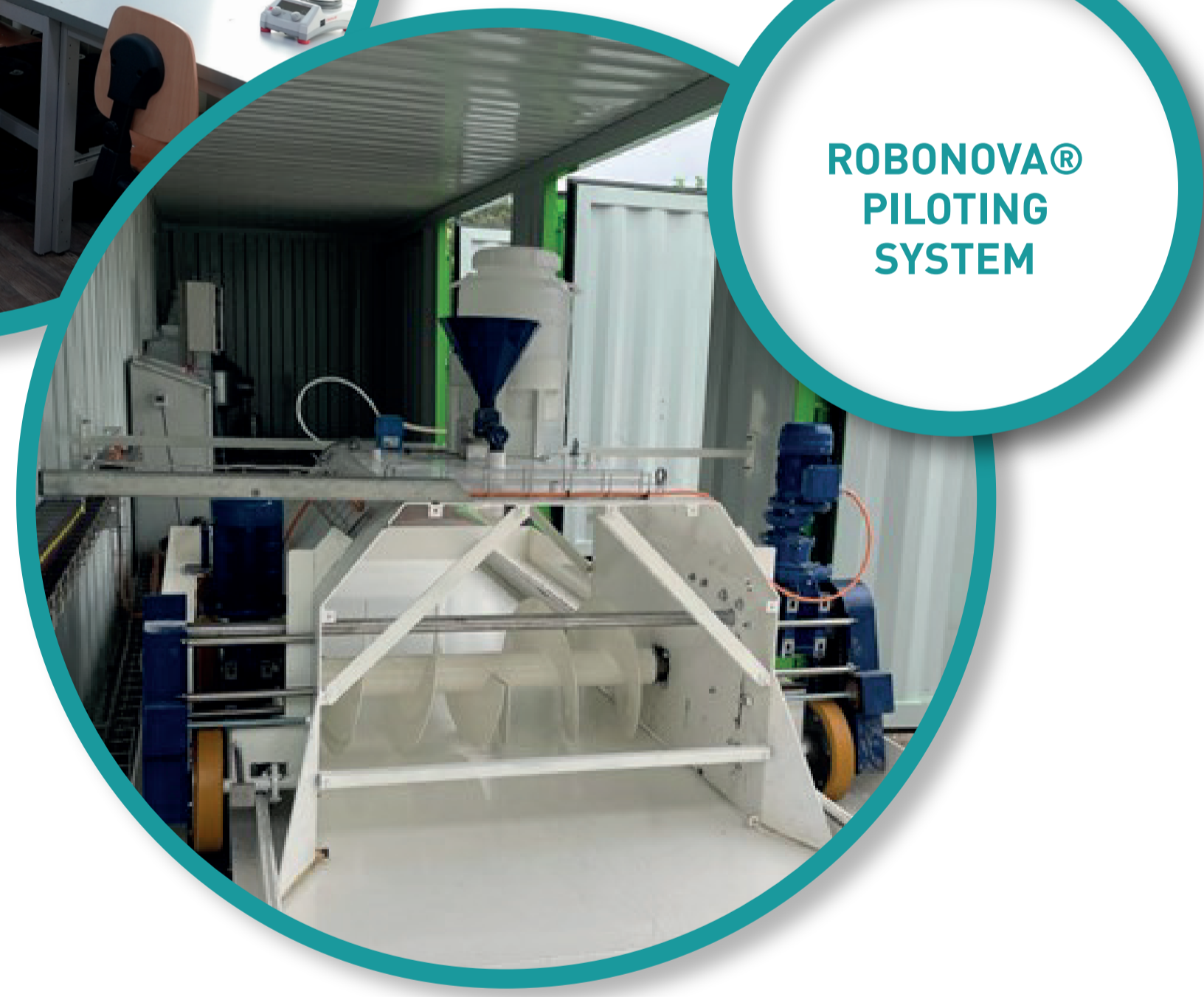
RESULTS

- Treatment protocol: nutrients at C:N:P = 100:10:1, moisture 15%, bulking agents, surfactants, commercial/autochthonous bacterial inoculum.

- RTC (1%) reached <6 months, final TPH ~0.3% compared to initial 3.4%.

- METAGENOMICS:

  - Significant difference between bacterial species at T0 and T1/2/4, Bacillus genus always dominant.

  - Decrease in biodiversity at T1 and T2 → speciation process in favour of competent species. Increase at T4.

  - Correlation HEM values & change in bacterial population, especially in mesocosms inoculated with autochthonous culture.

DOMINANT BACTERIA

BEST PERFORMING CASES
=
AUTOCHTHONOUS BACTERIAL INOCULUM

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