IMPLEMENTING AND OPTIMIZING THE OPERATION OF MEMBRANE BIOREACTORS FOR PETROLEUM WASTEWATER TREATMENT

V.J.Inglezakis*[1], F.Fatone[2], S.Malamis[2], M.Loizidou[3], T.Seidakhmetov[1], A.Omirkhan[1]

[1]School of Engineering, Nazarbayev University, Astana, Kazakhstan; *vasileios.inglezakis@nu.edu.kz; [2]University of Verona, Department of Biotechnology, Verona, Italy; [3]National Technical University of Athens, School of Chemical Engineering, Athens, Greece

INTRODUCTION.

The oil and gas industry in Kazakhstan is the most important industrial sector of the country. Kazakhstan's oil exports in 2003 were valued at more than $7 billion, representing 65% of overall exports and 24% of the GDP of the country [1]. Consequently, the oil and gas activities in the country produce significant quantities of petroleum wastewater effluents which must be properly managed in order to avoid environmental pollution [2]. The main objective of the project is to study & optimize the operation of a membrane bioreactor (MBR) coupled with suitable pre-treatment for the treatment of petroleum wastewater. The optimization will focus on the configurations to achieve the desired treated effluent quality [3].

MATERIALS AND METHODS.

The project will be implemented in cooperation with two prominent European Universities, University of Verona (Italy) & National Technical University of Athens (Greece) and the relevant know-how will be transferred to NU and Kazakhstan in order to lay the foundations for the development and implementation of further projects in the field. The work packages are as follows:

- WP1: Assessment of existing situation in Kazakhstan regarding the generation and treatment of petroleum effluent
- WP2: Physicochemical characterization of petroleum effluents
- WP3: Operation and optimization of pilot scale MBR process for petroleum effluents
- WP4: Inhibitory effects of substances met in petroleum effluents on biomass
- WP5: Dissemination
- WP6: Project management

The project will be implemented using pilot and lab scale MBR units available in Italy and Greece. These systems will treat petrochemical effluents with the desired composition based on chemical analysis of samples from Kazakhstani industry. The targets are: total suspended solids removal >99%; Nitrification efficiency >75% Nitrogen removal >70%, COD removal >60%, Cyanides removal >70%, polycyclic aromatic hydrocarbons (PAHs) removal >80%, removal of volatile organic compounds (VOCs)> 80%.

ACKNOWLEDGMENTS.

This project is funded by the NU Seed Grant scheme.

REFERENCES.

1. GDP growth (annual %). (2003). The World Bank. Datafinder.worldbank.org.
2. Kazakhstan Upstream Oil and Gas Technology and R&D Roadmap. (2013).
3. S. Di Fabio, S.Malamis, E. Katsou, G. Vecchiato, F. Cecchi, F. Fatone. (2013). Chemical Engineering Journal, 214: 68–77.