**Biotechnology in the petroleum industry: An overview**[Robert Thomas Bachmann](http://www.sciencedirect.com/science/article/pii/S0964830513003326)[a](http://www.sciencedirect.com/science/article/pii/S0964830513003326#aff1), [Anbu Clemensis Johnson](http://www.sciencedirect.com/science/article/pii/S0964830513003326)[b](http://www.sciencedirect.com/science/article/pii/S0964830513003326#aff2), [Robert G.J. Edyvean](http://www.sciencedirect.com/science/article/pii/S0964830513003326)[c](http://www.sciencedirect.com/science/article/pii/S0964830513003326#aff3)

* a Malaysian Institute of Chemical and Bioengineering Technology, Universiti Kuala Lumpur, 78000 Alor Gajah, Malaysia
* b Mechanical and Industrial Engineering Department, Caledonian College of Engineering, P.O. Box 2322, CPO Seeb 111, Muscat, Oman
* c Chemical and Biological Engineering Department, University of Sheffield, Newcastle Street, Sheffield S1 3JD, UK

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**Abstract**

A significant quantum of crude oil is trapped in reservoirs and often unrecoverable by conventional oil recovery methods. Further downstream, the petroleum industry is facing challenges to remove sulfur, metal, nitrogen as well as undesirable organic compounds from the crude.

Conventional secondary recovery methods such as water and gas injections helped to increase the productivity of the well, while chemical and physical refinery processes such as hydrodesulfurization, desalting, and high-pressure high-temperature hydrotreating remove most inorganic impurities. The increasing demand for oil in the world coupled with very stringent environmental laws piled economical and technical pressure upon the refinery industry to further improve crude oil recovery as well as reduce sulfur, metal and nitrogen concentration to the low ppm levels.

In the search for economical and environmentally friendly solutions, growing attention has been given to biotechnology such as the use of microbial enhanced oil recovery (MEOR). MEOR is an alternate recovery method that uses microorganisms and their metabolic products. In addition, the emerging field of crude oil refining and associated industrial processes such as biodesulfurization, biodemetallation, biodenitrogenation and biotransformation are also covered.

This review aims to provide an overview on MEOR and biorefining relevant to the petroleum industry and highlights challenges that need to be overcome to become commercially successful. Literature pertaining to laboratory experiments, field trials and patents are included in view of industrial applications and further developments.

## Keywords Microbially enhanced oil recovery (MEOR); Biosurfactants; Biodesulfurization; Biodemetallation; Biodenitrogenation; Biotransformation