

BIOREMEDIATION TECHNOLOGY AREA

Overview

The Bioremediation Technology Area is dedicated towards carrying out basic and applied research on utilizing microbial resources for environment protection. The activities of the Area are focused on achieving environmental remediation for sustainable development.

Thrust Areas in Bioremediation Technology at Environmental and Industrial Biotechnology Division

- Large-scale bioremediation of hydrocarbon-contaminated soil from oil spill and oily sludge
- Production of Oilzapper—cocktail of four natural hydrocarbon degrading bacteria—for bioremediation of oil-contaminated sites
- Bioremediation of pesticide-contaminated dumpsite
- Assessment of environmental damages caused due to oil spills
- Wastewater treatment
- Development of enzyme-based technologies for degradation of micro pollutants
- Development of bio-based product(s) for application in drilling of oil wells, fracturing of reservoir rocks, and water shut off job

Success Stories

- Created state-of-the-art series bioreactor facilities (ranging 10 litres, 30 litres, 300 litres, 150 litres, 1,500 litres, and 15,000 litres) for large-scale production of Oilzapper and algal culture.
- Completed a mega-size international bioremediation project in Kuwait Oil Company at Kuwait (funded by Kuwait Oil Company).
- To undertake bioremediation jobs at most of the oil-producing companies and refineries in India and abroad on a turnkey basis.
- Remediation of pharmaceutical waste.

Joint Venture

Oil and Natural Gas Corporation Limited (ONGC) joined hands with The Energy and Resources Institute (TERI) to form ONGC–TERI Biotech Limited (OTBL), with an aim to find sustainable solutions and provide ‘green’ technology services to the oil and gas sector. OTBL as a joint venture company came into being in 2007, in which 49.98% share is of ONGC while 48.02% share belongs to TERI.

OTBL is rendering service of large-scale application of Oilzapper (a consortium of crude oil and oily sludge degrading bacteria), microbial enhanced oil recovery (MEOR), and prevention of paraffin deposition technologies. OTBL is responsible for providing Oilzapper, MEOR, and prevention of paraffin deposition technologies to ONGC, Oil India Limited (OIL), and other companies in India and abroad, especially in Middle East countries (for details please visit www.obtl.co.in)

Fermentation Technology Research Centre (FTRC): *State-of-the-art fermentation facility*

- Bioremediation Technology Area developed a modern fermentation technology facility at FTRC in 2008 which was augmented with new production facilities in 2013.
- FTRC has a well-developed infrastructure, spread over 33,000 sq. ft area, with state-of-the-art equipment and fermenters. The Centre houses well-resourced quality control lab, molecular lab, analytical lab, pilot-scale fermenter lab, production fermenter lab, cold storage facilities, and utility building.
- There is facility of bioreactors of varying capacity, ranging from utility facility and downstream process for lab.
- Fermenters supported by steam-generating boiler, air compressor, chiller, reverse osmosis (RO) water purifying plant, and a nitrogen generator unit for anaerobic fermentation process are some of the establishments at the Centre.
- Production facility at FTRC has capacity of up to **1000 tonnes** of oil-degrading microbes (Oilzapper) per year. This is the enabling factor which allows Environmental and Industrial Biotechnology Division to take bioremediation jobs in various oil companies, at both national and international levels.

Clients' List

- ONGC (Oil and Natural Gas Corporation Limited)
- IOCL (Indian Oil Corporation Limited)
- HPCL (Hindustan Petroleum Corporation Limited)
- OIL (Oil India Limited)
- BPCL (Bharat Petroleum Corporation Limited)
- CPCL (Chennai Petroleum Corporation Limited)
- Mangalore Refinery
- Cairn Energy Private India Limited
- Reliance Industries Limited
- BG Exploration India Limited
- Tata Power Company Limited
- Kuwait Oil Company (Kuwait)
- Abu Dhabi National Oil Company
- PetroMasila Yeman

Oilzapper – an eco-friendly solution for oil pollution

Besides accidental oil spills, oily sludge – a hydrocarbon waste generated by oil refineries – also poses a serious threat to the environment. Dumping oily sludge into specifically constructed pits – the traditional method – is accompanied by many drawbacks. Some of the noticeable problems are limited availability of land for constructing such pits, which are needed in large numbers; possibility of seepage; high cost involved with constructing seepage-free pits; and so on. All these call for alternative solutions for eradication of oily sludge.

Extensive research at TERI has resulted in the development of an easy and cost-effective bioremediation process, this has provided great significance to bioremediation efforts occurring worldwide towards tackling oil spills and oily sludge. TERI has developed Oilzapper – a consortium of crude oil and oily sludge-degrading bacteria – derived from various bacterial cultures existing in the natural environment.

Collaborators

- University of Delhi
- CSIR–Indian Institute of Toxicological Research, Lucknow
- CSIR–National Botanical Research Institute, Lucknow
- CSIR–National Environmental Engineering Research Institute, Nagpur
- CSIR–National Institute of Oceanography, Goa.
- Indian Institute of Technology Guwahati
- Indian Institute of Technology Delhi
- Indian Institute of Technology Bombay
- Assam University
- Institute of Advance Study in Science and Technology, Guwahati
- Nirma University
- Finish Metrological Institute, Finland
- Pannonia University, Hungary
- Helmholtz Centre for Environmental Research, Leipzig, Germany
- Korea Maritime and Ocean University, South Korea



Fermentation Technology and Research Centre (FTRC), TERI Gram



Facility at TERI Gram for mass-scale production of Oilzapper



Oilzapper product



KT Oilzapper product



Packing of Oilzapper



Transportation of Oilzapper in an air-conditioned container

Remediation of oil-contaminated sites at oil fields of Kuwait Oil Company, Kuwait



Site before bioremediation in Kuwait oil field



Site after bioremediation in Kuwait oil field

Restoration of oil spill sites at farm fields in Gujarat



Before bioremediation



After bioremediation