

# Biotechnology and Bio-Energy Research

IndianOil R&D is focusing on the following current areas of research:

- Bioremediation of hydrocarbon waste from various sources such as oily sludges from crude oil and product storage tanks, oil spills, oil contaminated soil, highly aromatic waste, used lubricating oil & greases and spent metal working fluids
- Refinery ETP efficiency improvement through biotechnological interventions
- Monitoring and mitigation of microbiologically influenced corrosion in oil industry assets using abundance microbiology and molecular biology tools
- Degradation studies on waste plastics
- Studies on enzyme mediated carbon dioxide capture
- Electrobiocatalytic conversion of CO<sub>2</sub> into fuels
- Microalgae assisted CO<sub>2</sub> capture and lipid production

## Biotechnology Research:

### Technology Basket

1. Oilivorous-S Technology: for disposal of a variety of hydrocarbon waste
2. Bio-Inoculant Technology: for improving efficiency of refinery ETP through removal of multiple contaminants
3. Bio-treatment of Spent Cutting Fluids: A technology for environmentally safe disposal of spent cutting fluids

### Services Offered

1. Microbiologically influenced corrosion (MIC) detection and mitigation: MIC investigations in pipelines and refinery assets, molecular biology based profiling of MIC microbes and MIC mitigation support
2. Bio-fueling studies in refinery cooling tower: Bio-treatment optimisation
3. Biodegradability of lubricants and ecotoxicity: Test method (CEC-L-33-A-93 for biodegradability test) and In-vitro toxicity analysis of finished products and their components for developing environmentally safer products
4. Design package for open raceway pond: Open raceway pond design for cultivation of microalgae on industrial flue gas for CO<sub>2</sub> mitigation and biomass production

### Research Activities

1. Development of bio-assisted processes for conversion of CO<sub>2</sub> to hydrocarbons and fuels
2. Carbonic anhydrase enzyme mediated CO<sub>2</sub> sequestration
3. Development of microalgae based process for utilization of CO<sub>2</sub> in flue gas to useful products

## MAJOR FACILITIES:

- DNA Sequencing Facility

- Multi-Channel Fermentors
- Protein Purification Facility
- MIC Test Facilities
- In-vitro Toxicity Facilities: Microtox, Mutatox and Irritation Assay System
- Molecular Biology Facilities Automated Nucleic Acid Extraction System, PCR Machines, Real Time PCR Machine, Gene Pulser, Electrophoresis System, Imaging System

#### **IOC-DBT Advanced Bio-Energy Centre:**

The IOC-DBT Centre for Advanced Bio-Energy Research is jointly & equally funded by Department of Biotechnology (DBT), Government of India, and Indian Oil Corporation Limited. The Centre is committed to advanced bio-energy research addressing second and third generation bio-fuels. The major thrust of the Centre is to develop and deploy viable second generation bio-fuel technologies by leveraging IndianOil's strengths for commercialisation of advanced bio-fuel technologies. While IndianOil will harness in-house chemical engineering strengths for this purpose, the technology package will be developed in partnership with other DBT Centres.

The Centre has recently commissioned the first integrated pilot plant in India for conversion of Ligno-cellulosic biomass to ethanol with technological support from the National Renewable Energy Laboratory (NREL), USA. The pilot plant is designed for processing 5 kg/hr biomass and a variety of feedstock.

#### **MAJOR THRUST AREAS:**

- Ligno-cellulosic based bio-fuels
- Algal research scale-up studies on algal cultivation and harvesting
- Gas Fermentation & Syngas fermentation for bio-fuels
- Novel biotechnological method for CO<sub>2</sub> mitigation
- Life cycle analysis

The Centre is equipped with all modern analytical and biotechnology facilities such as Biomass characterisation lab, state-of-the-art fermentation and enzymatic hydrolysis laboratory, MALDI-TOF, LC-MS, Gene Sequencing facility, advance molecular biology facility, Microbial Culture laboratory, etc.