

Success Stories of Advanced Biofuels for Transport

DBT IOC CENTRE FOR ADVANCE BIO-ENERGY RESEARCH: CARBON DIOXIDE TO HIGH VALUE LIPIDS

Year of plant start-up:	2018
Location:	IndianOil R&D Centre, Faridabad, India
Technology:	Carbon dioxide to high value lipids
Plant capacity:	100 litre reactor
Operational experience achieved:	Around 100 hours of operation since start-up
Total Capital Expenditure:	0.5 Million US dollars
Principle feedstocks:	Carbon dioxide
Feedstock Capacity:	10 kg/day of CO ₂
Products/markets:	Omega 3 fatty acids, Biodiesel
Technology Readiness Level (TRL):	TRL 7 – system prototype demonstration in operational environment

DESCRIPTION

DBT-IOC Centre for Advanced Bio-Energy Research at IndianOil R&D (IOC R&D) has developed a novel 3rd Generation Bio-fuel technology by integrating the LanzaTech USA anaerobic gas fermentation technology to convert carbon dioxide into acetic acid and IOC (R&D) aerobic fermentation technology to convert acetic acid to lipids (algal oil) including highly valuable Omega 3-fatty acids (DHAs). The lipids are then transesterified to esters followed by separation of Omega 3-fatty acids (DHAs) esters as high value product & remaining lipid esters are used as biodiesel fuel. This makes the overall process economically feasible. DHA esters are essential components of nutrient formulation for children, adults and shall help in combating childhood malnutrition. The DBT-IOC centre has put up world's first pilot facility at IOC R&D, Faridabad at 100 lt reactor scale to sequester about 10 kg/day of CO₂. The US & Japan patents have been granted for IOC R&D process. IndianOil & LanzaTech received Game Changer Company of the year award by Petrofed in 2015 for this novel integrated process. The projected market for Omega 3 fatty acid esters by 2025 is about 60,000 Tons per annum (~ US \$ 57 billion). Commercial grade DHA esters price ranges from US \$500- \$ 1200 per kg depending upon the purity grade of DHA. Currently most of the production of Omega 3 fatty acid esters is from fish oil which uses huge quantities of wild fish as feed, contributing to an overfishing crisis and threatening global food security.



Carbon dioxide to high value lipids Pilot Facility, IndianOil R&D Centre, Faridabad, India

Stakeholders involved: Indian Oil Corporation Limited
 LanzaTech USA
 Department of Biotechnology, Government of India

Financing Support: Indian Oil Corporation Limited
 Department of Biotechnology, Government of India

Contribution to Sustainable Development Goals: The process has demonstrated the tremendous potential of CO₂ sequestration /carbon recycling. This technology shall create a platform that can produce sustainable food and fuels economically and at commercial scale. This disruptive technology shall not only reduce carbon emissions but also produce very high value products like DHA as well as Biodiesel.

Contribution to GHG emission reduction in transports: The facility in India is first such pilot facility in the world. Upon successful pilot trials. IOC have plans to put up commercial plant at suitable refinery/ 2G ethanol plants where pure CO₂ is available from the MEG/2G ethanol fermentation units and hydrogen from refineries. There are lot of MEG plant in Europe & several 2G ethanol plants are coming up in Europe where this technology has application.

Employment: The plant employs ~ 10 engineers & Operators.

Replicability and scale-up potential:

Several commercial plants are in pipeline in India & abroad upon successful pilot plant trials

Success factors:

The Government of India has unveiled a new National Biofuel Policy (2018) that incentivises biofuel generation through multiple measures. Major steps include encouragement of biofuel generation from excess crop production and setting apart Rs 5000 crores viability gap funding (VGF) to establish second generation ethanol refineries. For providing specific fiscal incentives, the policy categorises biofuels into several groups: 1G (First Generation), 2G, 3G, and bio-CNG.

This policy shall provide major boost in commercialising the technology.

Constraints:

Currently technology is at pilot scale only. Process validation being carried out for commercial viability.

Info provided by:

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More information:

www.iocl.com



The ART Fuels Forum brings together 100 experts and leaders representing the alternative transportation fuels Industry to facilitate discussions, elaborate common positions on policy issues and identify market penetration opportunities and barriers for these fuels. The Forum is established and financed by the European Commission under the project name “Support for alternative and renewable liquid and gaseous fuels forum (policy and market issues)”.

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