

Bio-Diesel

Developing use of Bio-Diesel is one of the mission areas of IROAF. Unlike fossil fuels Bio-Diesel has its origin from organic substances which are part of the carbon cycle and thus these fuels are CO₂ neutral.

IROAF is in the process of setting up two 30Tonnes Per Day capacity Bio-Diesel plants at Raipur and Tondiarpet (Chennai). These plants would encourage use of Bio-Diesel on Indian Railways, generate demand, and thus encourage the Indian Industry to set up more Bio-Diesel production capacity. The plant at Chennai is expected to commence production in 2015 while the Raipur plant is expected to become functional in 2016.

Bio-Diesel is diesel of organic origin and has all characteristics similar to mineral diesel. It can be produced from multiple type of feed stock like PFAD (Palm Fatty Acid Distillate), PAO (Palm Acid Oil), Palm Stearin, RBFAD (Rice Bran Fatty Acid Distillate) animal fats, non-edible oils from Jatropha etc., used cooking oil.

Blending of Bio-Diesel with mineral diesel upto about 20% can be done and used on diesel engines without any modifications.

In the budget speech 2014-15, Hon'ble MR announced use of 5% Bio-Diesel on Indian Railways for traction purpose. The process for procurement has been started.

Bio Diesel:

Bio-diesel is a fuel composed of mono-alkyl esters of long chain fatty acids derived from variety of vegetable oils or animal fat. Bio-diesel is miscible with petro -diesel in all proportions and can be used in place of petro-diesel. As per the nomenclature, B10 means mixture of 10% Bio-diesel with 90% petro-diesel. B100

means pure Bio-diesel. Upto 20% Bio-diesel mixed with petro-diesel can be used in the existing diesel engines without any major modifications.

Quality standards: IS:15607:2005, ASTM D 6751, EN 14214

Diesel Consumption over Indian Railways

The present diesel consumption over Indian Railways is estimated as below:

| Energy Source | Traction | Non Traction use | Total | Energy Bill |
|---------------|--------------------|-------------------|---------------------|-------------------|
| Diesel | 2.5 billion Litres | 50 million Litres | 2.55 billion Litres | Rs. 11,000 Crores |

Oil Chemistry:

Long Chain Fatty Acid Mono Alkyl Ester Molecular structure – chain length is different for different oils Bio-diesel derived from different oils would have different characteristics

Specifications of bio-diesel consequently are to be suitable if we are to absorb most of these species Fortunately, variation in properties not large and can be managed

RDSO Study:

Detailed engine characterisation studies with different types of biodiesel and its blends. Tribological studies – Wear of Engine moving parts, pistons, liners, rings, bearings etc.

Compatibility studies – reaction of the new fuel with various materials used in the engine, especially rubber parts and non-ferrous metal components. Various trials at RDSO on engine test bed with ALCO and EMD engines have indicated that there are no adverse effects on engine parts or its performance.

Bio diesel – advantages

Mainstream Alternative; Biodegradable, Non Toxic, free from Sulphur and Aromatics;

Renewable, favourable; Carbon Balance;

No engine modifications needed; Lubricity – greatly enhanced

Low S fuels; Reduced import bill; High flash point – safer to store and transport; Blend ratio (Bio Diesel to HSD) – Any

Benefits of Bio-Diesel - Energy Security:

Known worldwide reserves of petroleum : 100 billion barrels Domestic Production : Stagnated, Demand : Rising at a rapid rate; Projected Petroleum Imports by 2019 : 166 MT

By 2047 demand for HSD is likely to be 622 MT as against 39.81 MT (2001-02) and 52.32 MT (2006-07)

Emission Reductions with Biodiesel (DOE, US Estimates):

| Emission Type | B100 | B20 |
|---------------|------|-----|
|---------------|------|-----|

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|---------------------------------------|-----------|-----------|
| Carbon monoxide | -43.2% | -12.6% |
| Hydrocarbons | -56.3% | -11.0% |
| Particulates | -55.4% | -18.0% |
| Nitrogen oxides | +5.8% | +1.2% |
| Air toxics | -60%/-90% | -12%/-20% |
| Mutagenicity | -80%/-90% | -20% |
| Carbon Dioxide (Life Cycle Emissions) | -78.3% | -15.7% |

Available Industrial Technology

Desmet-Ballestra process from Italy; Lurgi process from Germany; Energea process from Netherland; ISM from Romania