CARBON CREDITS OF DIESEL ENGINES

RUNNING ON ETHANOL CONCENTRATION

This work entitled "**CARBON CREDITS OF DIESEL ENGINES RUNNING ON ETHANOL CONCENTRATION**" has been carried out in the Department of Mechanical Engineering, Sri Raaja Raajan College of Engineering and Technology, Amaravathipudur, Tamilnadu -630301.

This is part of a larger international plan which has been created in an effort to reduce global warming and its effects. Carbon credits are the estimates used to aid in regulations of an amount of gases that are being released into the air. The plan works by preventing an amount of total emissions that can be released by one company.

If there is a shortfall in the amount of gases that are used, there is a monetary value assigned to this shortfall and it may be traded. These credits are often traded between businesses. However, they also are bought and sold in international markets at whatever the determined market value for them is. There are also times when these credits are used to fund carbon reduction plans between trading partners. To mitigate the global warming, carbon credit is a major component at international and national levels.

The concept of carbon credits can be applied to mitigate pollution caused by emissions from diesel engines running on ethanol bio-diesel blends with nano and bio-additives in fishing boats. The reduction in global warming should encourage policy makers to promote ethanol to combat climate change by monetizing the reduction in emissions. Ethanol has been under research perspective as an alternate fuel because of its oxygenating property. Ethanol- gasoline blends have been tested and accepted as a potential renewable fuel because of its high octane rating. On the other hand, ethanol-diesel blends and its acceptance as an efficient alternate fuel for Compression Ignition (CI) engines are researched extensively now-a-days and outcomes are promising. Increased fraction of ethanol in diesel–ethanol blend has more potential to reduce the Particulate Matter (PM) as a result of **increased oxygen** content in the blend.

The cold flow properties could also be improved with the **addition of ethanol**. Many investigations have studied the impact of blending various oxygenates additives with diesel or bio-diesel fuel **on engine performance and emission characteristics of diesel engine**.

The most investigated oxygenates, in recent years are alcohols such as ethanol. It is known that diesel fuel and alcohol have difficulties in mixing and exhibit tendency to phase separation but bio-diesel is known to be miscible with alcohols.

Many researchers have proposed **adding bio-diesel as a solvent for ethanol** in diesel fuel. After number of trials, when the blends are subjected to high speed blending and then **ultrasonicating**, the stability of the blend starts to be augmented.

In current study, several blends of diesel-ethanol-bio-diesel with increasing concentrations of nano additives are

- D45E45B10,
- D45E45B10+50ppm,
- D45E45B10+75ppm,
- D45E45B10+100 ppm

for each of ceria-alumina and alumina doped ceria-zirconia and with increasing concentrations of bio-additives of **D35E45B20, D25E45B30, and D15E45B40** for each of fat oil, fish oil bio-diesels and DTPO respectively are used.

Combustion and emission characteristics analysis are carried out on a single cylinder, naturally aspirated, 4stroke, vertical, constant speed, water- cooled fishing boat diesel engine using nano and bio-additives as discussed earlier with diesel-bio-diesel-ethanol blends.

Canola oil bio-diesel prepared through transesterification process is used as co-solvent for blends with nano additives. This experimental analysis shows that Heat Release Rate (HRR) and cylinder pressure are found to be increased with the increase in nano and bio-additives concentrations. Also emissions such as Hydro Carbon (HC), Carbon monoxide (CO), **Nitrous Oxide (NOx),** smoke opacity and Carbon di oxide (CO_2) decreased with the increase in bio additives concentrations Emissions such as HC, CO, smoke opacity and CO_2 decreased with the increase in nano additives concentrations except NOx as it increases with increase in nano additives concentrations.

This reduction in emissions of fishing boat diesel engine such as CO, CO_2 and NO x from the values of diesel-ethanol-bio-diesel blends were converted into carbon credits for diesel-ethanol-bio-diesel blends with nano additives and bio-additives. These blends with nano additives provide an excellent opportunity for mitigation of Green House Gas (GHG) emission and reduce global warming for fishing boat diesel engines. A study was undertaken to calculate Global Warming Mitigation Potential (GMP) and thereby earning carbon credit from running the engine using diesel-ethanol-bio-diesel blends with nano additives. Basic idea is to identify most commonly used CI engine type in fishing industry and to make several test-runs on using ethanol-diesel blends containing ethanol percentage 45% mixed various concentrations of diesel, biodiesel, nano- additives and bio- additives.

The calculated carbon credits was Rs 72289.44 per tCO_2 for blends with higher percentage nano-additives such as ceria-alumina and Rs 72626.4 per $tCO_2$for blends with alumina doped ceria-zirconia. Carbon credits are calculated as **Rs 223740 per tCO_2**, Rs 179001.9per $tCO_2$and **Rs 161752.14 per tCO_2** and for blends with higher percentage bio-additives such **as fat oil bio-diesel, fish oil bio-diesel and DTPO** respectively.

Hence through this study we find that carbon credit is **higher for blends with higher percentage bio-additives**. The GMP of diesel-ethanol blends with bio-additives will attract the policy makers to promote ethanol to fight climate change. With surplus production possibility in ethanol, India has a good opportunity to solve its energy crisis, reduce **global warming** and earn **substantial revenue** under the new regime of carbon marketing. In these aspects Students are very thankful to the Management of M/S Sri Raaja Raajan College of Engineering and Technology for providing such research oriented facilities in our laboratory of our Institute.
