Study of Use of Green Fuel on Construction Site

Pratik Bhalerao[1], Zaid Shaikh[2], Saurabh Chavan[3], Praveen Kumar[4] Rajesh Katdare[5]
[1, 2, 3, 4] *Students (U.G.), Dept. of Civil Engg, Dr. D. Y. Patil School of Engineering, Lohegaon, Pune, India*
[5]*Assistant Professor, Dept. of Civil Engineering, Dr. D. Y. Patil School of Engineering, Lohegaon, Pune, India*

***Abstract*—Bio fuels are seen to be fast replacing the conventional petroleum based fuels, especially in vehicles used for transportation in building construction Industries. These fuels have low-carbon content and which help reduce greenhouse gas and climate change due to impact from transport. . The aim of the present study is to quantify the emissions from petroleum-based fuel like diesel used in earthworks/transportation related vehicles and compare them with emissions generated because of the use of bio- diesel. Other parameters under comparison between above two fuels include cost comparison, efficiency of vehicles and environment impacts. The data generated would be helpful to find out all pros and cons of replacing petroleum based diesel with bio-diesel.**

***Index Terms*—Petroleum base fuels, Pollution, construction, Bio-Diesel, Fuel consumption, construction site.**

I. INTRODUCTION

As India is a developing country there is a rapid growth in Infrastructure. This growth has brought a large population from rural areas to urban cities resulting in overcrowding of cities. To solve this problem, many areas have seen a tremendous amount of construction of residential as well as commercial structures.

The building materials used in construction sites are found to cause all the types of pollution which includes air, water and soil pollution to the residential areas which are in nearby of such construction sites. The effect of such pollution may be minimized by taking precautions and using eco-friendly material However the pollution generated in the form of dust and air pollution by the machinery like Cranes, Excavators, Diesel operated generators, vibrators etc, is most often neglected due to its insignificant value when compared to other sources. But this insignificant value adds up to become severe due to rapid growth and increased quantum of construction

Non Conventional fuels have a potential to replace fossil fuel at the construction sites but its replacement will be possible when its advantages over conventional fuel like diesel will be known and accepted universally over a period of time. However use of petroleum based products in the form of diesel for operating machineries and in transportation is still in existence in many parts of the developing countries like India.

Diesel is a compound of hydrocarbons obtained by refining petroleum oil. All vehicles that use diesel release toxic pollutants into the atmosphere. The incomplete burning of diesel generates soot /particulate matter along with gases like nitrogen and sulfur, which are directly released into the atmosphere. These gases are invisible and the vehicle releases emissions even when it is idling

Toxic fumes from the burning of diesel contribute to the production of ground-level ozone which damages crops, trees, and other vegetation. Also It produces acid rain, which affects soil, lakes, and streams and enters the human food chain via water, produces, meat and fish.

Considering all the above factors, diesel still contributes to a big portion of the pollutants in the air and therefore there is a need to use fuels that are alternatives to diesel.

Biofuels are liquid fuels that are made from biomass which is a cheap renewable source of energy. Ethanol and biodiesel are some of the types of biofuels available today, as alternative to petrol and diesel fuel.

II. LITERATURE REVIEW

Since the beginning of the automotive industry, Bio-fuels have been used in engines. Rudolph Diesel tested peanut oil in his first engine after coal was found to be unusable. In the 1940s, bio-ethanol

blends, such as Monopolin, Agrol, and Discol, were commonly used in the World [1]

After the Second World War, petroleum-derived fuel became cheaper hence further development of bio ethanol ceased. During the oil crisis in the 1970s, many countries showed renewed interest in the production of commercial bio-fuels; however, only Brazil started to produce ethanol on a large scale as part of the National Ethanol Programme 'Proálcool'[2]

During the late 1990s, with the rise in crude oil prices and concerns over energy security, the USA and many nations in Europe developed policies in support of domestic biofuels industries [3].

The interest in biofuels further increased in the past decade with the development of policies on climate change mitigation and strategies to reduce GHG emissions from the transport sector. More than 60 countries have since launched biofuels programmes and set targets for blending biofuels into their fuel pools [4].

Renewable Fuel Standard (RFS) [5] in the USA and the Renewable Energy Directive (RED) in Europe are the most notable standards[6].

Several other studies show that reductions in Greenhouse gases emissions from biofuels are achieved at the expense of acidification, eutrophication, water footprint, and biodiversity loss [7]

A study is proposed a quantitative method to predict the onsite fuel consumption of earthworks activities. First, the research identified fuel consumption agents related to earthworks activities. Then, an analysis of on-site fuel consumption was carried out by characterizing fuel equipment and load factors. Using data available from producers' technical manuals, and applying a cluster analysis method and then a linear regression, calculated load factors for a medium-sized tracked excavator, a small wheel loader, and a vibratory soil compactor. An analysis of transport fuel consumption was also undertaken. [8]

In another case, the Trani K.L. et al (2016), have developed an onsite model during planning stage and predicted onsite fuel consumption and corresponding carbon dioxide emissions arising from earthworks in residential construction projects. Then the next steps included onsite fuel consumption analysis for earthwork activities like Stripping overburdens, excavations, embankments and compaction. Characterization of fuel equipment and load factor (Average proportion of equipment power that is actually used) followed by Fuel consumption analysis in transport and estimation of onsite fuel consumption based on earthwork in the building projects [9]

Curto, J.W.(2020) have explained the different types of Bio- diesel, their origins and their unique characteristics and also include the emission trends of varying mixtures of diesel and bio-diesel. It was found that as bio-diesel concentrations increased in the fuel mixtures, carbon monoxide levels decreased. The carbon monoxide concentration held a 55negative linear relationship with increasing percentage of bio-dieselthe fuel that less releases CO2 to the atmosphere is ethyl alcohol; on the contrary, the fuel that releases highest CO2 emission to the atmosphere is diesel fuel. Due to the oxygenated nature of biodiesel, where more oxygen is available for burning, this fuel produces decreased rates of unburned hydrocarbon and CO emissions in the exhaust. The main advantage is that CO2 emissions, in the case of use of biodiesel, can be regarded as carbon credit as it is a biofuels, produced by photosynthesis. Therefore, the emission levels using this kind of biofuels are 78.45% lower in comparison with those of diesel fuel. The real parameter considering the biodiesel life cycle is 0.578 ton CO2/m3 (B100). [10]

While analysing the data collected on emission, the researchers were convinced that pre-processing of the data set has a significant impact on the accuracy of the models, among to pre-processing approaches mean-centering and max-min scaling feature improves the forecasting degree of the models remarkably in the field of this data set. [11]

In the separate research work, on finding the production cost of bio-diesel vis a vis petroleum diesel, it was found that the Bio-diesel can be manufactured as a high quality fuel for compression ignition engines. It has lower energy content than conventional diesel and a volumetric fuel consumption increase of about 6% with bio-diesel is typical of reported data. He reported that To be competitive with conventional diesel, bio-diesel will require more than the combined assistance of carbon tax credits and the cost savings resulting from reduced diesel emissions to make it competitive with conventional diesel, unless the price of crude oil is

maintained at prices significantly higher than historical average [12].

III. METHODOLOGY

The work is to be done according to the following process

1. Determination the consumption of diesel used in construction equipment and vehicles used at the construction site.
2. .Determination of the emissions of the particular equipment and vehicles and economical worth of that fuel
3. .Selection of the type of bio-fuel for the given equipment based upon the environment as well as economical aspect
4. Comparison of cost, efficiency, and pollution potential of the use of Petroleum diesel and the bio-diesel of choice.
5. Concluding the results

IV.CONCLUSION

The literature review does not give a specific model for study of onsite fuel consumption of earthwork activities (preconstruction stage), characterization of fuel equipment and load factors. Therefore some local construction sites would be taken up for study and using some innovative method the prediction of onsite fuel consumption for both conventional diesel and bio diesel/ethanol, will be required to be formulated. This method then would help minimize the environmental impact and brought about the best alternative fuel in terms of economy, efficiency and environmental sustainability .The results obtained then would be presented for pier's review and evaluation, to justify further the total replacement of conventional diesel with bio fuels.

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