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GREEN DIESEL BY POTASSIUM ALUM: A LITERATURE REVIEW

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Abstract

The world needs for the transportation depends on non- renewable fossil fuels. Among them one of the fuels for transportation is diesel. As the diesel based transportation system has increased, air pollution is also increased by the same fold. To control diesel pollution, alum usage in diesel found to be one among them. By the addition of potassium alum we can make the diesel in cheap fuel and reduce the carbon dioxide content. This paper presents a review of the addition of potassium alum in the diesel. We can change the diesel in cheap and best way into Nano Sulfur Diesel with sulfur content of 5 parts per million (ppm) and the fuel is also called ATFD (Any Temperature Flow Diesel).

Index Terms: *Alternative fuels, bio- diesel, Potassium Alum, Nano Sulfur Diesel.*

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1. INTRODUCTION

Today day by day air pollution increasing in environment due to use of fossil fuels such as diesel, petrol, kerosene etc.. which causes a serious negative effect /impact on ecosystem.
So, here after a long study we are using Potassium Aalum or Tawas in our experiment which provens that it play an important role in development of Non-Pollutant fuel that is "Non-Pollutent Diesel or Green Diesel or Bio Diesel" which keeps our environment pollution free reducing production of carbon-di-oxide, carbon-monoxide by 78%.

1.1 Technical Terms

1.1.1 Calorific Value

The calorific value of fuel is the quantity of heat produced by its combustion at constant pressure and under normal or standard conditions that means to 00c and under pressure of 1,013 mbar. The diesel higher calorific value is 44,800 kJ/kg, lower calorific value is 43,400 kJ/kg.

1.1.2 Auto Ignition Temperature

The auto ignition temperature or kindling point of a substance is the lowest temperature at which it will spontaneously ignite in a normal atmosphere without an external source of ignition, such as flame or spark. Diesel auto ignition temperature is 2100c.

1.1.3 Flash Point

The flash point of a volatile material is the lowest temperature at which it can vaporize to form an ignitable mixture in air. At flash point, a lower temperature, a substance will ignite briefly, but vapor might not be produced at a rate to sustain the fire. Diesel flash point is >620c.

1.1.4 Fire Point

The fire point of a fuel is the temperature at which it will continue to burn for at least 5 seconds after ignition by an open flame. Diesel fire point is >720c.

2. BENEFITS OF BIODIESEL FROM ALUM

A biodiesel plant, especially one of this size, will have many benefits for the metro region and the nation. First, biodiesel is a clean-burning fuel that reduces pollution and enhances air quality (The fuel will be used for diesel-powered vehicles and as home heating oil)

2.1 Potassium Alum

Alum $KAl(SO4)_212(H_2O)$ is the common name of Potassium Aluminum Sulfate dodecahydrate. Its chemical formula is KAl $(SO_4)_2$ and it is commonly found in its dodecahydrate form as KAl $(SO_4)_2 \cdot 12(H_2O)$. It is most commonly used in water purification, leather tanning, dyeing, fireproof textiles, and baking powder. It also has cosmetic uses as a deodorant, as an aftershave treatment and as a styptic for minor bleeding from shaving.

2.2 Benefits of Potassium Alum

Alum has several household and industrial uses. Potassium alum is used most often, although ammonium alum, ferric alum and soda alum may be used for many of the same purposes.

- purification of drinking water as a chemical flocculants
- in styptic pencil to stop bleeding from minor cuts
- adjuvant in vaccines (chemical that enhances immune response)
- deodorant "rock"
- pickling agent to help keep pickles crisp
- flame retardant
- the acidic component of some types of baking powder
- an ingredient in some homemade and commercial modelling clay
- an ingredient in some depilatory (hair removal) waxes
- skin whitener
- ingredient in some brands of toothpaste

2.1.1 Characteristics

Potassium alum crystallizes in regular octahedral with flattened corners, and is very soluble in water. The solution reddens litmus and is an astringent.

Molar Mass is 258.21 g/mol. Boiling Point is 200 °C. Melting Point is 92-93 °C. Density is 1.76 g/cm³. Odorless. Solubility in Water is 14.00 g/100 Ml (20 °C), 36.80 g/100 mL (50 °C). Refractive Index (*n*D): 1.4564.

2.1.3 Bio Diesel

Biodiesel is a mono-alkyl ester based oxygenated fuel made from vegetable or animal fats. It is commonly produced from oilseed plants such as soybean or canola, or from recycled vegetable oils. Biodiesel has similar properties to petroleum diesel fuel and can be blended with petroleum diesel fuel at any ratio. The most common blend rate is 20 percent biodiesel, 80 percent petroleum diesel. This mixture is referred to as *B20*. Pure or *neat* biodiesel is called B100. Biodiesel is a domestically produced, renewable motor fuel that is non-toxic and biodegradable. Biodiesel is registered as a fuel and fuel additive with the U.S. Environmental Protection Administration (EPA) and has passed the EPA's Tier 1 Health Effects Testing under the Clean Air Act section 211(b). Neat biodiesel, B100, has also been classified as an alternative fuel by the U.S. Department of Energy, and meets California Air Resources Board (CARB) clean diesel standards. The American Society of Testing and Materials (ASTM), the U.S. fuel standard-setting body, recently issued a new specification for biodiesel fuel. Specification D-6751 applies to all biodiesel bought and sold in the United States.

2.1.4 Emissions

There is a growing body of emission data who evaluate the PM reduction for biodiesel. Use of B100 significantly reduces particulate matter (PM), carbon monoxide and hydrocarbons but increases nitrous oxide (NO_x) whereas B20 changes in emissions are directionally the same as compared to conventional diesel fuel. According to CARB B100 reduce 30% and B20 reduce PM emissions by 22% when compared to conventional diesel fuel. The National Biodiesel Board indicates similar emissions benefits, and report PM reductions of 40 percent for B100 and 8 percent for B20.

Table -1: Biodiesel Emissions Compared to Diesel Fuel

	CARB		NBB	
Pollutants	**B100 (%)**	**B20 (%)**	**B100 (%)**	**B20 (%)**
PM	-30	-22	-40	-8
NOx	+13	+2	+6	+1
PAH	-80	-13	-80	-13

2.2 ISSUES REALTEED TO BIO DIESEL

Some additional features of biodiesel is biodegradable, non-toxic, and higher flashpoint than petroleum diesel fuel. Biodiesel is also a renewable, domestically produced fuel that can provide local economic benefits. Biodiesel yields 3.2 units as compar to petroleum diesel yields 0.83 per unit of fossil energy consumed according to U.S. Department of Energy.

Because biodiesel is derived from vegetable oils, carbon is also recycled.

2.2.1 Availability

Survey concludes Approx 12 companies actively marketing/enterperunership biodiesel fuel. In United States marketing/enterprenurship around 80 million gallons per year. However, new plants are being proposed throughout the country. Additional production capacity may be available within the oleo-chemical industry, where it is estimated that maximum as 200 million gallons of capacity may be available for biodiesel production**.**

2.2.2 Handling

Handling of biodiesel is similar to petroleum diesel fuels Because of its inherent solvent properties, there may be some material compatibility during handling. Rubber seals and hoses should be replaced as it degrade after prolonged exposure to biodiesel. Fuel filters should also be checked when first using biodiesel as they may become plugged with accumulated sediments. Also, spills need to be cleaned up quickly, as biodiesel is an effective paint remover.

2.2.3 Fuel Economy

Because of its lower British Thermal Unit (BTU) content, engine fuel economy and power are about 10 percent lower when running on neat biodiesel and about 2 percent lower for a B20 blend. Biodiesel also has excellent lubricity characteristics, and can be added to petroleum diesel fuel in quantities as low as 1 to 2 percent to provide significant

lubricity improvements meeting or exceeding OEM specifications.

3 Methodology

Ten samples of diesel has been taken before adding the potassium alum and we note the readings. Then, 50 grams of potassium alum is added in one liter of diesel for seven days. After seven days we removed the alum and again check for reading. It results as "calorific value of diesel is increased".

CONCLUSIONS

By using potassium alum in diesel we get the following results

1. It reduces the diesel fuel exhaust emissions.
2. It gives more mileage and more engine efficiency.
3. It affects the cetane number in diesel. Higher cetane number indicates that the fuel ignites more readily when sprayed into hot compressed air.
4. In general diesel viscosity increases quickly as the fuel's temperature decreases, turning into a non flowing gel at temperatures as low as −19 °c (−2.2 °f) or −15 °c (5 °f), which cannot be pumped by regular fuel pumps. The alamised diesel may solve this problem.

Readings	Diesel Before Potassium Alum	Diesel After Potassium Alum (50 Grams Per Liter)
Flash Point	$63^{o}C$	$53^{0}C$
Fire Point	$73\ ^{o}C$	$63^{o}C$
Specific Gravity/Density	0.8 to 0.82 kg/l	0.8272 kg/l
Refractive Index	1.4679	1.317005
Carbon Monoxide Emission	1.1 km/l	0.023 km/l

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