

'POWERMAX' A FUEL ADDITIVE TO SAVE FUEL CONSUMPTION AND TO REDUCE EXHAUSTED GAS EMISSION

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ABSTRACT

The global environment problems have a serious impact to the human life, therefore, anything which caused to the worst environment have to be avoided. Vehicles like trucks, buses, private cars, motorcycles have contributed to the worst of air pollution. The higher of the traffic density the higher the air pollution will be. The rapid development in system and technology of transportation should not account for the worst impact to the environment. Unfortunately, in reality is different, traffic jam one of those things in the urban, have a worst impact to the air pollution. Those cause by the worst of transportation management and uncontrolled of using open public space. Excessive in using oil energy also can accelerate the energy reserve run off. Warm energy of transportation is the answer to the human life on fulfills their needs and their mobility. Meanwhile the energy alternative for fuel which inexpensive and within the people reach is unavailable yet. "Fuel additive" is a product, made as an effort to save the using of fuel consumption and reducing exhaust emission gas is a wise solution. In this paper, Powermax, a non-tin liquid product of Indonesia is used as 'fuel additive'. The ratio 1 to 600 of using 'fuel additive', mean 1cc (cubic centimeter) of 'fuel additive' for 600cc of fuel will save a value of fuel around 20 – 30% and reduce the exhausts emission gas up to 60%.

Keywords: Pollution, fuel-additive, exhausts, emission, save, energy

1. INTRODUCTION

1.1 The influence of transportation to the environment

The development of transportation is potential to account for environment impact. The environment impact occur not only in preconstruction and during construction process, but also the impact which will last continually, like land using, the change of tree tightly distance, pollution of poisonous gas as well as environment jeopardy, where in future those impacts will becomes accumulative and synergy. Some studies which have been conducted in relation to the traffic among other are:

- noise,
- air pollution from exhausted gas,

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- vibration,
- disturbance of view,
- delay of pedestrian, and
- The dangerous of freight.

1.2 Air pollution

Air pollution is defined as the mixed of one or more solid, liquid, or gas pollutant into the air by nature and or by human in a certain amount and in a certain period of time, such a way be able or have a tendency to responsible for threatening to human life, animal, vegetation, and building, or able to account for disturbing the life.

Air pollution cause by vehicle contributes 20% the amount of Carbon di Oxide (CO₂) in the air. This amount of CO₂ is contributed by human activities and result in global warming. Transportation as a whole contributes 60 to 70% of NO_x, and 90 to 95% of Lead or Plumbum (P_b) as well as CO in the air, in form of emission gas, which can bring global acidness. The types of gas and particles which can be categorized as pollutant of vehicle exhausted gas are:

- CO (*carbon mono-oxide*),
- NO_x (*nitro oxide*),
- HC (*hydro carbon*),
- Dust (*particulate matter*), and
- Plumbum (*Lead*)

1.3 Transportation and Energy

Increasing of population in urban area together with increasing of welfare and change in life style result in increasing of vehicle volume in the road, especially private car. Transportation becomes more popular in developing countries, and ownership of car as well as motorcycle sharply increase year by year.

Transportation in urban area consumes much space and land for road and other infrastructures as well as energy. In the entire world in general, transportation consume 30% of total commercial energy. Around 82% of that amount is consumed by land transportation. Almost all of that energy is from crude oil product.

Increasing of transportation has created a new problem that is decreasing stock of conventional energy. Therefore, have started to open the way of a new energy resources among other thing is solar energy, wind energy, geo thermal, and nuclear energy. The same goes for fuel, have started to look into the fuel made from non-fossil like bio-diesel as an alternative.

1.4 Utilizing 'Fuel Additive' into fuel for vehicle

Now days have been able to product non-fossil fuel, but the price as realize still to high to the most user and the amount of production still limited, so that most user are still chose to use conventional fuel like gasoline (Indonesia's gasoline product call Premium) or diesel oil. In this situation, beside appeal to do save on using energy, utilizing of Fuel Additive to save current fuel is needed as an effort to decelerate the speed of reducing of reserving conventional energy. One should be paid to attention on utilizing of Fuel Additive is that Fuel Additive is an additive substance which environmentally friendly.

2. METHODOLOGY

To two type of fuel which commonly used in Indonesia that is Premium (gasoline) and Minyak Solar (diesel oil), Powermax-Fuel Additive was added. Analysis then was conducted to both type of fuel before and after adding with Powermax, and the influence of Powermax to the fuel is observed.

3. RESULTS AND DISCUSSION

Laboratory test results on utilizing Fuel Additive are as follows:

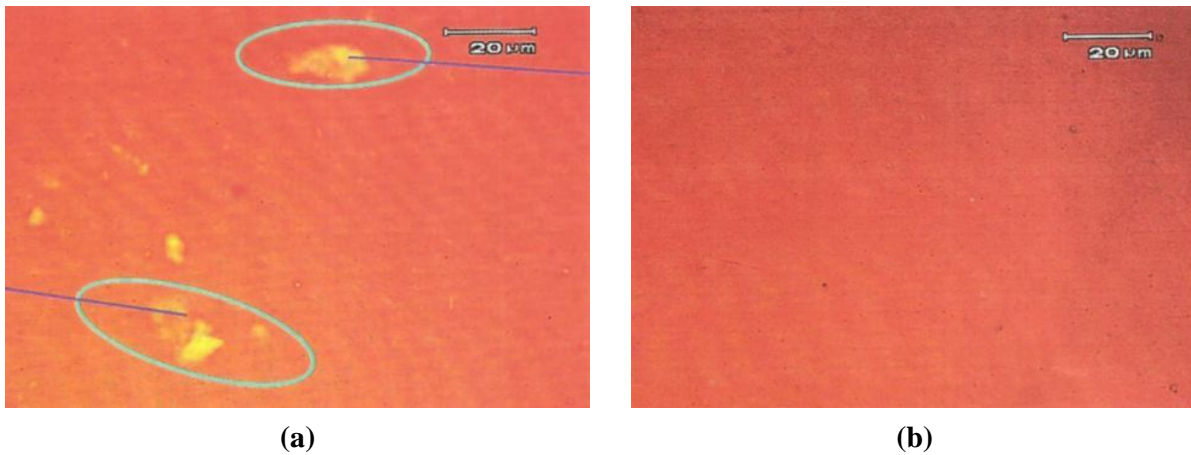
3.1 Emulsion process

Powermax-Fuel Additive exhibits able to dissolve the water into the either Premium or Minyak Solar in such away so that the emulsion process between water, powermax-fuel additive, and fuel is occurring. Figure 1 shows the microscopic photo of fuel before and after adding with Powermax.

The results of laboratory test to Premium and Minyak Solar before and after treating with Powermax are given in Table 1 and Table 2 respectively.

To answer the question: what are really needs of engine and its components? is needed little bid understanding about fuel. The explanation is about the quality of fuel especially Premium and Pertamina (the types of gasoline used in Indonesia) and diesel oil (high-speed diesel) and in Indonesia called Solar oil, which specified based on the Specification issued by Directorate General of Gas and Petroleum.

Fuel, both gasoline or diesel oil include MFO, MDO, LSWR etc., have the same requirement namely required a better quality of combustion. Meanwhile to find a better quality of combustion many factors are influences among other thing are water content, organic compounds content, sulphur content, organic acids, storage time, etc.



**Figure 1: Microscopy photo of fuel before mixing with powermax (a)
Microscopy photo of fuel after mixing with powermax (b)**

3.2 Utilizing Additive

3.2.1 Gasoline

Gasoline is a light distillate fuel which in its application in Indonesia sells with trade mark Premium, Pertamina, and Pertamina Plus.

3.2.1.1 Premium

Premium is distillates fuel which have Octane contain 88, and to be used for car and motorcycle. If it contain Lead (Plumbum) as a booster octane, generally in form of Tetra Etylene Lead. In this form, Premium cannot be used for vehicle which equipped with Catalytic Converter in it exhausted gas system, because will be able to plug of catalic holes and wipe out the electivity of the changer tools to change air pollution into the better emission.

3.2.1.2 Pertamina and Pertamina-Plus

Is the type of non-Lead fuel but containing additive? Especially Pertamina-plus is produced from selected high quality component called High Octane Mogas Component. Both Pertamina and Pertamina plus is recommended for vehicle who have high compression. On it application, Pertamina-plus must be completed with Catalic Converter, unless exhausted gas will polluted environment surrounding with substances like Nox, HC, and CO. Pertamina-plus is not recommended for vehicle where it valve seat make from soft metal.

Analysis conducted to Premium before treating with Powermax Fuel Additive, can be put on the list:

1. The present of *Washed Gum* is based on much amount of fuel mixing with non-volatile oil or incompatible additive with the fuel itself.

2. RON, F1 Clear is a scale expressing the ability of fuel especially gasoline in resist compression in order to do not burning before spark plug flaming.
3. Calorific Value is a scale expressing the amount of calorie resulted from combustion process of a certain amount of fuel with oxygen.

From the Table 1 and 2 'The result of analysis to the fuel type Premium before and after using Powermax', can be seen decreasing of Washed Gum and increasing the value of RON and F1 Clear so that detonation is not occur. Improving of gross Calorific Value in the fuel shows that Powermax able to improve fuel performance, which in turn make combustion process last flawlessly, so that emission gas reduce.

3.2.1.3 Diesel oil

Diesel oil is medium distillate fuel which is used for Ignition Compression engine. On diesel engine, air which is compressed at induction step will generate high compression and heat, so that can be burn diesel oil. Diesel oil was sprayed by injector in which the quality of ignition was decided by cetane value. The higher of cetane value show the easier of diesel oil to burn.

From the Table 3 and 4 'The result of analysis to the fuel type Diesel oil before and after using Powermax', can be seen that Fuel Additive able to maintain the quality of fuel condition, excessive viscous was not occur or in other word it kinetic viscosity is well maintain, so that the fuel is remain easy to fogged. Those have important meaning in diesel engine or steam engine. Water particles (water content) inside of diesel oil sprayed up maximally. So that of the performance of diesel oil, colorific value is improved, make the fogged process perfect.

Table 1: Analysis results of 'Premium' before and after adding Powermax

TEST	RESULT		STANDARD	
	BEFORE ADDING PWM	AFTER ADDING PWM	WITH PLUMBUM	WITHOUT PLUMBUM
1. Color	0.5	0.5	Red	Red
2. Doctor test	Negative	Negative	Max. negative	Max. negative
3. Sulfur content	0.05	0.05	Max. 0.05	Max. 0.05
4. Washed Gum	2.5	2.5	Max. 5	Max. 5
5. Copper Strip Corrosion at 100°C	1A	1A	Max. no. 1	Max. No. 1
6. Red Vapor Pressure at 100°F	58.6	58.6	Max. 62	Max. 62
7. Mercaotan Sulfur	0.0001	0.0002	Max. 0.002	Max. 0.002
8. RON F1 clear	87	88.5	Min. 88.0	Min 88.0
9. Distillation IBP	34	33		
5% Volume	46	44		
10% Volume	51	49	Max. 74	Max. 74
20% Volume	57	56		
30% Volume	65	64		
40% Volume	74	73		
50% Volume	85	85	85 – 125	85 – 125
60% Volume	98	100		
70% Volume	114	115		
80% Volume	130	132		
90% Volume	152	154	Max. 180	Max. 180
95% Volume	169	180		
EP	201	202	Max. 215	Max. 205
Recovery % Volume	98	98		
Residue, % volume	1.0	1.0	Max. 2.0	Max 2.0
Loss, % volume	1.0	1.0		
10. Lead Ph	<0.0001	<0.0001	Max 0.013	Max. 0.3
11. Calorific value (gross)	11116	11465	-	-
Calorific value (netto)	10394	10643	-	

(Source: Unity Network International Co. Ltd., 2008)

Table 2: Analysis results of 'Diesel Oil' before and after adding Powermax

TEST	RESULT		STANDARD	
	BEFORE ADDING PWM	AFTER ADDING PWM	WITH PLUMBUM	WITHOUT PLUMBUM
1. Color ASTM	02.0	02.0	Max. 3.0	Max. 1.0
2. API Gravity at 60°F	35.5	35.4	-	-
Density at 15°C				
3. Flash Point	846.9	847.4	815 - 870	820 - 860
4. Kin. Viscosity at 40°C	76	72	Min. 60	Max. 55
	3.404	3.828	2.0 – 5.0	2.0 – 4.5
5. Water content	144	145	Max. 500	Max. 500
6. Copper Strip Corrosion at 100°C	1A	1A	No. 1 Max.	No. 1 Max.
7. Pour Point	-1	-1	Max. 18	Max. 18
8. Cetane index	51.5	51.5	Min. 45	Min 48
9. Total sulfur	0.13	0.13	Max. 0.35	Max. 0.05
10. Conradson carbon Residue on 10% Destilate residue	0.01	0.01	Max. 0.1	Max. 0.01
11. Ash content	0.003	0.003	Max. 0.01	Max. 0.01
12. Settlement	0.003	0.003	Max. 0.01	Max. 0.01
13. Distillation Rec. Basis				
IBP	178	172		
5% Volume	212	211		
10% Volume	225	225		
20% Volume	245	245		
30% Volume	260	262		
40% Volume	273	274		
50% Volume	285	286		
60% Volume	298	296		
70% Volume	309	311		
80% Volume	326	327		Max. 390
90% Volume	346	348	Max 370	Max. 360
95% Volume	362	368		Max. 370
EP	358	371		
Recovery % Volume	98.0	98.0		
Residue, % volume	1.5	1.5		
Loss, % volume	0.5	0.5		
14. SAN	0	0	0	0
15. TAN	0.08	0.07	Max. 0.60	Max. 0.3
16. Calorific value (gross)	10903	10976		
Calorific value (netto)	10239	10294		

(Source: Unity Network International Co. Ltd., 2008)

4. CONCLUSIONS

1. Powermax as Fuel Additive after being tested exhibits that are in accordance to the standard or specification issued by Directorate General gas and Petroleum.
2. Powermax able to improve the quality of fuel, able to dissolve water to the fuel such away so that emulsifying occur, can break the big particle in the fuel to become small, so that easy to be fogged and the combustion perfectly occur. This perfect in combustion make the fuel consumption can be saved and the emission gas low.
3. Powermax also able to improve water particle which have function to keep fuel tank from corrosion. It is also important that Powermax is not changing the viscosity, structure, and composition of fuel organic compound, so that save for long term using of engine.
4. Powermax can be used as solution on saving fuel (oil energy) and reduce emission gas.
5. Utilizing Powermax can become appeal to support the movement on saving oil energy and Green Driving.

5. RECOMMENDATION

Considering varies of Fuel Additive are available in the market, the utilization of Fuel Additive must paid it performance into attention, by the way can be telling whether the best Fuel Additive can be used.

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