

## **ABSTRACT**

### **The Effect of utilization of external air filter using natural zeolite that physically activated on the engine performance and exhaust emission of 4-stroke motorcycle**

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The utilization of natural zeolite to increase engine performance has been carried out. However, zeolite is placed on the internal air filter in previous research, so that the zeolite filter can only be used on certain vehicle types, therefore the process of researching an external filter is needed.

Zeolite is firstly chemically activated by using a chemical activation (NaOH), and then physically re-activated at temperature about 250°C for 1 hour to increase the ability of the zeolite. There are two shapes of the external air filter used in this research; box and tube. Each shape was varied into 4 types: B100%, B75%, K100% and K75%. There are 8 types of filter used in this research in overall. Parameters used in this research are the fuel consumption, acceleration and exhaust emissions. Retrieval of data was performed on sunny and cloudy conditions.

In general, the box shaped-external air filter with type of KB 75% with zeolite mass 52,5 gram is the best type in increasing engine performance. On the road test, fuel consumption can be reduced to 61,167 ml (25,56%) from normal condition (without zeolite) about 82,167 ml with this type. Moreover box shaped-external air filter can also reduce level of CO and HC respectively 1,453 (61,18%) and 77,0 ppm (56,82%), while level of CO<sub>2</sub> was increased to 5,067 (20,63%) at 5000 rpm. The results obtained for the tube-shaped air filter is lower than the square-shaped air filter. Fuel consumption can be save up to 14,20%, the level of CO and HC was reduced respectively 15,96% and 22,38%, and levels of CO<sub>2</sub> was raised about 6,25%.

**Key words :** exhaust emission, the external air filter, fuel consumption, combustion engine, zeolite.