

# Studi Eksperimen Pengaruh Graphene Oxide Terhadap Performa Motor Pembakaran Dalam Gasoline/Ethanol = Experimental Study on the Influence of Graphene Oxide on the Performance of Gasoline/Ethanol Internal Combustion Engine

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## Abstrak

Kendaraan bermotor merupakan alat transportasi terpenting bagi penduduk Indonesia. Masalah yang ditimbulkan oleh kendaraan bermotor antara lain emisi yang lebih tinggi dan juga tidak selalu tersedianya minyak pemanas. Pemerintah Indonesia mengeluarkan Surat Keputusan No. Menteri Energi dan Sumber Daya Alam (ESDM). 12 Tahun 2015 tentang Penyediaan, Penggunaan dan Tata Niaga Bahan Bakar Nabati sebagai Bahan Bakar Lain. Solusi yang diterapkan saat ini adalah campuran bahan bakar etanol, graphene oxide dengan bensin. Tujuan penelitian ini akan menguji bahan bakar campuran gasoline-ethanol-grapheneoxide zat aditif terhadap pengaruh unjuk kerja, emisi, dan temperature pada mesin 4 stroke 125 cc SI. Komposisi campuran menggunakan gravimetri dengan masing-masing sampel 1000 dengan campuran E0 1000 gram gasoline, E20 campuran gasoline 800 gram dan ethanol 200 gram, E20GO campuran gasoline 800 ditambah ethanol 200 gram ditambah graphene oxide 25 mg (125 ppm). Melakukan rancang bangun Rig engine, modifikasi cylinder head untuk meletakkan termokopel, sistem elektrikal, fuel system. Alat ukur yang digunakan pada penelitian ini Data-Q sebagai data akuisisi, BRT JUKEN 5+ sebagai ECU, termokopel tipe-K, data box AFR Meter untuk bacaan AFR, gas analyzer kane 9206 Quintox, Chassis dynamometer, fuel system dan tanki KMHE 200 ml. Metode pengujian dengan variasi RPM rendah, tengah, tinggi dengan RPM 5000, 6500, 8000 di tahan pada waktu running selama 30 detik dan dengan throttle terbuka penuh (wide open throttle) diantara pengujiannya yaitu: unjuk kerja meliputi torsi, HP, Konsumsi bahan bakar. Emisi meliputi CO<sub>2</sub>, CO, HC. Temperatur meliputi temperatur exhaust dan temperatur exhaust valve. Berdasarkan hasil pengujian torsi dibandingkan dengan E0 didapat pada bahan bakar E20GO mengalami penurunan 2%, 20%, 23% dan daya didapat penurunan E20 5%, 4%, 26%. Hasil pengujian konsumsi di bandingkan dengan E0 didapatkan E20GO mengalami kenaikan 40%, 18%, 2%. Pengujian emisi dibandingkan dengan E0, didapatkan emisi karbon dioksida CO<sub>2</sub> E20 mengalami penurunan 10%, 3%, 12%. Emisi karbon monoksida CO E20GO mengalami penurunan 36%, 67%, 89%. Emisi Hidrokarbon HC E20GO mengalami penurunan 59%, 24%, 25%. Pengujian temperature exhaust dan valve exhaust dibanding dengan E0 didapatkan E20GO mengalami kenaikan pada RPM 5000 78%, dan 74 %, RPM 6500 dan 8000 mengalami penurunan 25%, 14%, 8%, 13%.

.....Motor vehicles are the most important means of transportation for the population of Indonesia. The issues caused by motor vehicles include higher emissions and the inconsistent availability of heating oil. The Indonesian government issued Minister of Energy and Mineral Resources Decree No. 12 of 2015 regarding the Provision, Use, and Trade of Vegetable Fuel as an Alternative Fuel. The current solution applied is a mixture of ethanol, graphene oxide, and gasoline as fuel additives. This research aims to test the performance, emissions, and temperature effects of the gasoline-ethanol-graphene oxide fuel mixture on a 125 cc SI 4-stroke engine. The mixture composition is determined using gravimetry, with each sample consisting of 1000 grams of gasoline for E0, a mixture of 800 grams of gasoline and 200 grams of ethanol

for E20, and a mixture of 800 grams of gasoline, 200 grams of ethanol, and 25 mg (125 ppm) of graphene oxide for E20GO. The research includes the construction of an engine rig, modification of the cylinder head for thermocouple placement, electrical system, and fuel system. The measurement tools used in this research are Data-Q for data acquisition, BRT JUKEN 5+ as ECU, type-K thermocouples, AFR Meter data box for AFR reading, Kane 9206 Quintox gas analyzer, chassis dynamometer, fuel system, and KMHE 200 ml tank. The testing method involves variations of low, medium, and high RPM at 5000, 6500, and 8000 RPM, respectively, held for a running time of 30 seconds, with the throttle wide open. Performance testing includes torque, horsepower, and fuel consumption. Emission testing includes CO<sub>2</sub>, CO, and HC. Temperature testing includes exhaust temperature and exhaust valve temperature. Based on the test results, compared to E0, the torque of E20GO fuel showed a decrease of 2%, 20%, 23%, while the power showed a decrease of 5%, 4%, 26% for E20. The fuel consumption testing showed an increase of 40%, 18%, 2% for E20GO compared to E0. In terms of emissions, compared to E0, E20 exhibited a decrease of 10%, 3%, 12% in carbon dioxide (CO<sub>2</sub>) emissions, while E20GO showed a decrease of 36%, 67%, 89% in carbon monoxide (CO) emissions and a decrease of 59%, 24%, 25% in hydrocarbon (HC) emissions. In the exhaust and valve temperature testing, compared to E0, E20GO showed an increase of 78% and 74% at 5000 RPM, and a decrease of 25%, 14%, 8%, 13% at 6500 and 8000 RPM, respectively.