

REKAYASA FAIRING TERHADAP COEFFICIENT DRAG MOBIL HEMAT ENERGI MENGGUNAKAN SIMULASI AERODINAMIS

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ABSTRAK

Penelitian ini bertujuan untuk menganalisis pengaruh rekayasa *fairing* terhadap karakteristik aerodinamika mobil hemat energi melalui simulasi *Computational Fluid Dynamics (CFD)*, menentukan nilai *coefficient* hambatan udara (*coefficient of drag/Cd*) pada setiap variasi desain *fairing*, serta memperoleh desain *fairing* yang paling efektif dalam meningkatkan performa aerodinamika kendaraan. Penelitian dilakukan menggunakan metode kuantitatif dengan simulasi *CFD* menggunakan perangkat lunak *ANSYS Fluent*. Model yang dianalisis terdiri atas desain awal, rekayasa *fairing* variasi 1, dan rekayasa *fairing* variasi 2. Parameter yang dianalisis meliputi distribusi tekanan, pola aliran udara, visualisasi turbulensi, nilai *coefficient drag (Cd)*, dan gaya hambat udara (*drag force*). Hasil penelitian menunjukkan bahwa rekayasa *fairing* memberikan pengaruh positif terhadap karakteristik aerodinamika kendaraan. Modifikasi *fairing* menghasilkan distribusi tekanan yang lebih merata, memperlambat terjadinya *flow separation*, serta mengurangi daerah turbulensi (*wake*) di bagian belakang kendaraan sehingga aliran udara menjadi lebih stabil. Nilai *coefficient drag* mengalami penurunan dari 0,6119 pada desain awal menjadi 0,5772 pada rekayasa *fairing* variasi 1 dan 0,5680 pada rekayasa *fairing* variasi 2. Penurunan tersebut diikuti dengan berkurangnya gaya hambat udara dari 69,70 N menjadi 63,74 N dan 32,96 N. Berdasarkan hasil simulasi, rekayasa *fairing* variasi 2 merupakan desain terbaik karena menghasilkan nilai *coefficient drag* dan gaya hambat udara paling rendah, sehingga mampu meningkatkan efisiensi aerodinamika mobil hemat energi.

Kata kunci: aerodinamika, *Computational Fluid Dynamics (CFD)*, *fairing*, *coefficient drag*.

**THE EFFECT OF FAIRING ENGINEERING ON THE DRAG
COEFFICIENT OF POLITEKNIK NEGERI BENGKALIS
ENERGY-EFFICIENT CAR USING AERODYNAMIC
SIMULATION**

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ABSTRACT

This study aims to analyze the effect of fairing engineering on the aerodynamic characteristics of an energy-efficient vehicle using Computational Fluid Dynamics (CFD) simulation, determine the drag coefficient (C_d) of each fairing design variation, and identify the most effective fairing design for improving the vehicle's aerodynamic performance. The research employed a quantitative approach through CFD simulation using ANSYS Fluent. Three vehicle models were analyzed, namely the original design, fairing modification variation 1, and fairing modification variation 2. The analyzed parameters included pressure distribution, airflow pattern, turbulence visualization, drag coefficient (C_d), and aerodynamic drag force. The results indicate that fairing engineering has a positive effect on the vehicle's aerodynamic characteristics. The modified fairing produced a more uniform pressure distribution, delayed the occurrence of flow separation, and reduced the wake region behind the vehicle, resulting in a more stable airflow. The drag coefficient decreased from 0.6119 for the original design to 0.5772 for fairing variation 1 and 0.5680 for fairing variation 2. In addition, the aerodynamic drag force decreased from 69.70 N to 63.74 N and 32.96 N, respectively. Based on the simulation results, fairing variation 2 demonstrated the best aerodynamic performance by producing the lowest drag coefficient and drag force among all tested designs. Therefore, it can be concluded that fairing engineering effectively improves the aerodynamic efficiency of energy-efficient vehicles.

Keywords: *aero dynamics, Computational Fluid Dynamics (CFD), drag coefficient, fairing.*