ABSTRAK

Perkembangan kendaraan listrik menjadi salah satu upaya strategis dalam menghadapi krisis energi dan permasalahan lingkungan global akibat emisi gas rumah kaca. Studi ini bertujuan untuk merancang dan menganalisis struktur chasis mobil listrik berdaya 2 kW tipe tubular dengan menggunakan perangkat lunak SolidWorks 2020 berbasis metode elemen hingga (Finite Element Analysis/FEA). Penelitian difokuskan pada dua model desain chasis dan membandingkan kinerja tiga jenis material: Aluminium A6061, Aluminium 6061-T6, dan Plain Carbon Steel terhadap tiga parameter utama, yaitu tegangan (stress), perpindahan (displacement), dan faktor keamanan (Factor of Safety/FOS). Simulasi pembebanan dilakukan berdasarkan regulasi Kompetisi Mobil Listrik Indonesia (KMLI) tahun 2024. Hasil simulasi menunjukkan bahwa desain kedua dengan material Aluminium 6061-T6 memberikan performa terbaik, dengan nilai FOS mencapai 5,7, displacement maksimum 1,55 mm, dan tegangan maksimum 47.839 N/m². Material Plain Carbon Steel menunjukkan nilai displacement terendah namun memiliki massa jenis lebih tinggi. Sebaliknya, seluruh material pada desain pertama tidak memenuhi batas keamanan karena nilai FOS < 1. Dengan demikian, desain chasis kedua berbahan Aluminium 6061-T6 direkomendasikan sebagai solusi yang paling optimal dari segi kekuatan struktural, efisiensi massa, dan keselamatan, serta sesuai untuk diterapkan dalam pengembangan kendaraan listrik kompetitif.

Kata kunci: Mobil listrik, chasis tubular, SolidWorks, Aluminium 6061-T6, stress, displacement, factor of safety.

ABSTRAC

The development of electric vehicles represents a strategic effort to address the global energy crisis and environmental issues caused by greenhouse gas emissions. This study aims to design and analyze the structure of a 2 kW electric car chassis with a tubular type using SolidWorks 2020 software based on the Finite Element Analysis (FEA) method. The research focuses on two chassis design models and compares the performance of three materials—Aluminum A6061, Aluminum 6061-T6, and Plain Carbon Steel—based on three main parameters: stress, displacement, and factor of safety (FOS). Load simulations were conducted in accordance with the 2024 Indonesian Electric Car Competition (KMLI) regulations. The simulation results show that the second chassis design with Aluminum 6061-T6 provides the most optimal structural performance, with a FOS of 5.7, a maximum displacement of 1.55 mm, and a maximum stress of 47,839 N/m². Although Plain Carbon Steel demonstrated the lowest displacement value, it has a significantly higher mass density. In contrast, all materials used in the first chassis design failed to meet safety standards, as their FOS values were below one. Therefore, the second tubular chassis design using Aluminum 6061-T6 is recommended as the most suitable solution in terms of structural strength, mass efficiency, and safety, making it ideal for competitive electric vehicle development.

***Keywords**: Electric vehicle, tubular chassis, SolidWorks, Aluminum 6061-T6, stress, displacement, factor of safety.*