Automotive Lightweight Frame Design — Case Study

Introduction

This case study explores the engineering process of reducing the overall weight of a vehicle frame without compromising structural integrity. The project was undertaken to improve fuel efficiency, reduce material costs, and enhance vehicle performance.

Design Process

- Created initial sketches to outline frame dimensions and key structural elements.
- Developed full frame assembly in SolidWorks using part modeling, assembly design, and weldment features.
- Ran stress and strain simulations to evaluate frame performance under load.
- Tested multiple iterations until optimal balance between weight reduction and strength was achieved.

Outcome

- Frame weight reduced by 15% while maintaining safety factor ≥ 2.5.
- Improved fuel economy and handling.
- Reduced material usage without compromising integrity.