Prince Sattam bin Abdulaziz University
College of Engineering
Mechanical Engineering Department

Development and Characterization of Eco-friendly Products Manufactured from Upcycled Tires.

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2st Semester 1446 / 2024-2025 GP 2

Introduction:

- Green Technology: Focuses on protecting the environment and reducing reliance on non-renewable resources through sustainable solutions that minimize environmental impact and enhance resource efficiency.
- Green Manufacturing: An industrial approach aimed at reducing the environmental impact of production by improving resource efficiency and lowering emissions and harmful material usage.

Problem Statement:

Saudi Arabia faces a major problem with too much waste from cars and industries. This issue harms the environment and people's health if proper plans are not made to address it. There are not enough recycling methods or laws to help solve the problem, which negatively affects the country's nature and the health of its population.

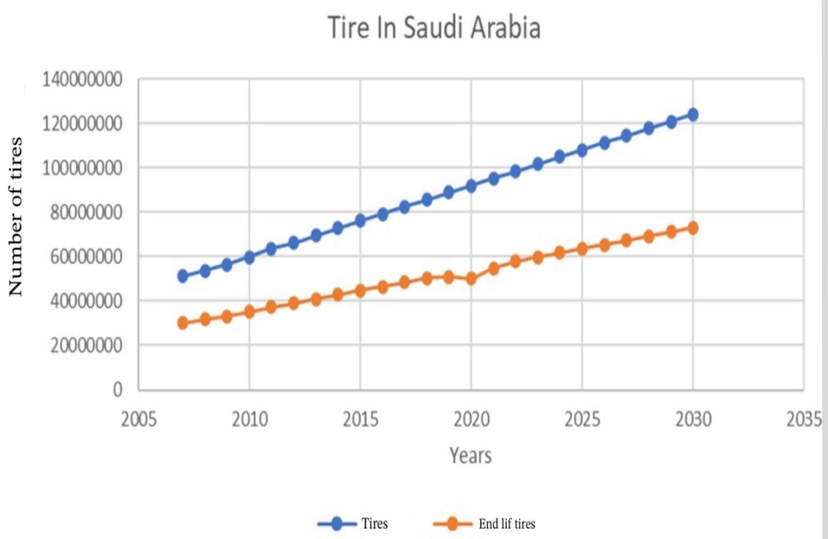
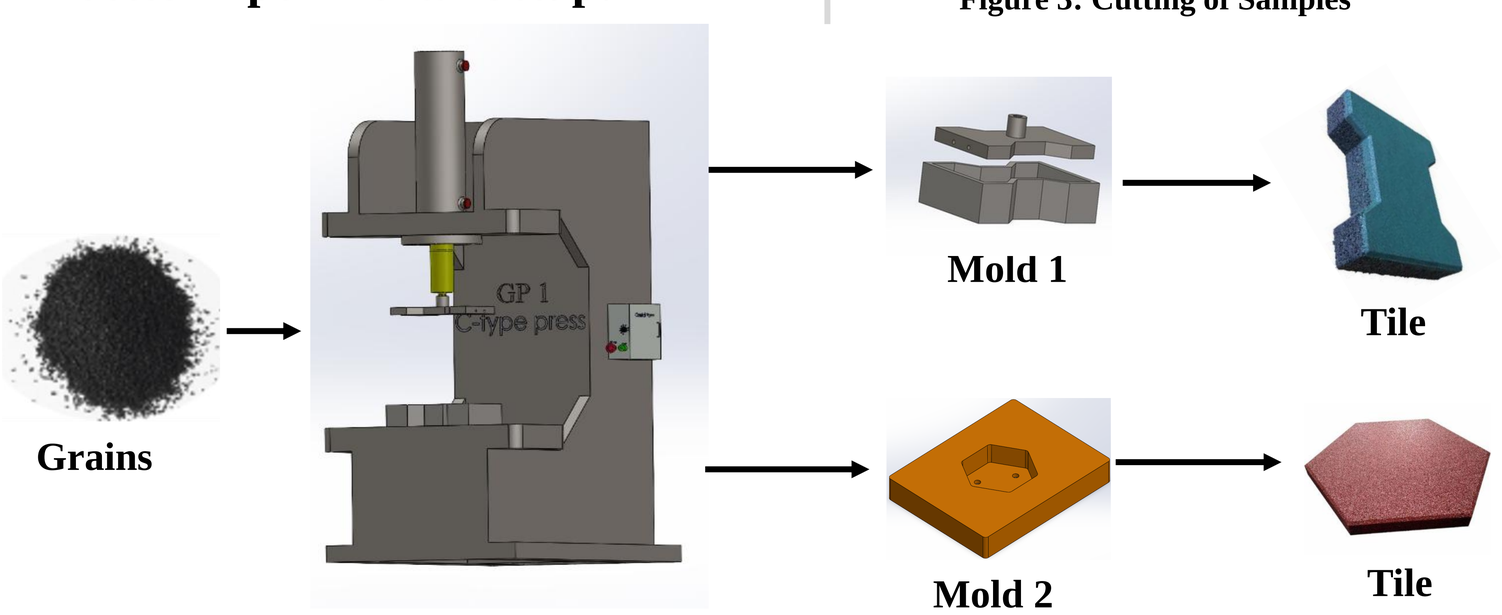


Figure 1 : Tires in Saudia Arbia

Process Experimental Setup:



Objectives:

- Design and manufacture molds using reverse engineering, along with an ejection system, to produce eco-friendly rubber products from recycled tires.
- Produce experimental rubber tiles and test them using tensile testing.
- Analyze the test results to determine the optimal manufacturing parameters using the Factorial Method.

System Design:

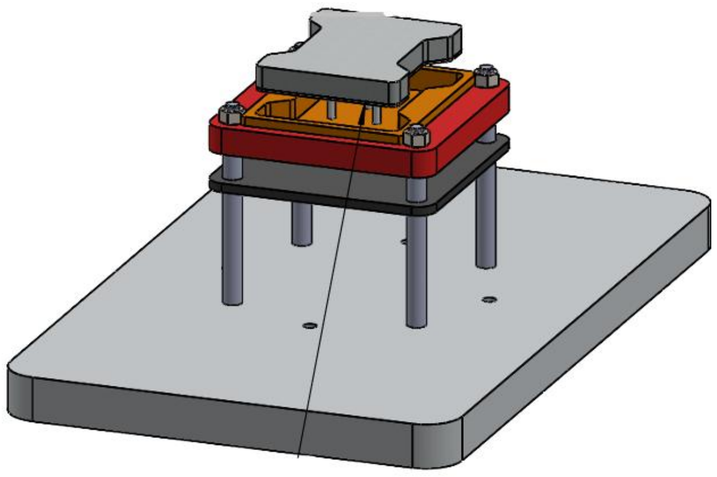


Figure 2: system design

Tensile Testing of Recycled Rubber:

Samples were cut uniformly and tested using ASTM D412 (Type C) to evaluate the strength, durability, and flexibility of recycled rubber

Figure 3: Cutting of Samples

Results:

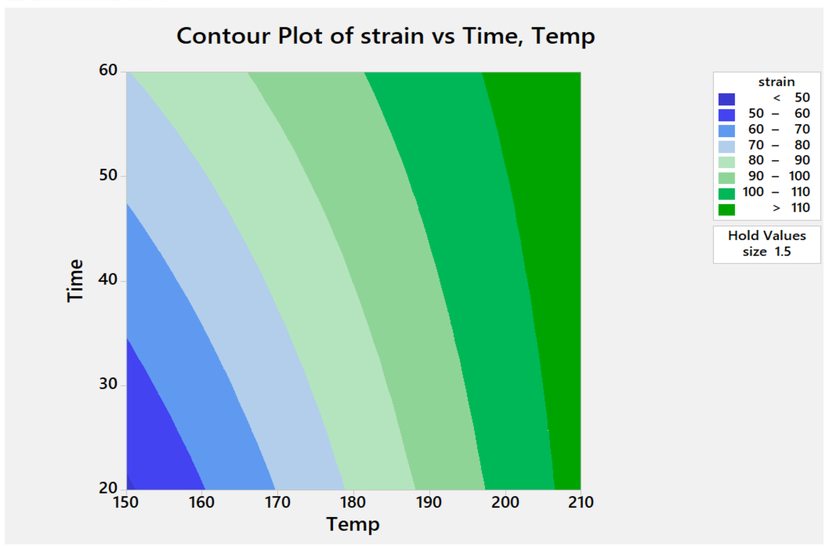


Figure 4: Contour plot of strain vs time, Temp

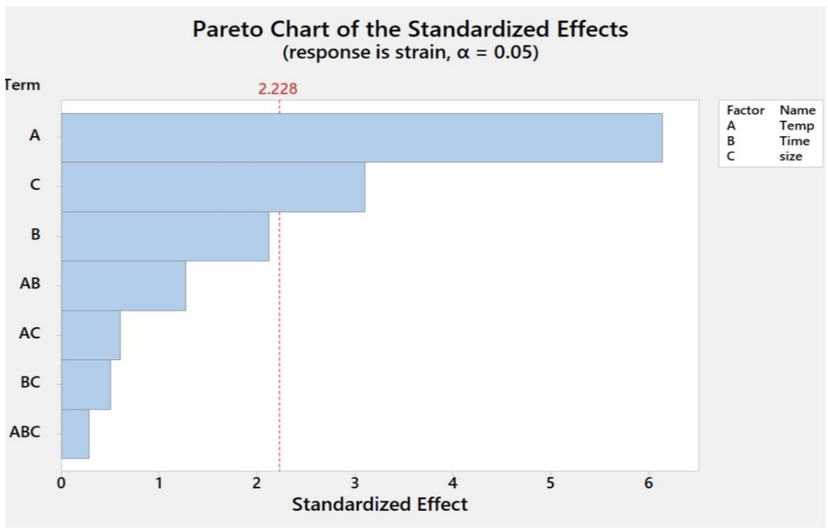


Figure 5: Pareto Chart of the Standardized Effects

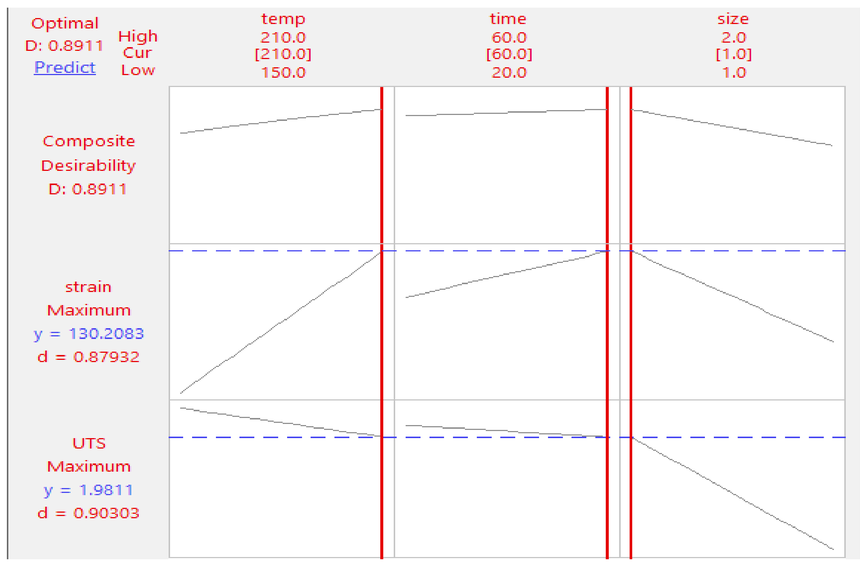


Figure 6: Optimization Plot Analysis

Conclusions:

- After completing GP2, we manufactured the system based on the initial design and produced experimental samples using recycled tires.
- The samples were tested using tensile testing, and the results were analyzed using the Factorial Method, which helped us identify the optimal parameters for producing a high-efficiency, environmentally-friendly product.