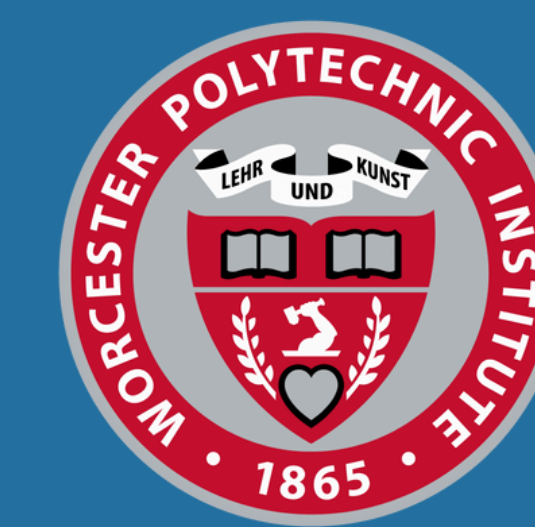




Developing a Mobile Thermal Disposal System for On-Site Construction Wood Waste

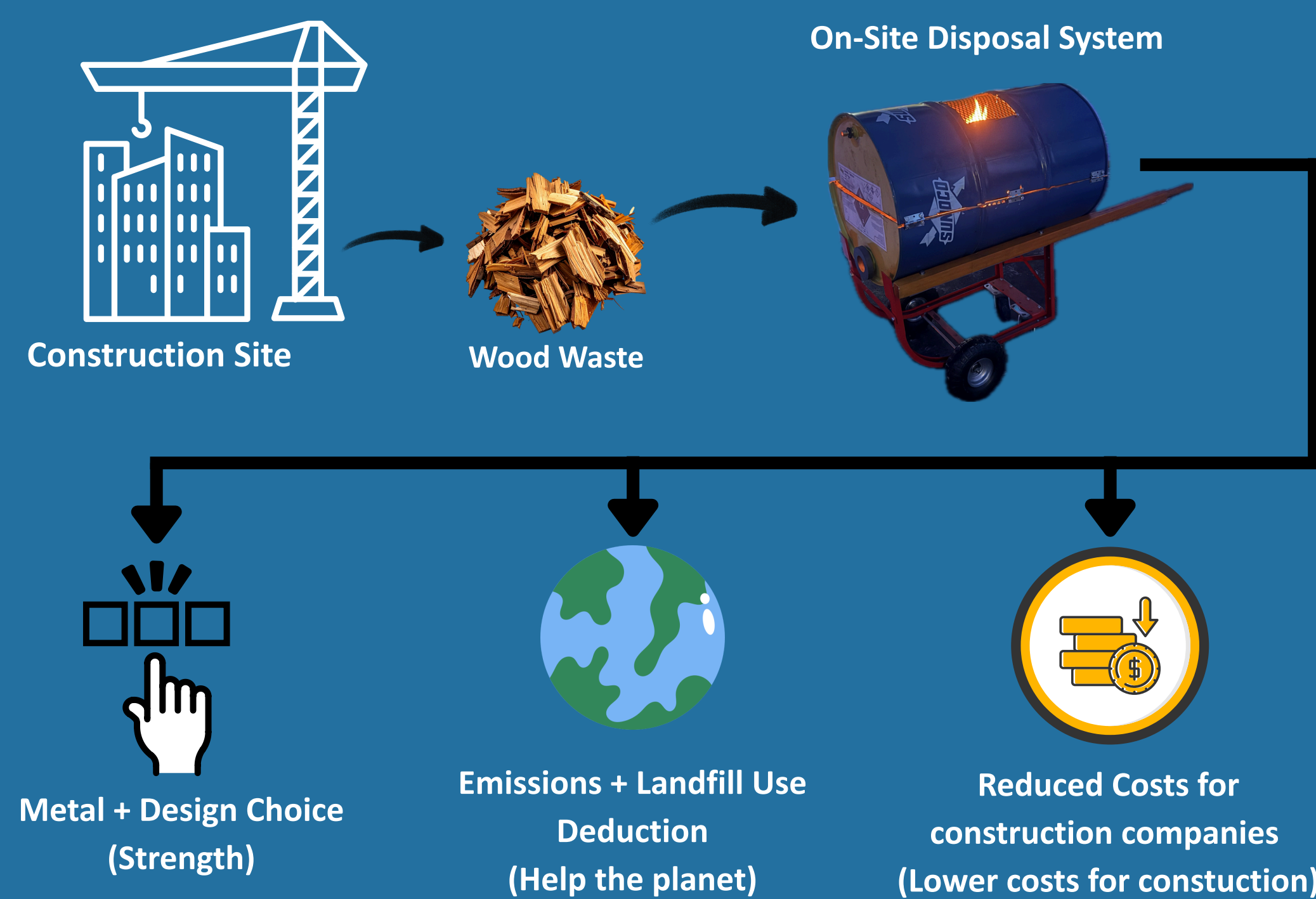
Ryan Prendergast

Advisors: Mr. Chad Bergeron, BSCE. Dr. Kevin Crowthers, PhD.



WPI

Visual Abstract



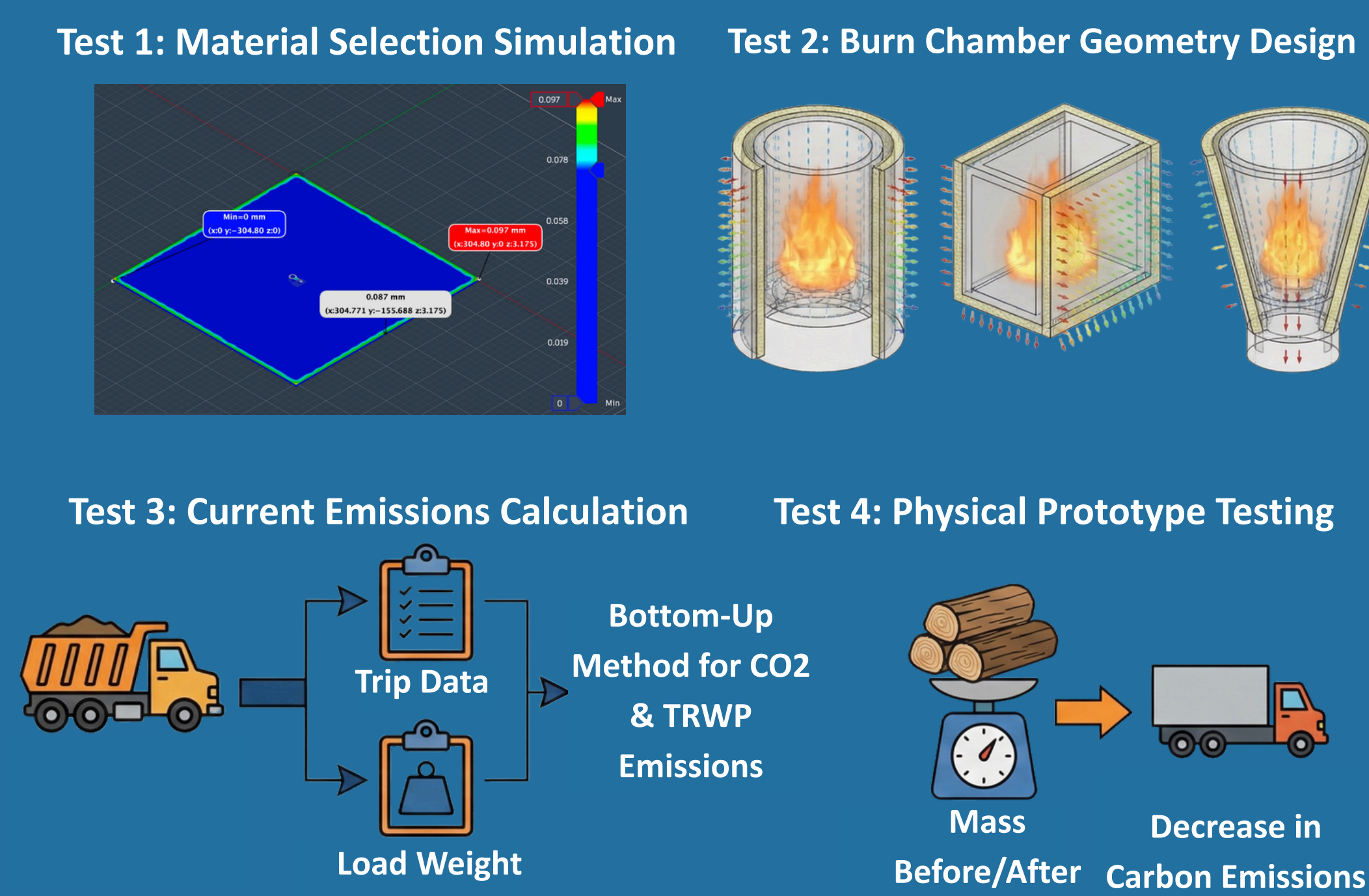
Problem



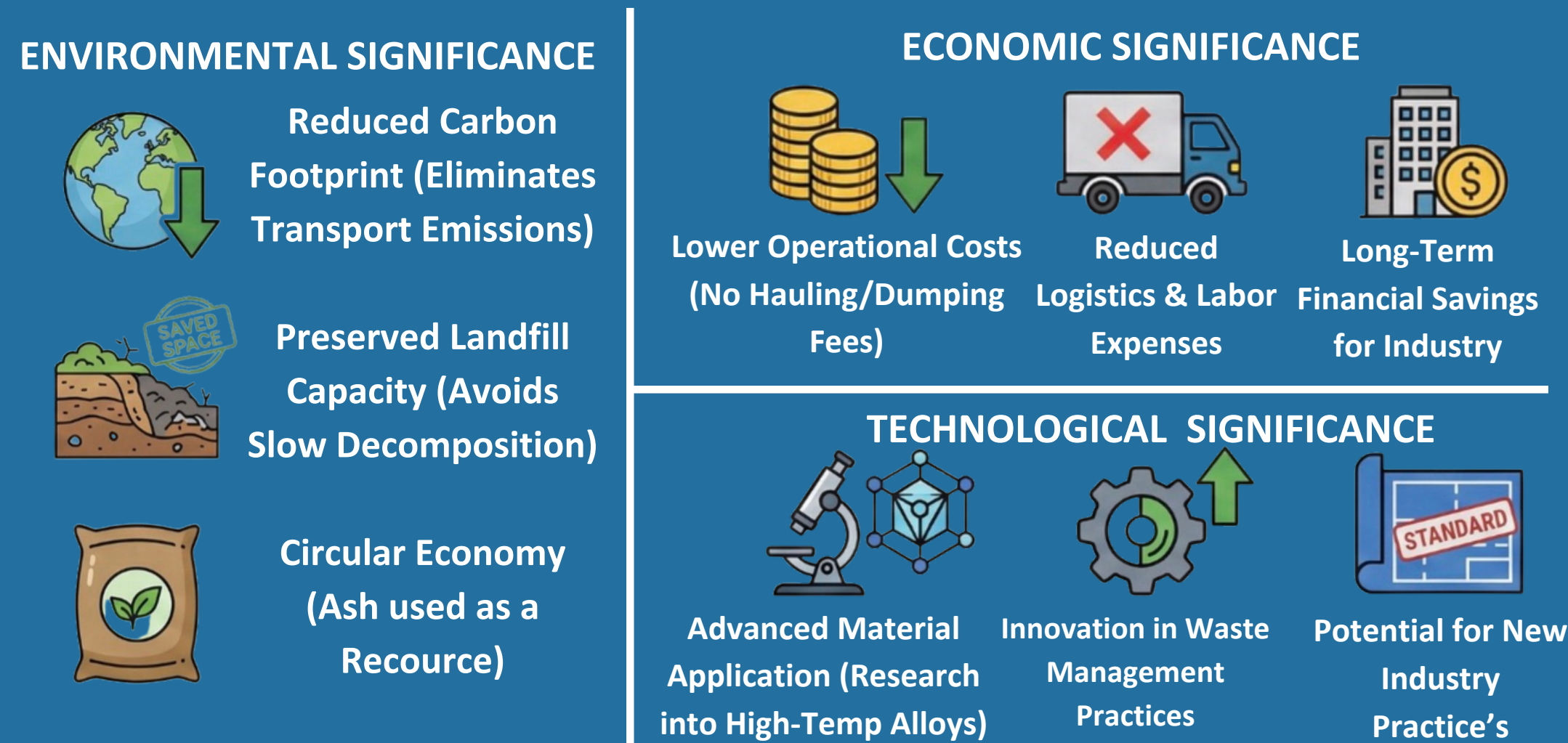
Results

Save 60% of Emissions, 100% of Landfill Space, and 80% of Money by Burning Wood Waste On-Site

Methodology and Tests



Significance & Impact



Overall Goal: A More Sustainable, Efficient, and Cost-Effective Construction Waste Lifecycle

Test 1: 5 Metal Options for Burn Chamber

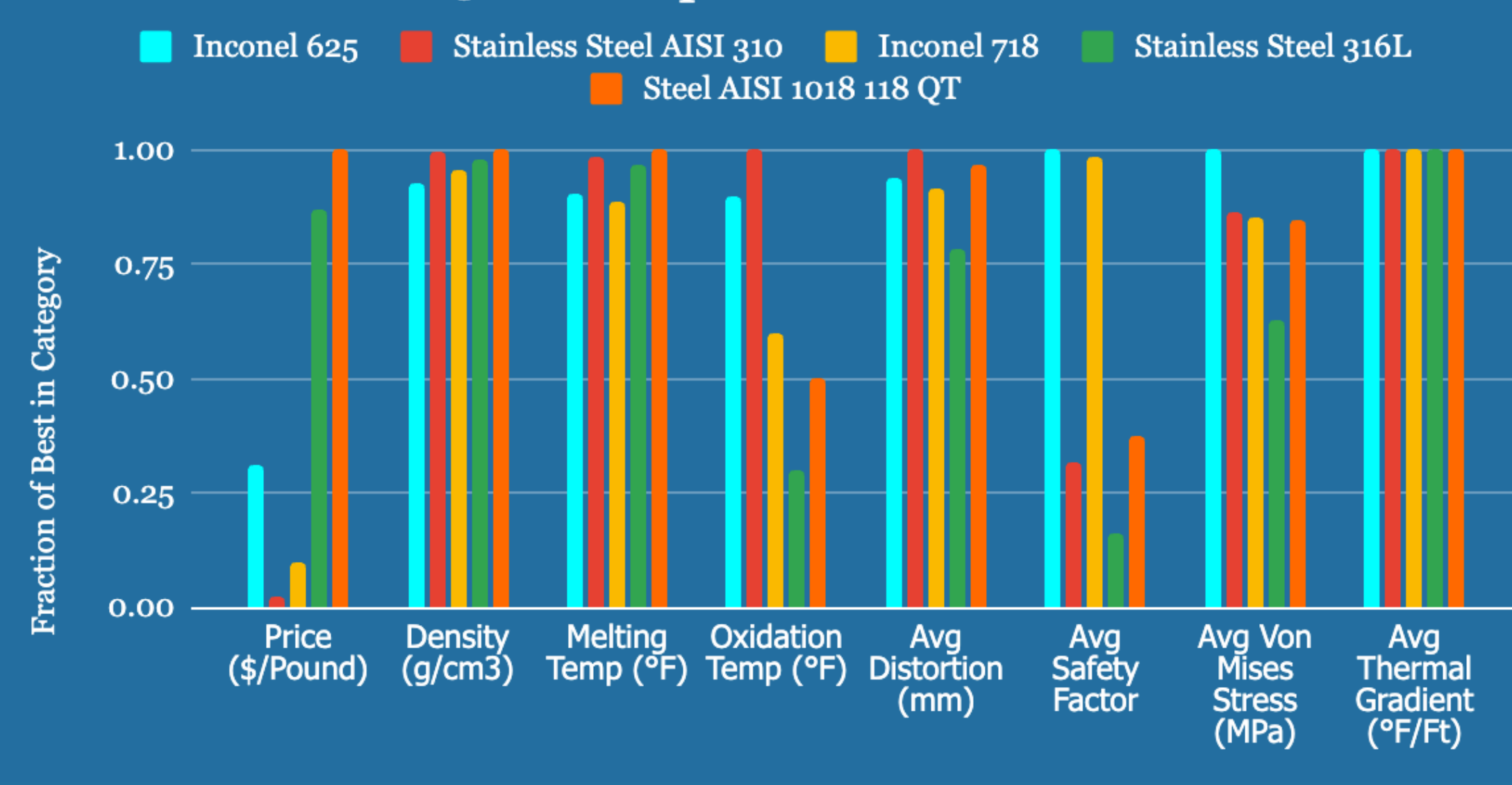


Figure 1: Compares 5 select metals in a multitude of categories to determine which will be most effective to use for the burn chamber. Simulations run with Fusion 360. See Decision Matrix 1 for more details.

Project will be built out of Steel AISI 1018 118 QT

Test 2: Burn Chamber Designs (Total)

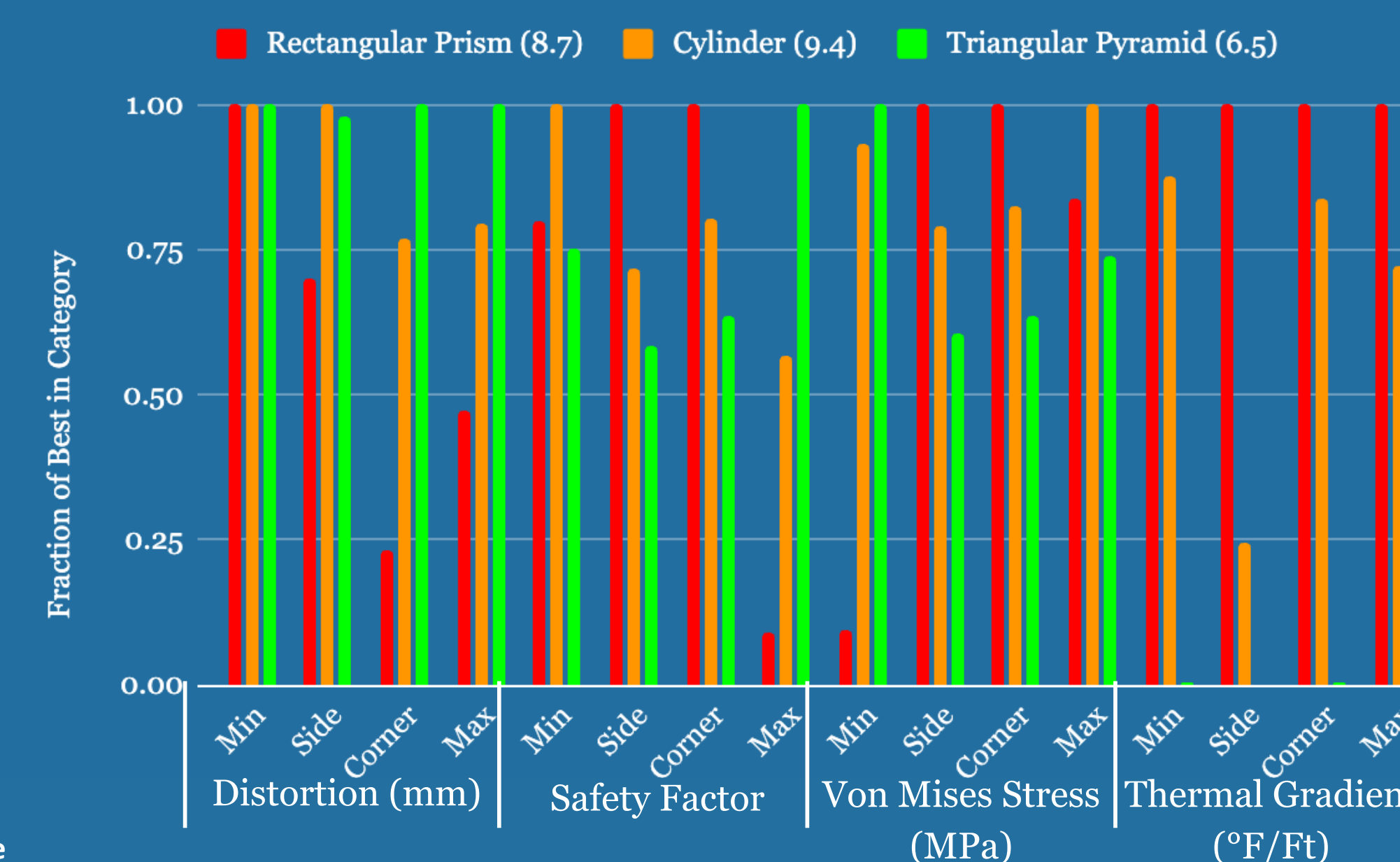
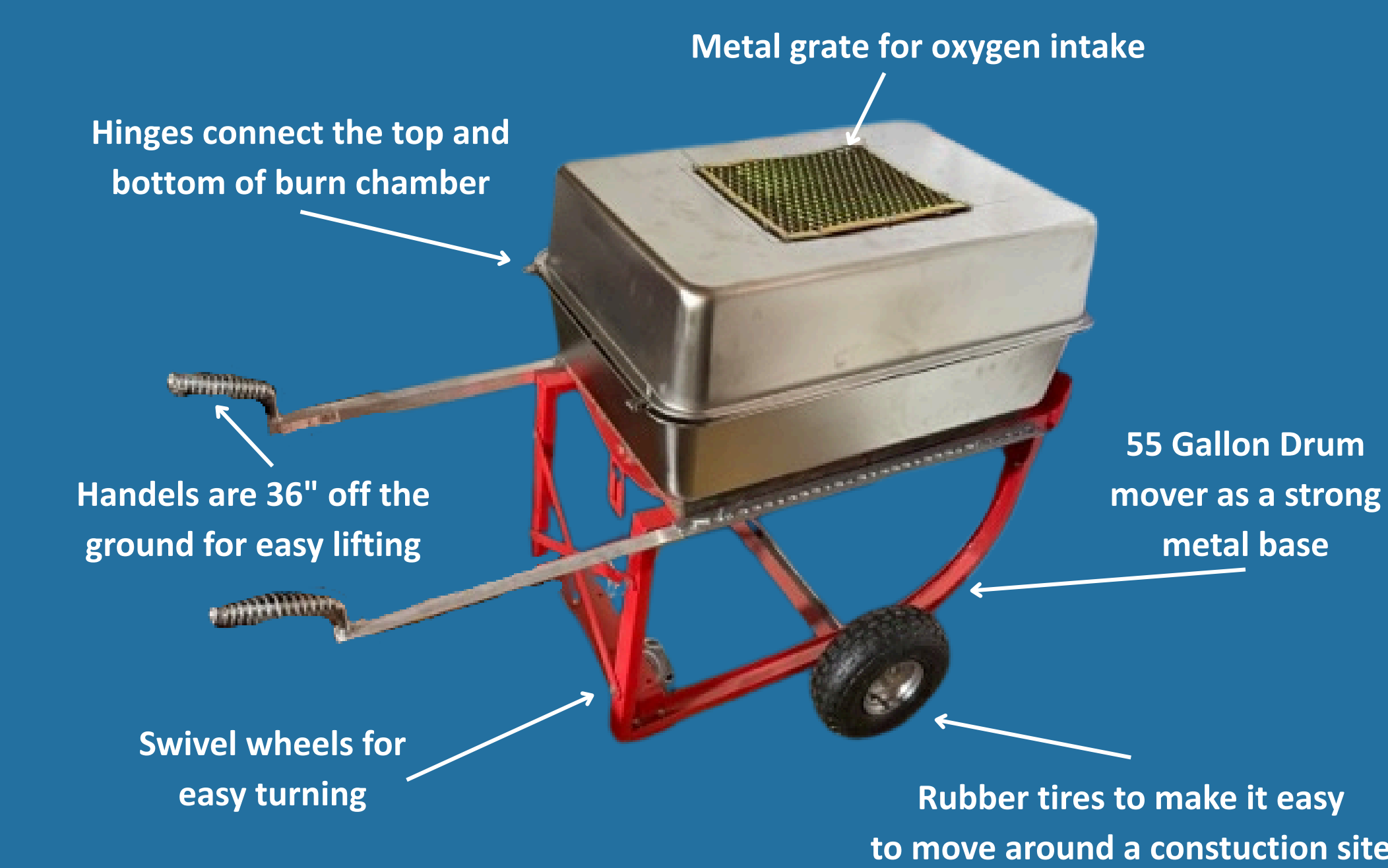


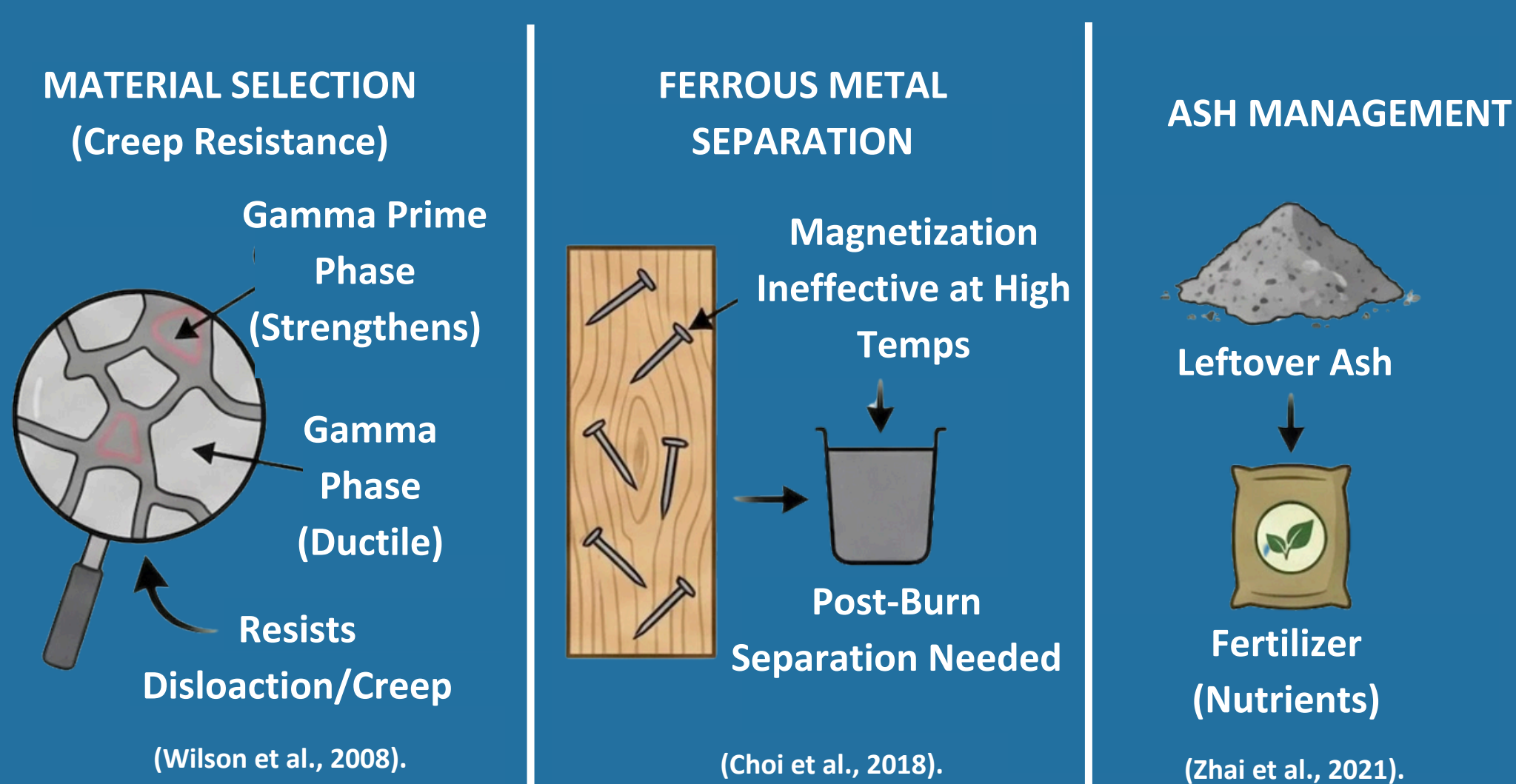
Figure 2: Compares 3 different possible burn chamber shapes to determine which will be most effective to build. Simulations run with Fusion 360. See Decision Matrix 2 for more details.

Burn Chamber will be a Cylindrical Shape

First Prototype



Background



Test 3-4 A: Emissions (Tons) for Each Solution

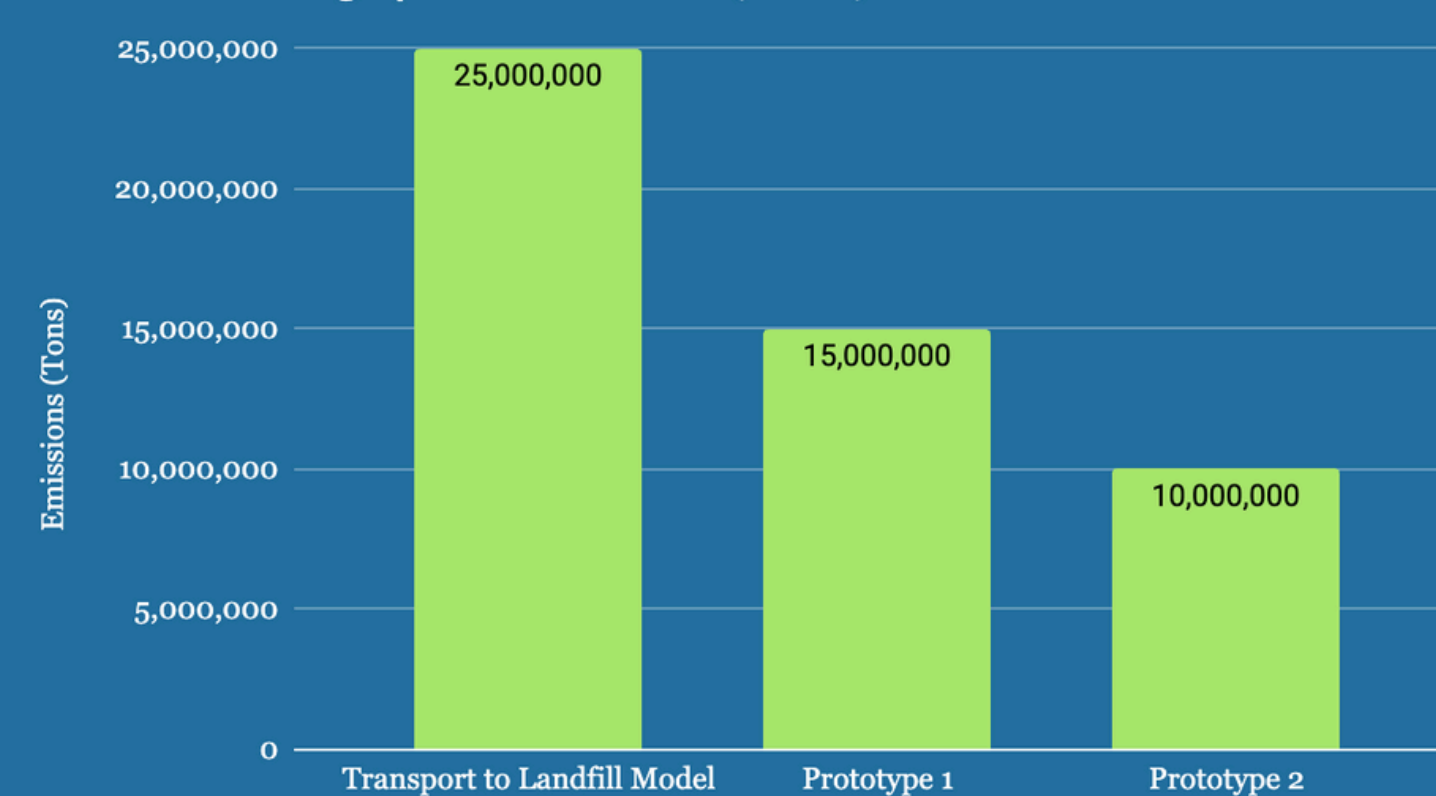


Figure 3: Compares emissions produced by the current industry standard (transport to landfill model), prototype 1, and prototype 2. Emissions for the current model only include emissions produced by trucks and landfills. Prototypes only include emissions produced while functioning. Findings reinforced by Wei et al. (2022).

Test 3-4 B: Total Cost (\$) for Each Solution

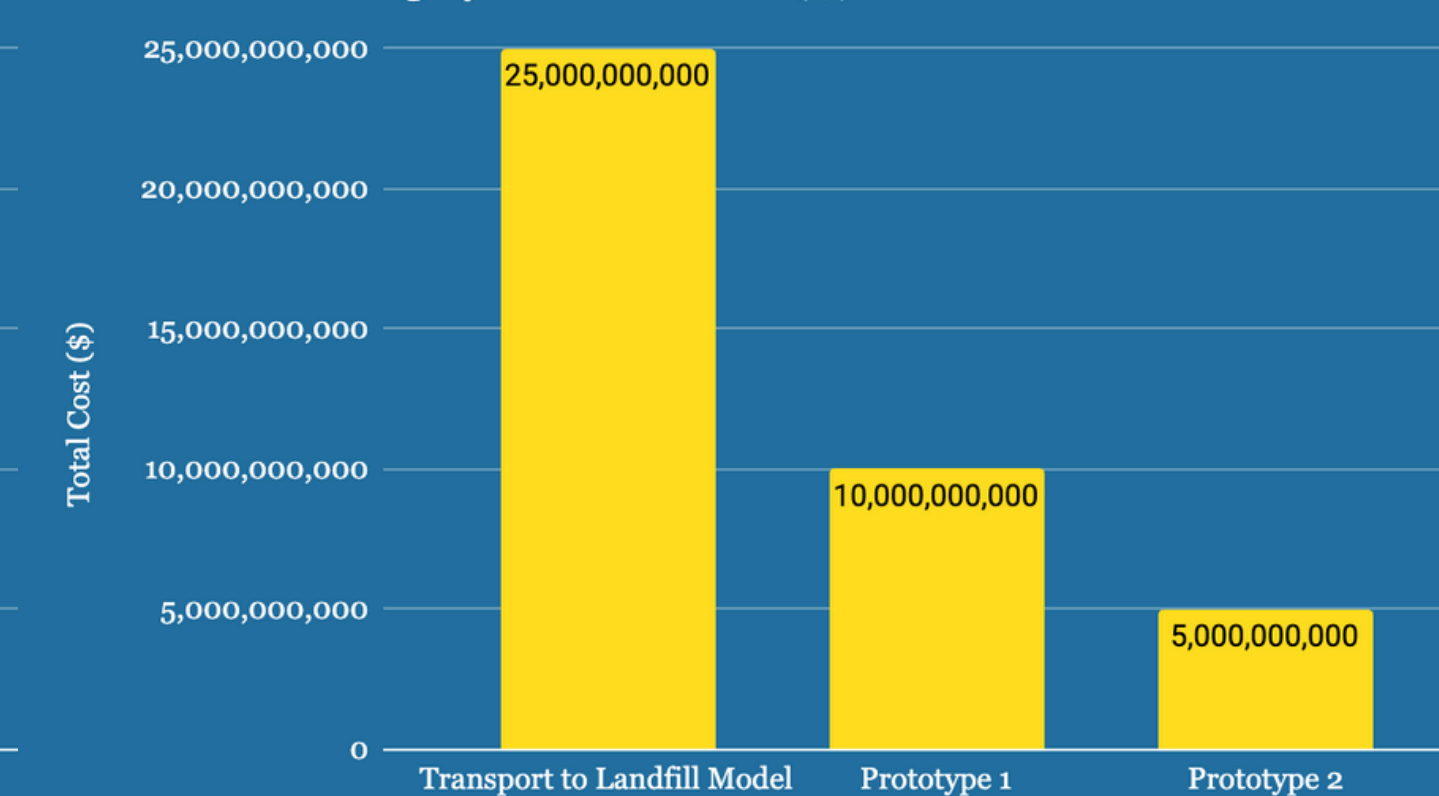


Figure 4: Compares money spent by construction sites for the current industry standard (transport to landfill model), prototype 1, and prototype 2. Money spent for the current model only includes labor, trucking (gas, maintenance), and dump fees. Prototypes only include money spent to purchase product and have someone constantly monitor for 1000 h / year.

Test 3-4 C: Landfill Space Used (Cubic Yards) for Each Solution

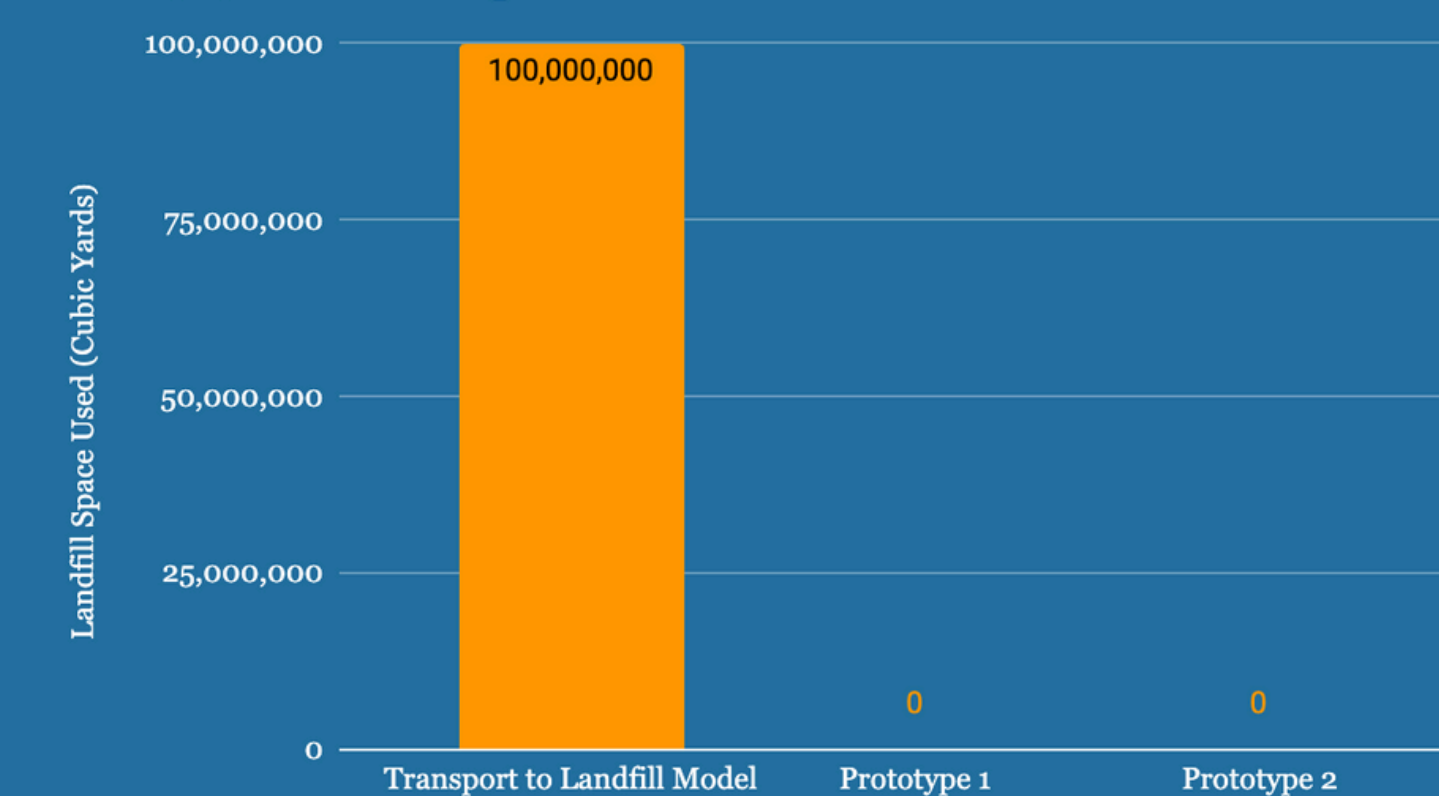
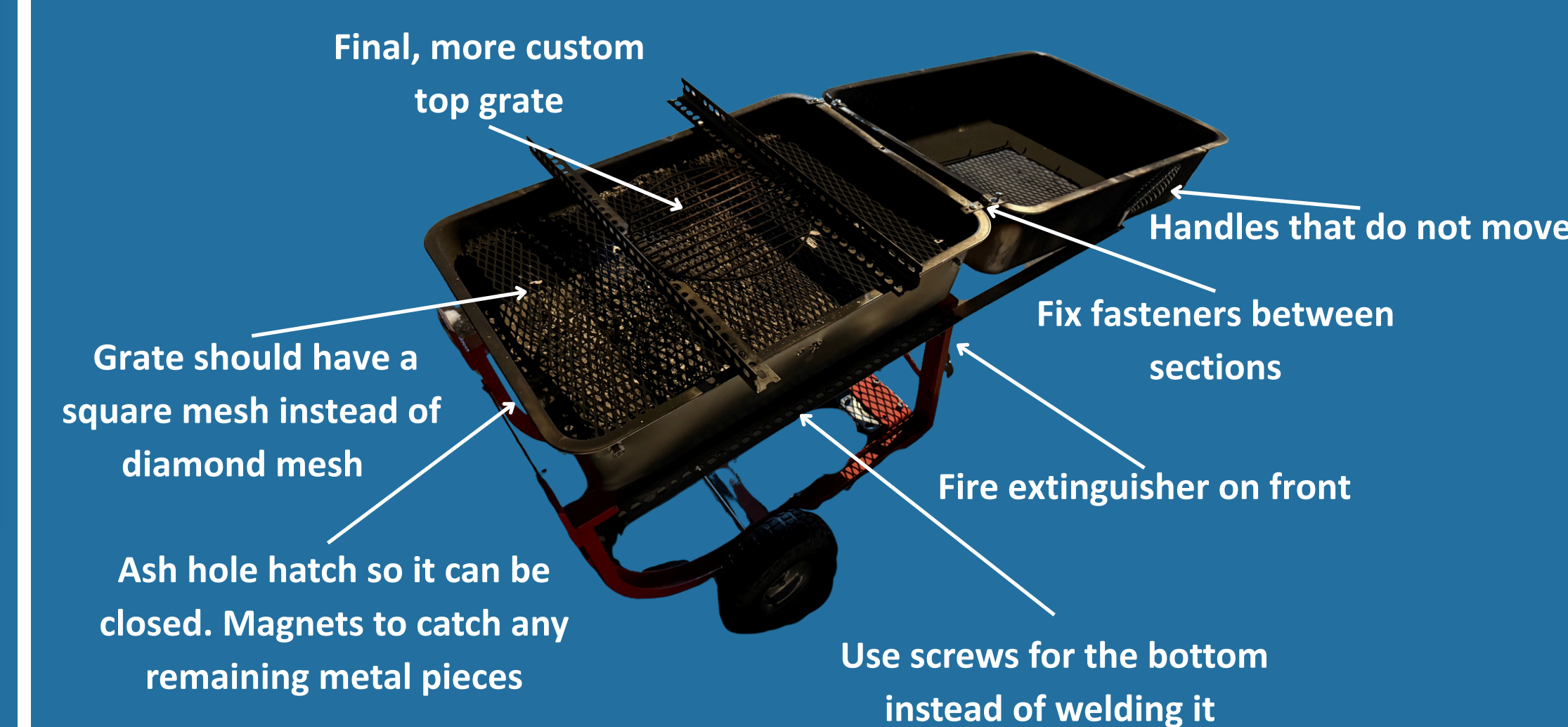


Figure 5: Compares landfill space used for the current industry standard (transport to landfill model), prototype 1, and prototype 2. Landfill space used for the current model only includes wood waste that is dumped. Prototypes do not take up any landfill space as they burn on-site and the ash is used as fertilizer.

Plan for Prototype 2



References



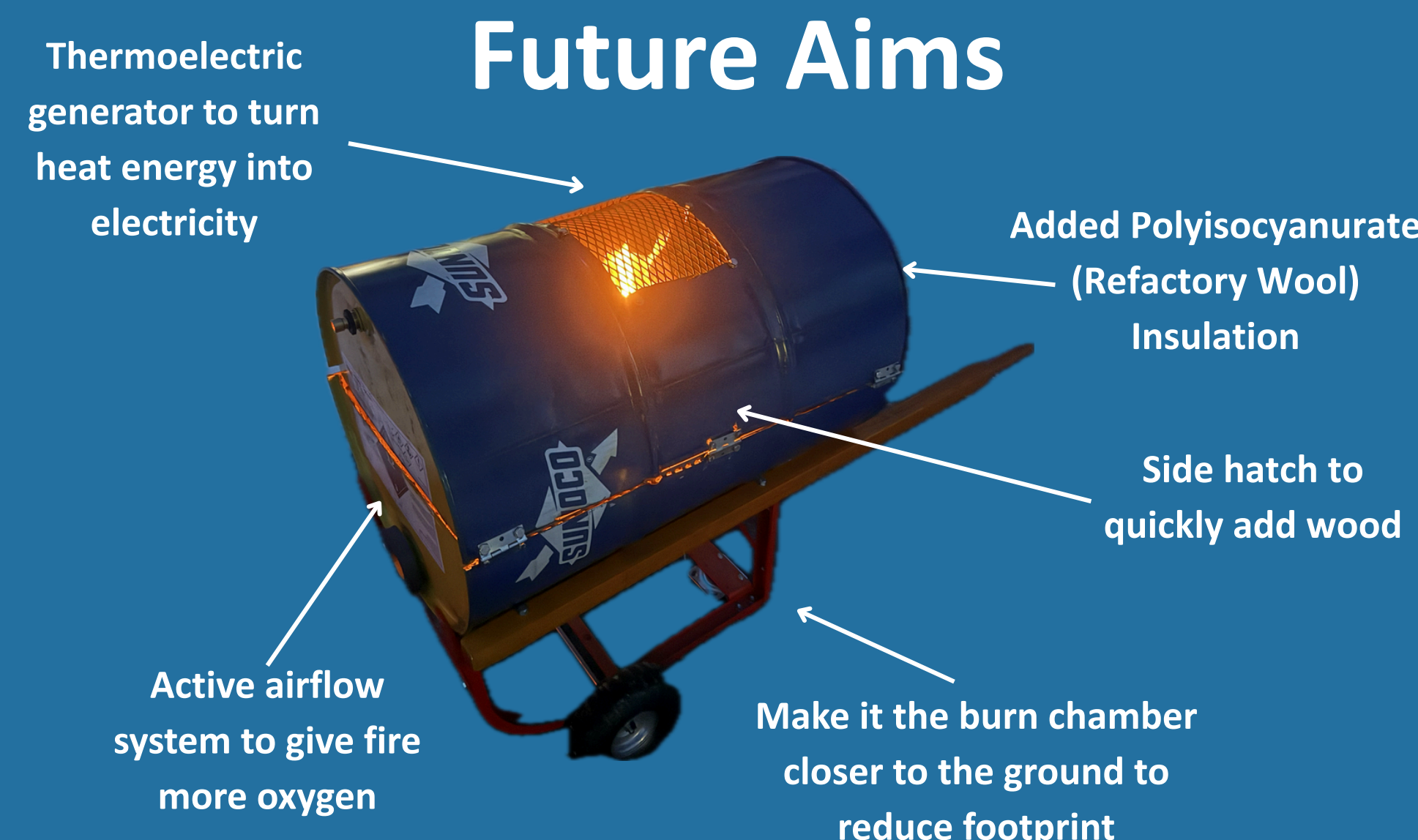
Or visit sources at: <https://shorturl.at/DAsV3>
Icons to make diagrams were provided by Canva
All graphs were created by student
Project not sponsored by Sunoco



Competitor Analysis



Future Aims



Second Prototype

