PROPOSAL FOR THE NASENI COMMERCIALIZATION RESEARCH GRANT ON:

DESIGN AND PRODUCTION OF NEDDI VEHICLE WEDGE

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1. EXECUTIVE SUMMARY

This project seeks NASENI's financial and technical support for the design, fabrication, and commercialization of a locally engineered Vehicle Wedge (Car Wheel Chock) developed by NEDDI. The innovation addresses a critical safety challenge during vehicle maintenance, especially when lifting a car for tyre replacement or suspension repairs.

The NEDDI Vehicle Wedge is designed from mild steel, capable of safely supporting passenger vehicles up to 1660 kg, and preventing unwanted vehicle motion during maintenance. Its design integrates novel structural features for

enhanced strength, safety, and durability, as well as a reflective safety indicator for roadside use.

The project will establish a pilot production line with a total estimated cost of ₦15,600,000, capable of producing 500–1,000 units monthly for the Nigerian automotive service market.

2. PROJECT BACKGROUND AND JUSTIFICATION

Neglecting proper obstruction of vehicle motion during lifting can cause severe accidents. A Vehicle Wedge (or Wheel Chock) provides a simple, mechanical solution that prevents unwanted vehicle movement. Imported wedges are expensive and often not optimized for local conditions.

The NEDDI-developed wedge provides a cost-effective, durable, and safe local **alternative**, using readily available materials and standard fabrication processes.

The justification for this innovation includes:

- **Customer Need:** Enhances safety during maintenance and tyre change operations.
- **Competitive Positioning:** Locally produced at one-third the cost of imported wedges.
- **Product Fit:** Extends NEDDI's range of automotive safety tools.
- **Profitability:** High local demand among vehicle owners, vulcanizers, and fleet operators.
- **Uniqueness:** Strength-improved geometry and reflective warning features.
- **Cost/Benefit:** High safety benefit at low production cost.

3. PROJECT OBJECTIVES

The objectives of this project are to:

1. Produce a low-cost, effective wedge to obstruct vehicle motion during maintenance.
2. Utilize locally sourced materials and Nigerian manufacturing capacity.
3. Compare the production cost with imported alternatives.
4. Determine the load capacity and safety factor of the wedge.
5. Establish an efficient production process and manufacturing line.
6. Identify the vehicle categories the wedge can safely serve.
7. Analyze the forces and buckling loads acting on the wedge to ensure structural integrity.

4. DESIGN ANALYSIS SUMMARY

- Material: Mild Steel
- Slope Angle: 45°
- Plate Thickness (T): 3 mm
- Length of Plate (L): 160 mm
- Modulus of Elasticity (E): 210×10^3 N/mm²
- Applied Load (P): 8.527 kN
- Frictional Force (F_1): 2.62 kN
- Critical Buckling Load (Wcr): 12.873 kN

Since Wcr > P, the design is structurally safe and stable under expected loads. The maximum height (120 mm) was determined from the ground clearance of common passenger cars in Nigeria (Toyota Corolla, Mazda 323, Peugeot 505, BMW 125, and Audi CC).

5. ORIGINALITY AND INNOVATION

6. The originality of the NEDDI Vehicle Wedge lies in its **structural and safety innovations**, including:

1. Profile depression on the slanting face to enhance contact grip and prevent deformation.
2. Triangular reinforcement depression on the vertical plate to improve strength.
3. Reflective safety caution sign for visibility in dark conditions.

These features collectively improve material strength and user safety, differentiating NEDDI's design from imported alternatives.

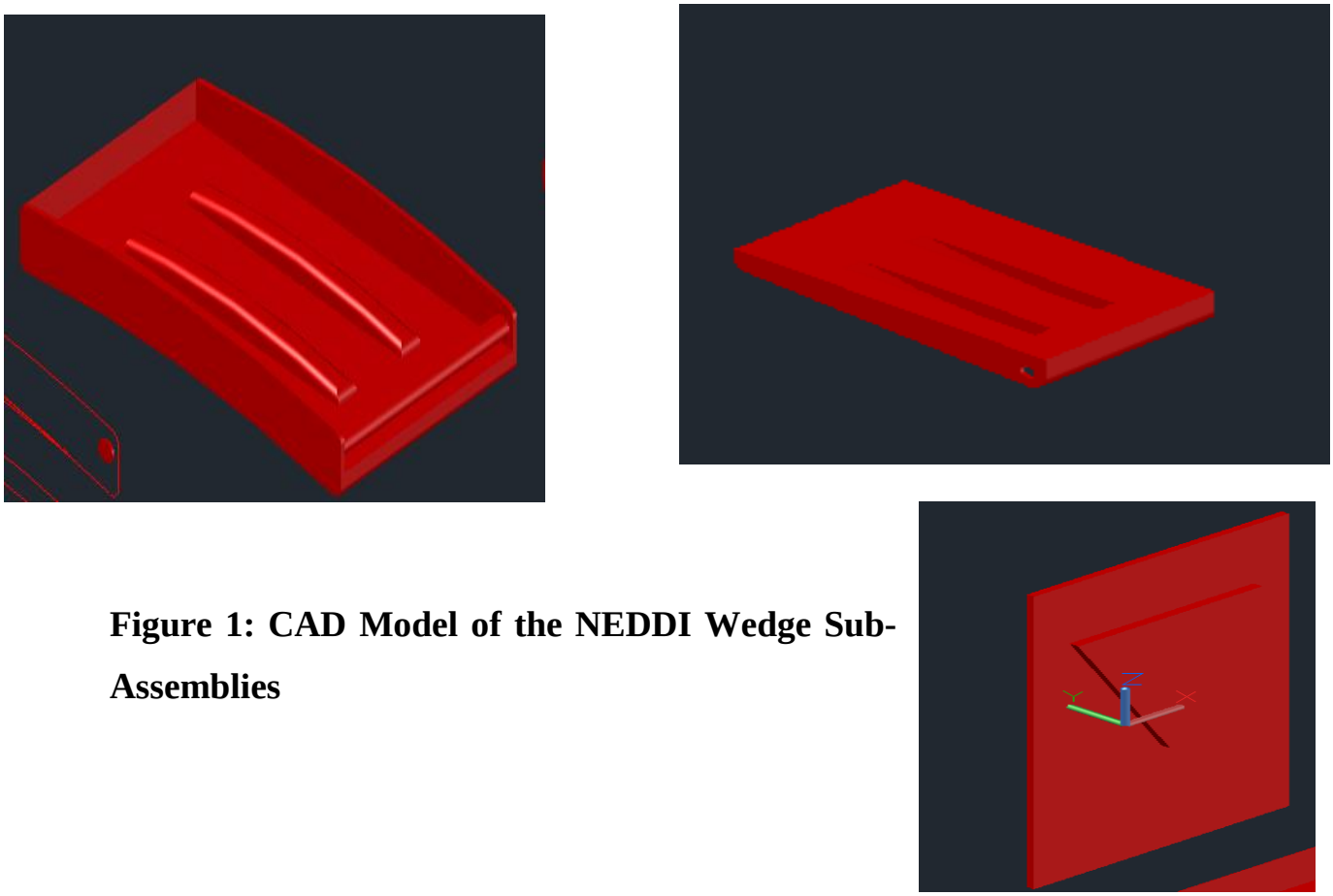
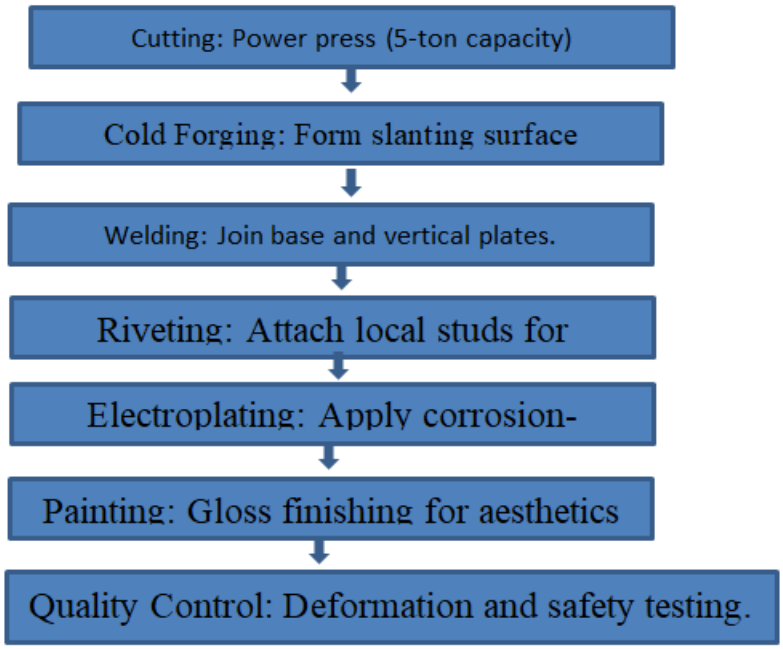


Figure 1: CAD Model of the NEDDI Wedge Sub-Assemblies

6. MANUFACTURING OPERATIONS

6.1 Process Flow



8. Product Specification

S/N	Parameters	Specification
1	Efficiency	85%
2	Net Weight	1 kg
3	Dimensions	160 × 100 × 3 mm
4	Material	Mild Steel
5	Max Vehicle Load	1660 kg
6	Manufacturing Efficiency	85%

Figure 2: The produced Sample of NEDDI Motor Wedge

9. Local Raw Material Content

All materials are 100% locally sourced:

- Mild Steel sheet
- Glossy reflective film
- Fabricated studs and fasteners

10. Expected Outcomes and Impact

- Safety Improvement: Reduces risk of vehicle roll movement during maintenance.
- Economic Impact: Encourages local manufacturing and job creation.
- Commercialization: Marketable to auto workshops, roadside mechanics, and fleet companies.
- Import Substitution: Replaces costly imported wheel chocks.
- Scalability: Production capacity scalable for national distribution.

11. Financial Requirement

A. Production Line machine cost:

S/N	NAME	DESCRIPTION	QUANTITY	UNIT PRICE(#)	AMOUNT
1	Gilleting/ Cutting Operation	A power press Gilleting Machine	1	10,000,000	10,000,000
2	Blanking Operation	A Hydraulic press of 10 Hp capacity	1	6,400,000	6,400,000
3	Stamping Operation	A Hydraulic press of 10 Hp capacity	1	6,400,000	6,400,000
4	Punching / Reveting Operation	A Hydraulic Press of 5 Hp capacity	1	6,400,000	6,400,000
5	Electroplating	A set of electroplating set up of 5 tons capacity (2 x 4 x 3) ft	1	2,500,000	2,500,000
6	Moulds	Pattern moulds for the wedge components	3	1000,000	3,000,000
				Sub-Total	#34,700,000

B. Cost of Tools and Instruments

These will include cost of workshop hand tools and connecting cables to energy source in lump sum
= #5,500,000

B. Cost of materials for production of 500 units of medium type.

This cost is at #15,000 per unit
= #7,500,000

D. Cost of materials for production of 500 units of small type.

This cost is at #10,000 per unit

= #5,000,000
Total = #34,700,000 + #5,500,000 + #7,500,000 + #5,000,000
= #52,700,000
Contingencies @ 10% of total cost = #5,270,000

Grand Total = #57,970,000
(Fifty Seven Million Nine Hundred and Seventy Thousand Naira Only)

12. Conclusion

The NEDDI Vehicle Wedge Project demonstrates the capability of indigenous engineering design and fabrication to meet Nigeria's automotive safety needs using local materials, manpower, and technology.

Funding support from NASENI will enable the establishment of a pilot production line, promote commercialization, and expand local content manufacturing in line with Nigeria's industrialization agenda.