CHAPTER 2

AIM AND METHODOLOGY

2.1 SCOPE OF THE PRESENT WORK

Differently abled Persons are one who has either legs or hands. It is duty of every individual to safeguard them. Government is helping through lot of schemes by supplying wheel chair etc. There is need for sophisticated vehicle for them to travel in roads and work in the factory premises. The primary objective of this project is to develop a vehicle for differently abled people especially for people without legs. Hence extensive research was carried out to come out with this idea and its methodology. Since this is a vehicle primarily designed for differently abled (without legs), the vehicle is designed considering their disability in mind and much importance is given regarding the safety of the passenger. Hence driver ergonomics plays a key role in the designing of this vehicle.

2.2 METHODOLOGY

Basic parameters of the vehicle were arrived based on output of QFD. The required power is arrived based on payload and maximum operating speed. Since it is a electric equipment, the voltage and amperage of the system are fixed and suppliers is identified for battery and Hub motor for manufacturing of the vehicle. Start up and acceleration are by electrical controllers such as on/off switch, horn, throttle and indicator switch are provided on the handle bar of the vehicle.

Based on the voice of the customer the QFD diagram is generated and shown in figure 3.1.

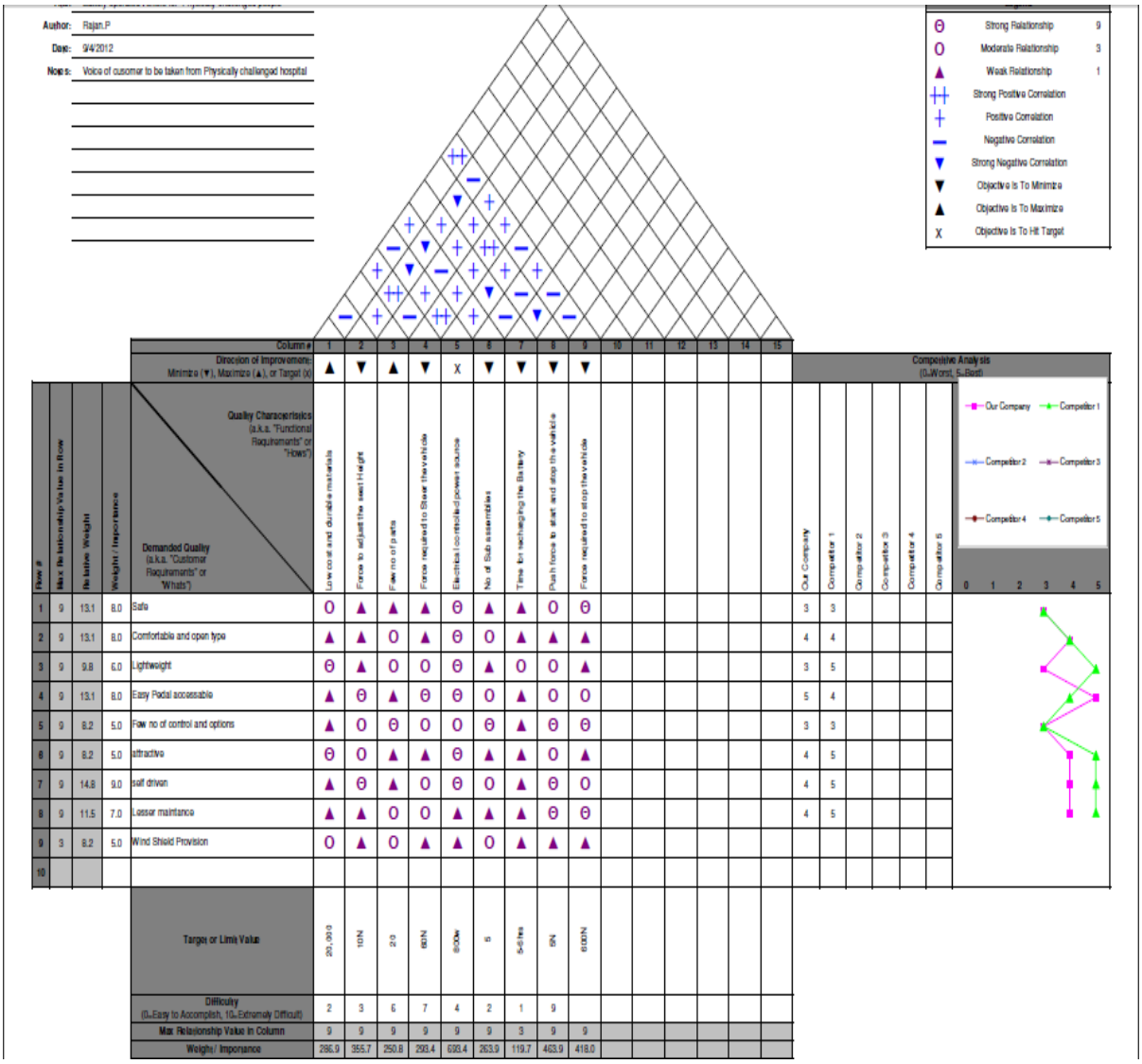
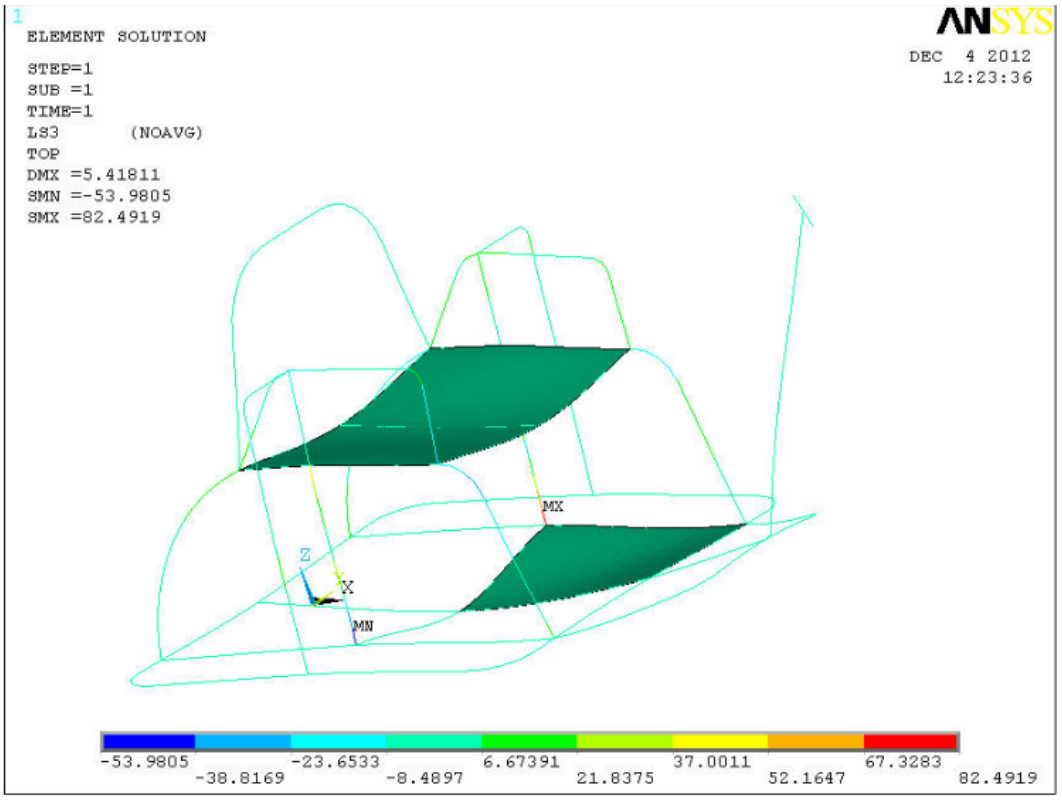


Figure 3.1 - QFD Analysis

Bending Stress –Y Direction



From the above analysis , the displacement for given cross section for steel 4130 is low as compared to aluminium 6061, Since the stress for the given force is 101 N/mm^2 is less than 435 N/mm^2(Yield stress) .This shows design in safe .

The Steel 4130 is chosen for easy availability, serviceability and meeting the functional characteristics.

Based on the design calculation, the Front view of the vehicle developed is given in figure 4.3

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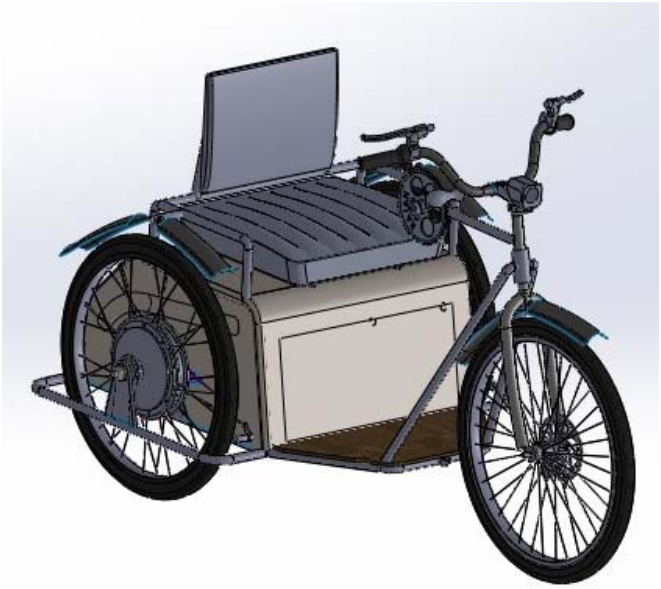


Figure 4.3: Front View of the Vehicle

Based on the design calculation, the Back view of the vehicle developed is given in figure 4.4

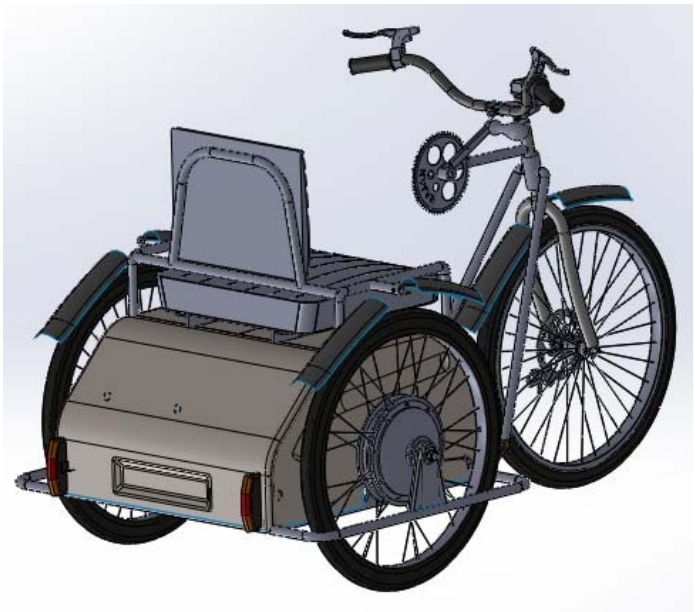


Figure 4.4: Back View of the Vehicle

5.2 COMPONENTS FABRICATED

5.2.1 Fabrication of frame

- AISI Steel 4130 steel pipes are cut to the required sizes using hand cutting tool.
- Grinding operation is performed on the ends of each pipe.
- The fabrication of the chassis is completed as per structural drawing of chassis
- Wheel track and wheel base are maintained for the three planes by providing temporary base plates with marking and additional clamps used to maintain the alignment.

Specifications:

Material: AISI Steel 4130

Yield strength: 435 Mpa Ultimate strength:670 Mpa

Density: 7.85 g/cc Total weight of the frame:13 kg

Figure 5.1: Fabrication of Chassis

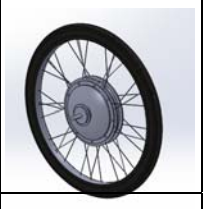
5.2.5 Fabrication of rear guard:

Rear guard out of M.S sheet is folded to required dimension .Socket hole is provided to hold the battery charger input socket and mounting holes are provided to mount the tail light and rear guard to the chassis.

Figure 5.6: Fabrication of rear Guard

5.3 BILL OF MATERIALS

Table 5.2 Bill of Materials

Sl. No	Description	Dimensions	Material	Wt. Kg	Qty	Total weight	Pictures
1	PMDC Motor with wheel	250W,12V, Max15 Amp,230rpm	STD	8	1	8	
2	Rear wheel ,LHS	24 inch wheel ,with drum brake	STD	1.5	1	1.5	
3	Front wheel	24 inch wheel	STD	1	1	1	

6.3. CONTROLLER SYSTEM

Controller system consists of controller which is designed for the Power-250W, which controls the speed of the vehicle (20Km/Hr max) by accelerator and provide electrical braking of Hub motor wheel (LHS Wheel) .

Figure 6.2: Controller system

6.4. FRONT HANDLE BAR ASSEMBLY

Handle bar assembly consist of common rear brake lever for both LHS &RHS wheel, Horn, Front wheel brake lever , Head light with battery charging level indication and hand cranking mechanism.

Figure 6.3: Front Handle Bar Assembly

6.5. CHASSIS AND WHEEL ASSEMBLY

Chassis and wheel assembly consist of main chassis frame and three wheels are assembled to the main chassis. The front fork along with front wheel is assembled to the main chassis. The rear wheels both LHS and RHS wheels are assembled using fasteners.

Figure 6.4: Chassis and wheel Assembly

Figure 6.5: Assembly of the Vehicle

Table 7.1: Test Run of Vehicle

SI.NO	Maximum speed ,Km/Hr	Average Speed , Km/Hr
Manual Mode		
Conventional Tricycle	10	6-7
Battery operated Vehicle	8	5-6
Battery Mode		
Battery operated Vehicle	20	12-15

Figure 7.1: Test Run of Vehicle

7.2. TESTING OF 36V BLDC HUB MOTOR

Hub Motor under various load condition is tested and for 250W power requirement we get efficiency of 75%, we get maximum efficiency for current rating 6-10 Amps .A standard dynamometer device is used to test the hub motor under various loading conditions.

CHAPTER 8

CONCLUSION

Design and fabrication of a Battery Vehicle for Differently abled Persons was taken-up for the benefit of persons with legless. First a concept drawing was evolved, based on that customer survey carried out to know about prior art and preferences. Customer feedback is considered as input for QFD, the output of QFD converted to specification and concept drawing is updated/modified. Design calculations were done for functional aspect of product like payload, operating speed and size. Discussions are being made with potential industrialist to commercially exploit this design and modifications were made suiting his requirements. Suppliers for main components like battery, hub motors and controllers were identified and procured. BOM is made and listed as above.

Raw materials like steel tubes and plates are given for fabrication as per the drawing. Individual subassemblies were made and collected for the final assembly. Initial test drives were made and reading were recorded for analysis . Therefore finals vehicle performance efficiency as above matches with battery operated vehicle. Sun orthothics and prosthectics centre as reconfirmed interest to utilise the design for commercial manufacturing.