International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 05 | May-2018 www.irjet.net p-ISSN: 2395-0072

SEMI AUTOMATED ADAPTABLE RAMP FOR DIFFERENTLY ABLED TO ENTRAIN AND DETRAIN

Akhil P Santhosh[1], Anpn Zachariah Joys[2], Dinu V James[3], Jishnu v [4]

[1,2,3,4] *Bachelor of Engineering, Department of Mechanical Engineering, Saintgits College of Engineering*

Abstract - *The scenes of struggles put by the handicapped to entrain and detrain the "Differently abled compartment" in Indian trains are very hard. The "same level" concept to bring platform and train floor in the same level is still in vein. Reports regarding the accidents happening in the mentioned area are shocking. The project put forward a well-developed mechanism , which consists of a slant sheet of aluminum which provide an easy track for the wheel chair for its trouble free movement . Properties of various materials are studied and aluminum is taken for sheet because of its strength, coefficient of friction and machinability property. Actuation is done with Arduino. The operation of the system made easy by automation. The height of the system is automatically adjusted through the rack and pinion mechanism. The slant angle is 15 degrees with the human ergonomics and comfort. Structural analysis of aluminum sheet, tangential force of rack and pinion is done along with this profile.*

Key Words: **Adaptable ramp, Differently abled people, Rack and pinion mechanism, Semi automated, etc.**

1. INTRODUCTION

Necessity of the project was defined after a survey done at various railway stations across Kerala. The maximum and minimum range of platform to train floor height was obtained as 40cms and 65cms respectively .But in a wider observation this figure changes and in some stations in Andhra Pradesh, the platform and railway tracks are at same level. This will be very difficult for a differently abled person to entrain and detrain. The project provide an adaptable ramp for easy movement of wheelchairs into the train. Adaptable means that the system itself can adjust to any platform to train floor height within the designed operating range. Structural analysis of ramp material is done initially. Deformation under the load is studied. Two sheets of aluminum are held together and moves with respect to each other as per the requirement. This is made possible by the rack and pinion mechanism .Rack and pinion movement is made automated and thereby operation is made very simple.

2 LITERATURE REVIEW

"DESIGN AND FABRICATION OF RAMP ATTACHMENT FOR WHEEL CHAIR" BY ARISH IBRAHIM, refers that wheel chairs are widely used because of its availability and economic factors even if it faces the limitation of accessing curbs and stairs. Some of the advanced electronic wheelchairs having the climbing feature but those wheelchairs are not affordable to common people and not suitable for daily usage in rough terrains. This paper proposing a ramp attachment design that makes the normal wheelchair to climb the curbs on the streets and accessing the buildings without ramp facility. The design concept doesn't make any modifications in the basic design of wheelchair as it involves just an attachment of ramp and sliding mechanism. The proposed design can also applicable to shopping carts or any other people transferring devices for meeting the specific needs.

3. METHODOLOGY

The system consists of three plates. Two plates are kept stationary. Third plate moves over a rack and pinion mechanism. First two plates are fixed at an angle of 15 degrees based on the human ergonomics and comfort. Third plate adjust the height required without any change in the angle. The pinion is attached to power window motor. Rotation of power window motor is calculated by a microcontroller with platform-train floor height as its input. This height is a constant for a platform and it varies for different platforms and stations. When the height is given at the keypad provided, the controller calculates the time for which the motor rotates so that the required height is obtained. As the motor rotates the rack undergoes linear movement. When the required is achieved , locking of system is done manually.

There is an alteration in mechanism is enabled with this system under any case of failure or in emergency. This system comes into act, it is hydraulic jack mechanism. With a hydraulic jack with a 5 tonnes capacity. Instead of linear motion of plate here the lift of plate is done.

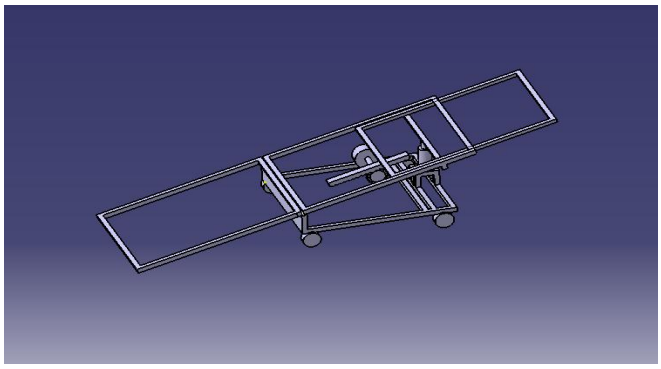
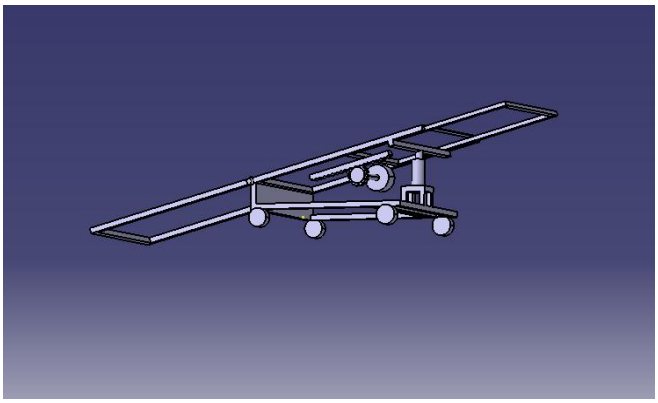


Fig 1



3.1 DESIGN OF RAMP

3.1.1 DESIGN CALCULATIONS

Weight of the body to be pushed (W) = 1000N (wheel chair +passenger)

Angle of inclination of ramp with horizontal($\boldsymbol{\theta}$) = 15 degrees

Component of weight acting parallel to the inclined surface = W*sin($\boldsymbol{\theta}$)

= 1000* sin (15) = 258.819 N

This force must be applied parallel to inclined plate to push the wheelchair.

(Assuming frictional force to be negligible)

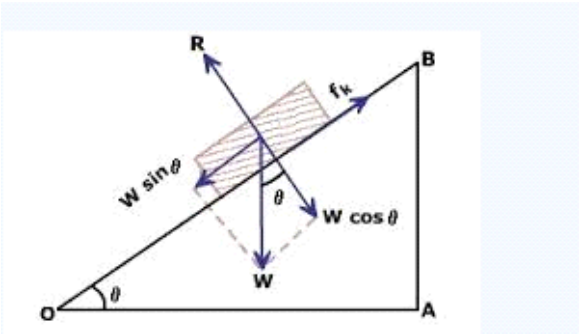
3.1.2 SELECTION OF MATERIAL

Material for frame: GI +MS PIPE (1 inch)

Material for ramp: ALUMINIUM SHEET

Criteria for selection:

- Ability to provide required strength.
- Light weight.
- Low cost.



3.2 Design of Frame

According to survey, it is clear that the height of platform to train floor at various stations is having large variations. The height is different even in the platforms of the same railway station. The value is mainly varies between 45 to 75 cms. We designed our ramp to use at any height in between 41 to 60cms.

The angle between plate and horizontal is fixed as 15 degrees considering the human ergonomics and comfort. The max height that is to be achieved is 60cms

3.2.1 Length of Ramp

Total length of plate must be greater than 231.821cms.The extension plate should be less than main plate, so that it can be easily placed inside the main plate. The flap can be approximately same length as that of main plate, so that flap can be folded and placed over the main plate

We designed;

Main plate = 86 cms

Extension plate = 65 cms

Flap plate =82 cms

Total length= Main Plate + Extension Plate + Flap Plate

= 86+65+82 = 233 cms.

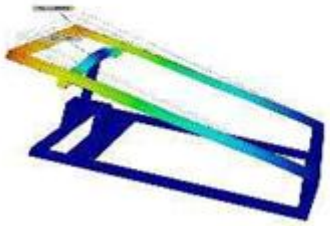
3.2.2 Width of Ramp

Standard train door width = 67.5cms

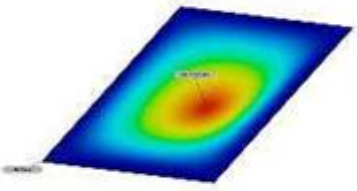
Width of the extension plate = 63cms

4. STRUCTURAL ANALYSIS

4.1 Displacement Total (Frame)



4.2 Displacement Total (Plate)



5. CONCLUSION

Designing, analysis and simulation of the project was done based on the data collected by survey. Survey clearly validates the necessity of the project. Design was made so simple such that fabrication becomes more simple. Analysis ensures the safety of the structure and simulation reduces the cost of testing. Though this seems like a simple project, this idea is sharpened from more complex design, even planned to build system within train. Due to some issues regarding the permission from Indian railways that was drop .finally the current idea was developed and the railway officials appreciated the effort and concept. From initial stage onwards the ultimate objective was to develop a simple mechanism and which can be easily adaptable to Indian railway stations.

ACKNOWLEDGEMENT

First and foremost, we thankfully acknowledge our Principal Dr. M D MATHEW for giving us an opportunity to present this project. The constant encouragement and timely support rendered by our Head of the Department,

Dr. JACOB T VARGHESE is deeply remembered. We express our heartfelt gratitude to our project guide, Er. ARUN K VARGHESE, Assistant Professor, Department of Mechanical Engineering, for his valuable guidance, constant support and encouragement during the course of the project and in the preparation of the report. We have greatly benefited from his experience and knowledge. The help extended by all other staff members of the department are remembered with gratitude. We also remember all the encouragement and support received from our friends and well-wishers.

Above all, we would like to express our profound gratitude to God Almighty for His immense blessings showered upon us for the successful completion of this project.

REFERENCES

[1] Ibrahim, Arish, "Design and Fabrication of Ramp Attachment for Wheel Chair", Journal, Vol.7, No.7, pp.46-48

[2] Storr, Tim et al., "Design Features of Portable Wheelchair Ramps and their Implications for Curb and Vehicle Access",Vol.41, No.3B, pp.443 - 452

BIOGRAPHIES

Akhil P Santhosh
Student, Department of Mechanical Engineering,
Saintgits College of Engineering

Anpn Zachariah Joys
Student, Department of Mechanical Engineering
Saintgits College of Engineering

Dinu V James
Student, Department of Mechanical Engineering
Saintgits College of Engineering

Jishnu V
Student, Department of Mechanical Engineering
Saintgits College of Engineering