

CHAPTER – 1

Introduction

1.1 The wheelchair is one of the most commonly used assistive devices for enhancing personal mobility, which is a precondition for enjoying human rights and living in dignity. Wheelchairs assist disabled people to become productive members of their communities. About 10% of the global population, i.e. about 650 million people, have disabilities. Studies indicate that, of these, some 10% require a wheelchair. In 2003, it was estimated that 20 million of those requiring a wheelchair for mobility did not have one. There are indications that only a minority of those in need of wheelchairs has access to them, and of these very few have access to an appropriate wheelchair.

A lot of difficulties and hassles involved with the mobility of the physically challenged people in the society. It has been observed that physically disabled people are basically using some assistive devices like, crutches, artificial limbs or legs etc. and manual wheel chairs or three-wheelers for their day-to-day movements. But, these wheel chairs or three-wheelers are crude or of inefficient in design; not very much suitable for outdoor use or common terrain in the country like Bangladesh. Undoubtedly these manual wheel chairs or the three-wheelers are the blessings for crippled people but in the question of humanity, it is just “to add insult to injury”. Because, commonly found manual wheel chair or three-wheeler has a basic problem that the occupant must use physical force to turn the wheels. This action is physically stressful, can result in muscle and joint pain and degradation, torn rotor cuffs, repetitive stress injury, and carpal tunnel syndrome; which causes secondary injury or further disability.

Again, Use of conventional energy sources and rapid development of the present world have some bad impacts on the surroundings and environment, like depleting limited energy resource, damage of ecosystem, environment pollution, global warming and so on. As a result, Designing for Environment is the crying need of the time and it is very much necessary to develop environment friendly equipment or transport for better living, for better world. The incredible capacity to adapt to difficult circumstances has led to wonderful inventions, particular beneficial

to individuals with mobility problems. Mobility scooters have changed the way in which people in wheelchairs are able to maneuver. The powered scooters of today offer several advantages that were previously unheard of in the mobility world. However, the power scooters also have limitations that a person may not even think to consider.

Today, more than half a century later, electric wheelchairs have widened its role in helping the disabled. Besides helping the permanently disabled to move around independently, it is also used during the physical therapy of injured people who could not walk temporarily. An advantage of electric wheelchairs is that it can be recycled as long as the motors are well maintained. Many do purchase used electric powered wheelchairs as they are cheaper and still have a lifespan of at least 5 years.

Considering the overall prevailing situation, development of a solar three-wheeler for disabled people is a vital effort where solar energy and its advantages are taken into account. A solar three-wheeler could be a stand-alone system; it will be self-operated and independent in nature, using unending solar energy from the sun. It is powered by solar energy from attached solar panel at top, exposed to sunlight. It can take us off the grid; can be used in a place where there is no electricity.

This team has taken an initiative of developing an indigenous photovoltaic based motor driven wheel chair to have the techno-economic feasibility study of introducing the device for physically challenged people.

1.2 Objectives of the Study

The objectives of this study have been set as:

- To study renewable energy technology, in general and solar energy technology, in particular.
- To identify the power requirement, power-train and selecting appropriate electrical devices to have mobility in the wheel chair.

- To design photovoltaic based electricity supply system for the motor driven wheel chair.
- To prepare a model project basing on this study.

1.3 State of Study

1.2.1 World Health Organization studied on preparation of solar wheel chair and published a fact sheet on its feasibility on October 2010[1].

1.2.2 Yoshihiko Takahashi, Syogo Matsuo, and Kei Kawakami, Department of Mechanical System Engineering, Department of Vehicle System Engineering, Kanagawa Institute of Technology, Japan. They work on Energy Control System of Solar Powered Wheelchair using PV cell and Hydrogen. They published a paper named “Energy Control System of Solar Powered Wheelchair” International Journal of Current Engineering and Technology, Vol.2, No.1 (March 2012), ISSN 2277 – 4106[2]

1.2.3 Arun Manohar Gurruma, P.S.V Ramana Raoa, Raghuveer Dontikurti, Department of Mechanical Engineering, Centurion University of Technology & Management, Paralakhemundi, Odisha-761211, they work on Solar Powered Wheel Chair and published a paper named “Solar Powered Wheel Chair: Mobility for Physically Challenged”. They were successful in their project and the project paper was published in International Journal of Current Engineering and Technology, Vol.2, No.1 (March 2012), ISSN 2277 – 4106[3]

1.2.4 Md. Shahidul Islam, Zaheed Bin Rahman, Nafis Ahmad from Bangladesh worked on designing solar three-wheeler for disable people. They completed the project and published the paper named “Designing Solar Three-Wheeler for Disable People” which was published in International Journal of Scientific & Engineering Research Volume 3, Issue 1, January-2012 1 ISSN 2229-5518[4]

1.4 Study Outline

After discussing the background of selecting the topic and the objectives of this study, Chapter 2 will discuss, in brief, about the renewable energy technology, particularly solar energy technology.

Chapter 3 will discuss about working principle, types, characteristics of pv cell, different types of storage systems and charge controller.

Chapter 4 will discuss the methodology and necessity of wheel chair.

Chapter 5 will discuss about designing of solar powered wheel chair and its different components.

Chapter 6 will discuss about data analysis.

Chapter 7 will discuss about conclusion, limitation and recommendations.