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FOR A BETTER FUTURE**

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**“ LEVERAGING TVET
FOR A BETTER FUTURE”**

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Developing EZ Lifter for Aircraft Maintenance

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ABSTRACT

The EZ Lifter was designed based on a normal trolley which is used to carry tools or equipment from one place to another but improvised with some features, which are to lift objects onto certain height and a 2 step ladder, attach to the structure of the lifter which let the personnel to reach higher place. The height of the EZ Lifter is 3 feet and it can be extended to 4 feet. EZ Lifter uses electric winch for lifting purposes and equipped with a pulley system to ease the operation. EZ Lifter is powered by a 12-volt battery in conjunction with 4.0 technologies (Arduino) to run the function of the device. The lifting process is controlled using the mobile phone app (Blynk) which connected to the Arduino programming. EZ Lifter can be used in a workshop or hangar to ease the personnel either transferring item or housekeeping purposes. Besides, it can also be used for a maintenance task on a light aircraft such as the Cessna 172N. The output of this device is that it could transfer objects on the trolley platform from one place to another with maximum weight of 80kg and capable of lifting objects with maximum weight of 50kg. As an outcome, EZ Lifter manages to ease the effort of lifting an object rather than using manpower and reduces the risk of back pain. Moreover, instead of using three different devices to provide lifting, moving and climbing operations, EZ Lifter was designed with great innovation implementation to provide all those three operations greatly. This proves that less time is consumed to perform multiple tasks in a time and with the modern technologies available nowadays this device also comes out very ease of control with using a smartphone.

Key Words: EZ lifter, Arduino, 4.0 technology

1.0 INTRODUCTION

EZ Lifter is an innovation product which can be used either in workshops or hangar to ease personnel for easily loading, lifting, transporting and unloading of any heavy object. EZ Lifter is built with electrical winch to provide the lifting purposes to reduce energy and manpower when lifting the loads as in Figure 1. It is also attached with a 2 step ladder to give an access at high place. The specialty of the EZ Lifter was designed with implementation 4.0 technologies (Arduino) to operate the function of lifting process by using Blynk mobile application installed in smartphone. The EZ Lifter is very useful in improving carry out maintenance inside a workshop, accessing and lifting high stock shelves in a storeroom or warehouse. This also helps to prevent injury by designing innovative product such as EZ Lifter to reduce lifting hazards.

The height of the EZ Lifter is 3 feet and it can be extended to 4 feet. EZ Lifter uses electric winch for lifting purposes and equipped with a pulley system to ease the operation. There is 3 pulley block used and attached to the frame structures to reduce the lifting force. EZ Lifter is powered by a 12 volt battery in conjunction with 4.0 technologies (Arduino) to run the function of the device. The lifting process is controlled using the mobile phone apps (Blynk) which connected to the Arduino programming. EZ Lifter can be used in a workshop or hangar to ease the personnel

either transferring item or housekeeping purposes. Besides that, it can also be used for a maintenance task on a light aircraft such as the Cessna 172N. The output of this device is that it could transfer objects on the trolley platform from one place to another with maximum weight of 80kg and capable of lifting objects on the lifter platform with maximum weight of 50kg.



Figure 1: The EZ Lifter on normal operation (left) and lifting operation (right)

2.0 RESEARCH BACKGROUND

2.1 Problem Statement

Lifting an object with certain weight may lead into several injuries if not performed correctly which be a leading occupational health and safety issue. Musculoskeletal disorders are injuries or illnesses that result from overexertion or repetitive motion which involve the back pain. In 2016, musculoskeletal disorders involving the back accounted for 38.5 percent of all work-related musculoskeletal disorders (134,550 back cases out of 349,050 total cases) as reported by the Bureau of Labor Statistics, U.S. Department of Labor.

However, with an exact proper ways and technique of lifting an object, the risk might be handled but definitely still cannot be eliminated due to lack of work experience or training (Van Nieuwenhuysse et al., 2004). Various types of lifting devices have been developed throughout the years. The invention of a hand trolley has been devised particularly to not solely for the lifting of heavy objects only. It has been innovated to be a multipurpose lifting device. Therefore, to solve this, a new innovation product called EZ Lifter is improvised from conventional lifter and trolley into a multipurpose use.

2.2 Objectives

The EZ Lifter has been developed to achieve a few objectives as below:

- i. To design multi-purpose device for easily loading, lifting, transporting and unloading heavy objects.
- ii. To implement innovative features with 4.0 technology for lifting operation.

3.0 METHODOLOGY

Flowchart in Figure 2 shows methodology of EZ Lifter development. After background research process, the design was done by using AutoCAD software for 3 Dimension (3D) and orthographic view. The design includes all three different features implemented which is trolley, ladder and winch mechanism with a pulley operation. The EZ Lifter started from the fabrication of the frame structures as per design. The main frame structures of the trolley such as c-channel, rectangular and angle bar was welded together. Ladder section was fabricated by using the steel hollow squares and welded to the frame structures.

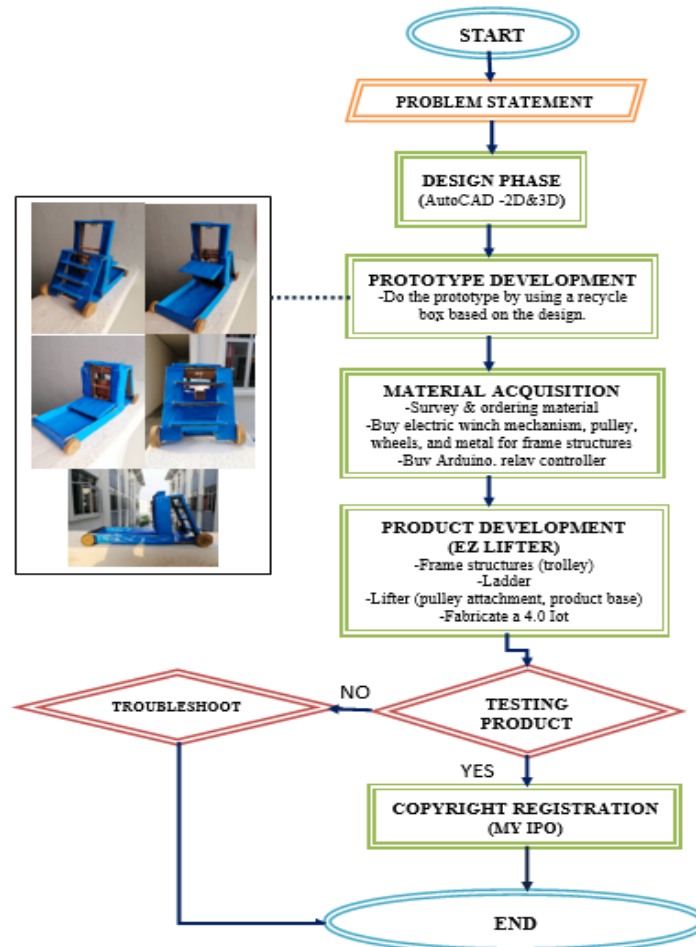


Figure 2: Flowchart of EZ Lifter development

Pulley is attached to the designated area to smooth the lifting and retract operation of the product. 3 pulleys system combining with motorized winch mechanism are used to lessen the force during the lifting operation. In addition, the EZ Lifter was designed to be operated by manual switch mechanism or mobile application for smartphones. 4.0 technologies such as Arduino implementation can be easily operated by a mobile app called Blynk installed in a smartphone. Blynk is set up with Arduino IDE which includes Blynk Libraries and Arduino ESP8266 Board Manager. Figure 3 shows how Blynk application is installed from the Playstore for android smartphone and configures the widget for lifting operation.

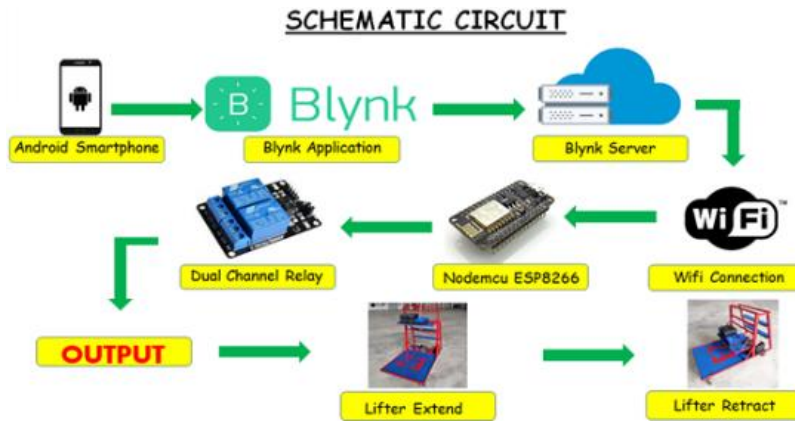


Figure 3: Schematic circuit of the EZ Lifter

Next, the connection between Arduino and dual channel relay as in Figure 4 is arranged with electrical winch according to circuit diagram. The code to connect Blynk with smartphone is uploaded to Arduino ESP8266 by using computer. The uploading code is then tested.

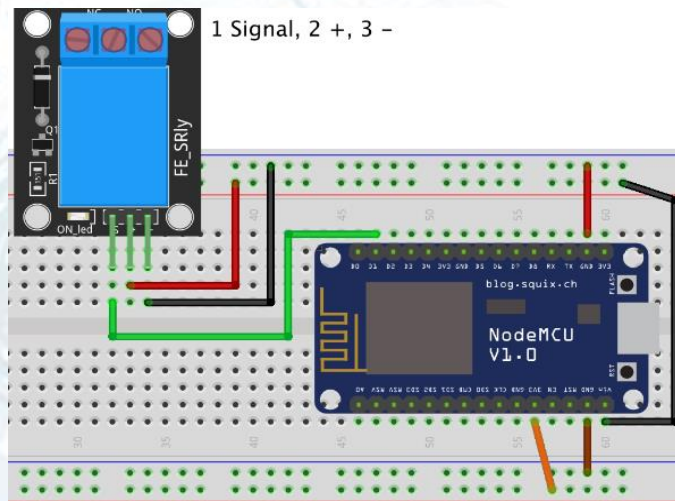


Figure 4: Connection between Arduino and dual channel relay

Figure 5 shows EZ Lifter was operated by using smartphone for lifting purposes. For functionality of the product, user testing the EZ Lifter for maintenance and servicing work at the light aircraft Cessna 172 as in Figure 6.



Figure 5: Mobile app Blynk to operate EZ Lifter



Figure 6: User testing the EZ Lifter for Cessna 172 maintenance work.

4.0 RESULT AND DISCUSSION

The height of the EZ Lifter is 3 feet and it can be extended to 4 feet. EZ Lifter is powered by a 12 volt battery and electric winch for lifting purposes. The electric winch is equipped with 3 pulley blocks to ease the lifting operation. As the implementation of lifting process, user can control the lifting operation by using mobile phone apps Blynk which connected via Wifi module ESP8266 through Arduino programming. The output of this device is that it could transfer objects on the trolley platform from one place to another with maximum weight of 80kg and capable of lifting objects on the lifter platform with maximum weight of 50kg.

5.0 CONCLUSION

Throughout a series of conducted fabrication, development and testing of the EZ Lifter, it can be concluded that the aim and objectives at the beginning of the work are successfully accomplished. The aim of the project is to design a multi-purpose device for easily loading, lifting, transporting and unloading heavy objects such as EZ Lifter and second is to implement innovative features with 4.0 technology for lifting operation. A literature review of the study has been comprehensively developed throughout the project plan and this includes the procedure to construct the product from AutoCAD then prototype before it became a real product and followed by product standards. Furthermore, EZ Lifter successfully constructed with 3 separate parts which consist of ladder, trolley and lifter. In addition, the lifting operation can be controlled by user smartphone other than a manual switch provided. The EZ Lifter is designed to ease the technician needs and reduce the manpower for a better working environment.

Throughout the experiments, there are some limitations that contribute to affect the accuracy and consistency of the aim and objectives of the project. However, there is always a space for improvement to take place in order to greatly increase the reliability of the experiments and test results of the research such as changing the material used especially plywood which does not stand against heavy objects for the product long term period. Hopefully, with a continuous effort and commitment, this project can be improved in certain areas for future research.

REFERENCES

Bureau of Labor Statistics, U.S. Department of Labor, The Economics Daily, Back injuries prominent in work-related musculoskeletal disorder cases in 2016 on the Internet at <https://www.bls.gov/opub/ted/2018/back-injuries-prominent-in-work-related-musculoskeletal-disorder-cases-in-2016.htm> (visited April 18, 2019).

Van Nieuwenhuysse A, Fatkhutdinova L, Verbeke G, Pirenne D, Johannik K, Somville, Mairiaux Ph, Moens GF and Masschelein R. Risk factors for first-ever low back pain among workers in their first employment. *Occupational Medicine*. 2004, 54, 513-519.

Get started with Blynk. (n.d.). Retrieved March 3, 2019, from <https://blynk.io/en/getting-started>

What Is a Microcontroller? — Programming an Arduino Board. Retrieved March 3, 2019, from <https://turbofuture.com/misc/What-is-an-Arduino-Programming-Microcontrollers>





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