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Development of Press Machine for Metal Waste Using Blynk Application Remote Control at General Machine Workshop

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Abstract: This study is related to the development of a press machine for metal waste using Blynk application remote control at general machine workshop. The purpose of product development was to manage the metal waste and storage space. The press machine was capable of compressing metal waste into cube blocks. Therefore, the wasted metal could be stored in proper places. The compressor of the press machine could be controlled using remote ESP8266 which was connected to the Blynk android application. The waterfall model was used as a guideline for the development of the product. The analysis was carried out by using product testing to test the suitability using pneumatic systems as a compressor and functionality application ESP8266. The result of testing showed that the press machine could work for the metal waste in the machine shop.

Keywords: Metal Waste, Press Machine, Blynk Application

1. Introduction

The process of waste management involves site planning, transporting, storing, managing materials, operations on-site isolation, reuse, recycling, and disposal of waste materials in the final stages (Ng, 2015). According to Ismail & Manaf (2013). the methodology used in waste management is open-ended, which involves the entire world using this non-costly method of disposing waste and thus, affecting the quality of the environment.

In a study conducted by Azimi Jibril et al. (2012), effective solid waste management systems have been implemented in developed countries as they reduce the cost of treating solid waste materials. However, good cooperation between the two parties is made up of the disposal companies and consumers for the separation of solid, gas and liquid.

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As such, the 5S system has been introduced in Malaysia since 1980. The 5S system has been implemented by multinationals in the private sector at an early stage and has grown and followed by the public sector today. 5S system is one of the management systems to create the environment introduced in Japan by emphasizing five stages in its implementation starting with the letter 'S'. Therefore, 5S can be defined as Seiri. Seiton, Seiso, Seiketsu and Shitsuke derived from the Japanese words which give meaning as 'Side, Sort, Sweep, Standardize and Sustain' in English.

There are some issues in metal waste management at machining workshops, which are related to poorly managed metal waste causing a quick piling up and filling up of waste.. According to Mapa, Asmad & Beddu Asis (2015), changing the technological lifestyles will result in increasing metal waste through product manufacturing activities from factories, learning and business processes. Therefore, recycling program is the most effective action plan in addressing the poorly managed waste disposal problem Wee & Radzuan (2010). However, the 5S system has not been implemented well since some organizations do not have high commitment towards continuous implementation to create 5S quality environment (Kartika, & Hastuti, 2011). Moreover, the issue regarding the limited storage in the workshop makes piles of waste become out of control and unable to dispose waste properly (Norsilan, 2006). According to Aziz et al. (2015), workshop injuries and accidents are unrealistic since they can result in physical injury, property damage, minor accidents, and workshop losses to workshop users. Hence, better control of material waste will reduce the risk of accidents occurring literally in the workshops or laboratories used during teaching and learning.

Currently, metal waste in machining workshop is taken by scrap metal dealers for recycling (Siti Salwa Khamis, 2015). However, metal waste is not compressed first before being sold. As a result, there is a lot of metal waste falling on the floor. It can be dangerous if not cleaned properly. In order to manage more efficiently with the latest technology use, a project was developed using a pneumatic system to compress metal waste into blocks to facilitate the storage and disposal of metal waste from general machining workshops so that workshops were always kept clean and safe.

The objectives of this study were:

- To develop a pneumatic compressor product using the Blynk application remote control.
- To test the Blynk application compressor and remote control device developed in terms of safety, practice and space for waste disposal.

2. Materials and methods

The development of Blynk remote control compressor machines is a product developed to assist in the management of waste in the machine workshop, at Faculty of Technical and Vocational Education, Universiti Tun Hussein Onn Malaysia. The Waterfall SDLC model is used as a guideline to develop the product. The Waterfall SDLC model has six stages of development, such as design, implementation, intervention, testing, system deployment, and maintenance.

In the first phase of the analysis, the researcher conducted observations and interviews to identify problems with the management of metal waste at the workshop. As a result of the observations and interviews, the researcher carried out an analysis of the problems encountered while managing the waste at the workshop.

In the second phase, the remote-control-based compressor machines were designed considering the machine workshop space. After that, implementation phase continued connecting, finishing and programming the remote control using ESP8266 of Blynk applications. Afterwards, the researcher conducted a simple test on the product to ensure the product functionality towards the pneumatic system and remote control of the Blynk application.

After ensuring that the Blynk system and product were working properly, the deployment system was carried out for expert evaluation of the compressor machine products based on the remote control of the Blynk application. The feedback received from experts was used as a reference to improve the product. The last phase of the SDLC Waterfall Model was to conduct maintenance for the product, based on the advice from the experts for future studies.

3. Results and Discussion

The findings of the information obtained based on the expert evaluation and product testing were addressed in the data analysis. The research included expert assessment and product evaluations to address the problem of analytical process. The goal was to test the functionality of the Blynk application with a compressor to compress the metal waste. Table 1 shows the analysis of metal waste compression pressure.

Table 1: Metal waste compression testing based on range controller pressure

Compression Range Pressure	Result
1	Less compression. The tests of 1 bar pressure show that the metal waste is still badly compressed.
2	Less Strong Compression. Metal waste remains poorly compressed.
3	Good Simplicity Compression. The tests of 3 bar pressures have shown that the metal waste can be compressed.
4	Good Simplicity Compression. The result of the 4-bar pressure was still same as the compression at the 3-bar pressure.
5	Good Compression. The results of the 5-bar pressure indicated a denser compression relative to the researchers' ideal pressure of 3 bar and 4 bar.
6	Very Good Compression. The compression results tended to be more compressive at a pressure of 6 bar and formed a very strong cube.

Based on Table 1, the iron compression analysis shows that the pressure was based on metal waste compression pressures. The experimental results showed that the pressure of one (1) bar was compressible due to the low pressure on the compressed metal waste. However, the findings of the six-bar compression showed that the metal waste was well-compressed and formed a strong cuboid.

The findings showed that the low pressure was not enough to compress metal waste. However, the product could still compress a metal waste by using the four and above pressures. The findings showed that a study should be conducted on the constant compression time needed for the rod length pressure. Three different readings were taken to make the correct analysis during this experiment. The aim of the analysis was to consider human errors in which the researchers took the readings.

4. Conclusion

The development of Blynk application based on remote control of compressor machines is one of the efforts taken by researchers to solve the problem of metal waste that was filling up at the waste storage in machining workshop. It was developed using waterfall model. The findings of the study showed that the metal waste pressure machine could function well after turning up the controller to four and above. However, to get a strong metal waste block, the use pressure at level 6 is needed. Comparable

metal waste pressure products are available in the market and developed for industries. The machine was much bigger, stronger and can compress better. But the price is costly.

Therefore, the metal waste pressure machine was developed in small scale using a low cost. It is suitable for use in machining workshops in educational institutions. Besides, the product was developed to enable the users to compress with remote control provided by the Blynk application by integrating programming within ESP8266.

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