

Design of Automatic Recycling Handwashing Tool in Prevention of the Covid-19 Virus

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ABSTRACT

This study aims to design an automatic handwashing tool. This design uses the Autodesk inventor application validated by experts. The data obtained then documented and analyzed descriptively qualitatively. Based on the results of the research conducted, can be concluded: (1) the design of automatic handwashing tool according to a list of guidelines covering solar panel placement, use of water osmosis, and use of automatic sensor taps; (2) the results of expert validation regarding the feasibility of the design conclude the design is valid to proceed to the manufacturing process stage; (3) the prototype manufacturing process still requires some improvements, especially the layout of the panel box inventor, pump, and battery.

Keywords

Article Received: 10 August 2020, Revised: 25 October 2020, Accepted: 18 November 2020

Introduction

By 2020 all countries in the world face very severe problems that plague the covid-19. The covid-19 has killed 1.34 million people with positive cases of contracting the covid-19 with a total of 55.6 million people. Prevention of covid-19 transmission is carried out by diligently washing hands, wearing masks, and maintaining a minimum distance of 1 meter. Hand washing equipment used as a means of preventing covid-19 can even be a means of spreading covid-19. It happens if hand washing tools still use manual water taps. Covid-19 can stick to water taps that are turned mechanically by hand movements. The best prevention is to use an automatic water tap using a sensor.

According to Llorca et al [1] hand washing is approving as one of the most urgent activities in preventing infection transmission in clinical settings. Added by Pavani K.Ram et al [2] washing hands with soap can prevent infectious diseases, especially for children. Several previous studies on handwashing equipment have been conducting by several researchers, such as Dewy Antriani [3], a portable handwashing device suitable for outdoor sports activities. Kristyna Hospital Hulland's research [4] focuses on making hand washing facilities and building community habits to get used to washing hands. Gbasouzor Austin Ikechukwu [5] makes automatic hand washer and dryer without the use of touch.

Hand washing equipment must meet the requirements, namely easy to move, hygiene, to have education on the dangers of covid-19 [6]. Added by Ababu Teklemariam Tiruneh [7], hand washing equipment must be able to save water because water and soap can improve handwashing behavior in the community. Washing hands is the most useful activity in preventing the spread of viruses or infectious diseases. Apart from the availability of water and soap, the factor of comfort and convenience of handwashing devices become a useful concept in developing handwashing tools during the current covid-19 pandemic [8].

Based on some of the research and problems above, researchers are interested in designing an automatic handwashing device. Handwashing planned to use solar power, automatic sensors, and water recycling so that effective and efficient in their use. The design made is expected to be an illustration in making a prototype of a hand washing device that can be applied to prevent the spread of the Covid-19 virus. Efendi, Nugraha, and Baharta [9] states that designing, manufacturing, and testing are the stages of making tools that carry a new concept of "go green". Also, this study also collaborates with the industry, namely PT Master Engineering, which provides advice on design designs and manufacturing processes for making tools that meet standards.

Research Method

This research was conducted from June to November 2020 at the Subang State Polytechnic Image Laboratory. The research stages began with field observations, forum group discussion (FGD), design making, validation, and finishing. Field observations began by looking for data in several industries that have developed automatic handwashing devices, FGD were held between researchers and PT Master Engineering regarding a list of technical requirements for automatic handwashing device design, a list of technical guidelines to guide the design of tools according to needs, making designs using the inventor Autodesk application, the results of the designs for automatic handwashing tools are then validated by experts. The next step is the material selection and finishing. The process of designing an automatic handwashing device is carried out by documenting all the steps that are carried out. The data obtained were processed through a qualitative description.

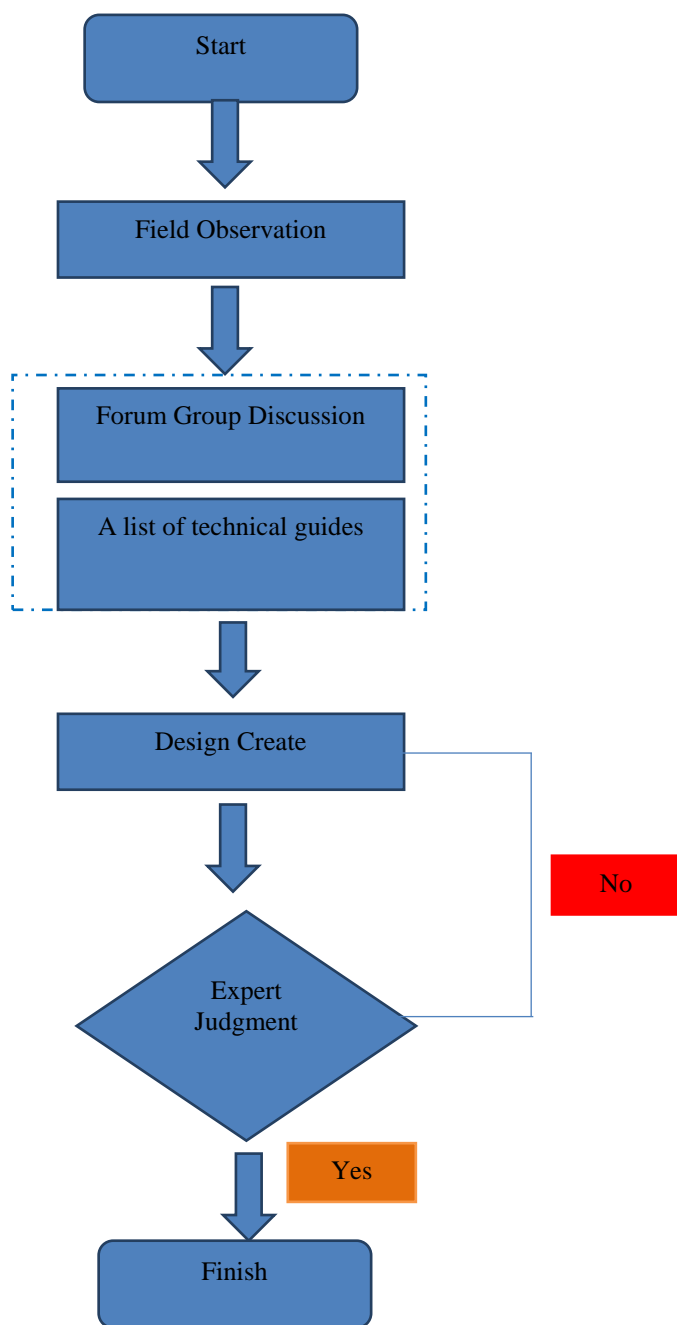


Figure 1. Research Methods

Results and Discussion

Field Observation

Field observations were carried out in August-October 2020 at PT Jimoda, PT Granada, PT Master Engineering, and several other campuses regarding the designs of existing automatic handwashing devices and what innovations could be developed. Some conclusions were obtained that a handwashing device that could use recycling was needed and was equipped with a sensor system. This is intended as an effort to use water and prevent the spread of the covid-19 virus when users/people wash their hands.



Figure 2. Moveable Hand Washer Universitas Indonesia

Forum Group Discussion (FGD)

FGD are carried out regularly, namely discussions between the Subang State Polytechnic research team and PT Master Engineering regarding the design of an automatic handwashing device that will be made. The FGD produced a Design Technical Guidance List which contains the main points of what must be achieved before the design enters the manufacturing period with the inventor Autodesk application. The FGD concluded that it was necessary to design a handwashing device that uses solar cells as a power producer. Solar sell was chosen because it uses environmentally friendly solar power. The next list of guides requires a handwashing tool that uses recycled water. This means that water osmosis is needed to circulate water that has been used so that it can be reused. Water osmosis is designed with an accuracy of 0.002 microns to prevent the covid-19 virus from living there. The final guidance requires handwashing devices that use automatic sensors. Pradip Dashraath et al [10] mentions that the spread of the covid-19 has entered a dangerous stage in several countries in the world. This handwashing device can reduce touch and prevent the risk of spreading the virus when washing hands.



Figure 3. Forum Group Discussion

Design Making

Designing automatic recycled hand washing equipment using the inventor Autodesk application. The design is made based on a list of guides that have been discussed through the discussion group forum stage. The design results include component drawings and full 2D and 3D designs of automatic recycled handwashing machines.

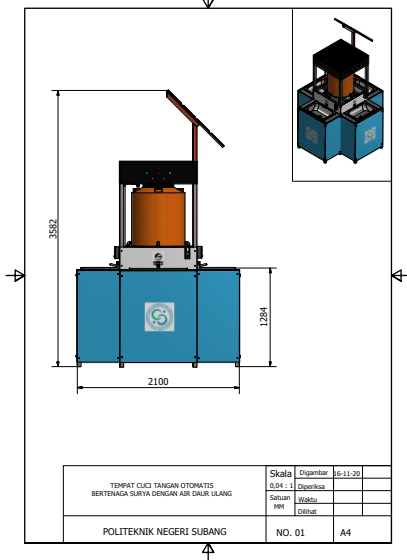


Figure 4. Design 2D of Automatic Handwashing Tool

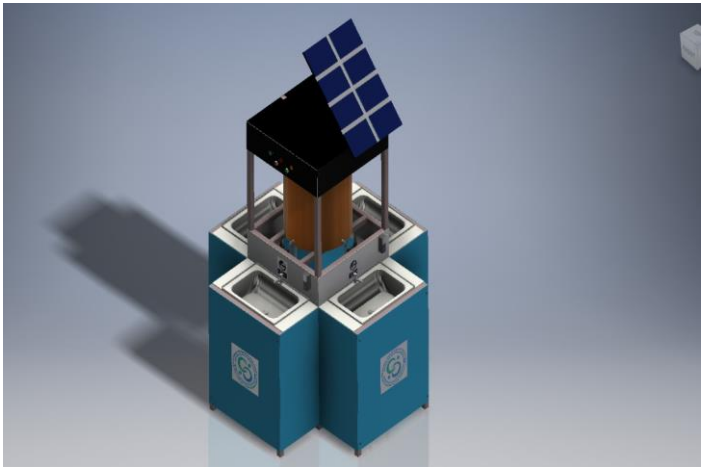


Figure 5. Design 3D top view of Automatic Handwashing Tool

Figure number 5 is a visualization of the list of guides produced during the discussion stage between the researcher and the team from the master engineering company. In the first list of design guidelines, a handwashing tool is needed in the prevention of Covid-19 which uses solar power in an effort to maximize new renewable energy. The solar cell is installed at the top of the handwashing device with a 45% transverse location. One solar cell is chosen because the power required is not too large to convert heat energy into electrical energy.



Figure 6. Design 3D side view of Automatic Handwashing Tool

The next list of guides is that a handwashing device that uses recycled water is needed. Based on these recommendations, the research team used osmosis water with a 0.002-micron filter to filter used water used in the first process of washing hands, so that water can be reused at a later stage. The osmosis location design is placed at the bottom near the pump and reservoir. This aims to make the water circulation process run more effectively and hygienically.



Figure 7. Design 3D front look of Automatic Handwashing Tool

Figure 7 visualizes the use of an automatic tap on a hand washer. The use of an automatic tap using a sensor is in accordance with the guided list of images from the FGD results. Automatic taps are expected to reduce touch and crowding in the handwashing process. The faucet uses a stainless-steel material which is expected to be more resistant and easier to clean in the process of using this automatic handwashing tool.

Expert Judgment

Expert validation was carried out by Mr. Roni Suhartono, S.Pd.T., M.Pd. as a drawing lecturer at the Subang State Polytechnic. The validator has been verified by BNSP as an expert in CAD. The validation results show that several refinement processes are needed in the design of the handwashing device. This improvement is in the form of assembling all components into one unit. The lecturer validation includes the feasibility of washing hands properly for the manufacturing stage. The parameters used by the validator include the analysis of the design of the handwashing device as the basis for the tool-making process.

Finishing

This process is carried out by refining the design according to the advice of the validator, then carrying out the manufacturing process of an automatic handwashing prototype. The manufacturing process must pay attention to occupational safety and health factors to reduce risks and achieve goals.



Figure 8. Manufacture Process

Conclusion

Based on the results of the research conducted, can be concluded the design of automatic handwashing tool according to a list of guidelines covering solar panel placement, use of water osmosis, and use of automatic sensor taps. The results of expert validation regarding the feasibility of the design conclude this design is valid to proceed to the manufacturing process stage. The prototype manufacturing process still requires some improvements, especially the layout of the panel box inventor, pump, and battery

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