DEVELOPMENT OF THE FREE ENERGY FLASH LIGHT

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ABSTRACT

The road users are facing difficulties to detect the presence of safety cones when on the road due to low visibility at night. The problem faced is a road warning sign such as the safety cones in the market do not emit clear light to vehicle users. In addition, the existing safety cone requires high maintenance and electrical energy. To overcome this problem, the free energy flash light was created to solve the problem associated with the existing safety cones in the market. The project was designed to use fully free energy source which is one of the steps to make the world a greener place. It will replace the use of electrical energy such as batteries and LED light with natural energy. The working principle of this project is the circlip will rotate when the vehicle passes through the safety cones and produces the wind that will move the blade. Moreover, the blade will reflect the vehicle light. Furthermore, the project has a portable port that can be mounted on, such as safety cones and road divider. The brightness of the free energy flash light will be clearly seen up to 80 meter direction. On the other hand, this project will help the road users to be more aware of the presence of warnings along the road.

Keywords: Free energy flash light, safety cone, road users, natural energy

INTRODUCTION

The road users in Malaysia are facing difficulties to detect the presence of safety cones when on the road due to low visibility at night. Statistically, Malaysia is one of the countries that has a high rate of the road accidents (Crab & Crinson, 2008). One of the common causes of accident is vehicle user would not able to detect the hazard ahead of them (Jatinder, Manjoe, Safoora, Saleem & Inaamul, 2016). This situation occurs due to the lack of illumination on ready cones and less reflection of light to the vehicle users (Mittal, Abhijitsinh, Vidhi & Dhaval, 2014; Stanislaw & Mariusz, 2013).

The problem faced is a road warning sign such as the safety cone in the market do not emit clear light to vehicle users. Motorists will not notice the safety cones when on the road due to low visibility at night (Talib, Mohd, Sutiman & Ramlan, 2003). In addition, the existing safety cone requires high maintenance and electrical energy. To solve the problem, the Free Energy Flash Light (FEFL) is created and is associated with the existing safety cones in the market. It is designed to replace the use of electrical energy (batteries and LED light) with natural energy. They are often used to create separation or merged lanes during road construction projects or automobile accidents, although heavier, more permanent markers or signs are used to make sure it stay in place for a long period of time.

FEFL is typically used outdoors during road work or other situations requiring traffic redirection or advance warning of hazards or dangers, or the prevention of traffic. For night time use or low-light situations, traffic cones are usually fitted with a retroreflective sleeve to increase visibility. On occasion, spin reflector may also be fitted with flash lights for the same reason.

There are various types of safety cones in the market, each type has a different shape and specification. The existing safety cone in the market is more compact and has a disadvantages in which the cone has a small reflection and is hard to see as shown in Figure 1. This can lead the road users to not be able to see and notice the presence of the safety cone. The evolution process of safety cone started with addition of light electronic inside cone as presented in Figure 2. The cone can be easily be seen by the road users because there is a light bulb in the cone. However, further studies are needed to determine overall maintenance cost and frequency of batteries replacement as electronic safety cone requires electrical energy. It is expected to be higher cost than safety cone.

FEFL was designed to be highly visible and easily movable. Figure 3 shows the evolution process of FEFL with the improvement by using wind energy to propel its head above the cone. It is environmental friendly as it does not use electrical energy. By adding a spin head above the safety cone, the reflected light is brighter which in result will make the road users able to see and notice the presence of the safety cone. Traffic cones come in many different colours, such as orange, yellow, pink, and red being the most common colours due to their brightness. Others come in green and blue, and may also have a retroreflective strip known as flash tape at the blade on the head of the cone to increase their visibility. The blade of FEFL was designed in two colours, which are red and white. Blades at the top of the cone can move around in two directions. This project is highly visible and easily movable. Besides being a portable built with safety features, this product can be used for a long term.

Fig. 1. Safety cone

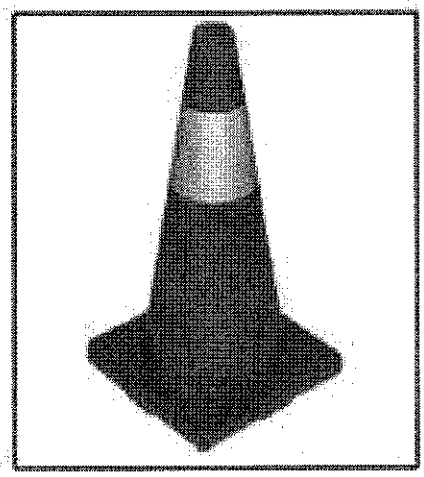


Fig. 2. Electronic safety cone

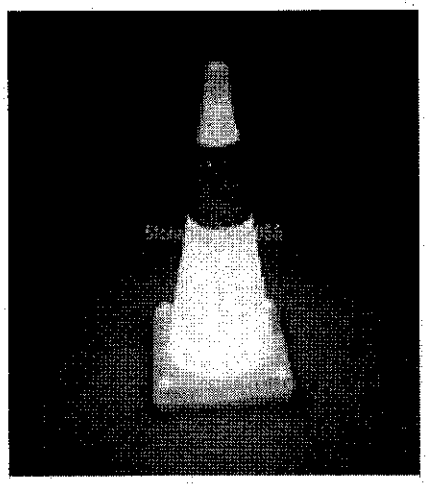
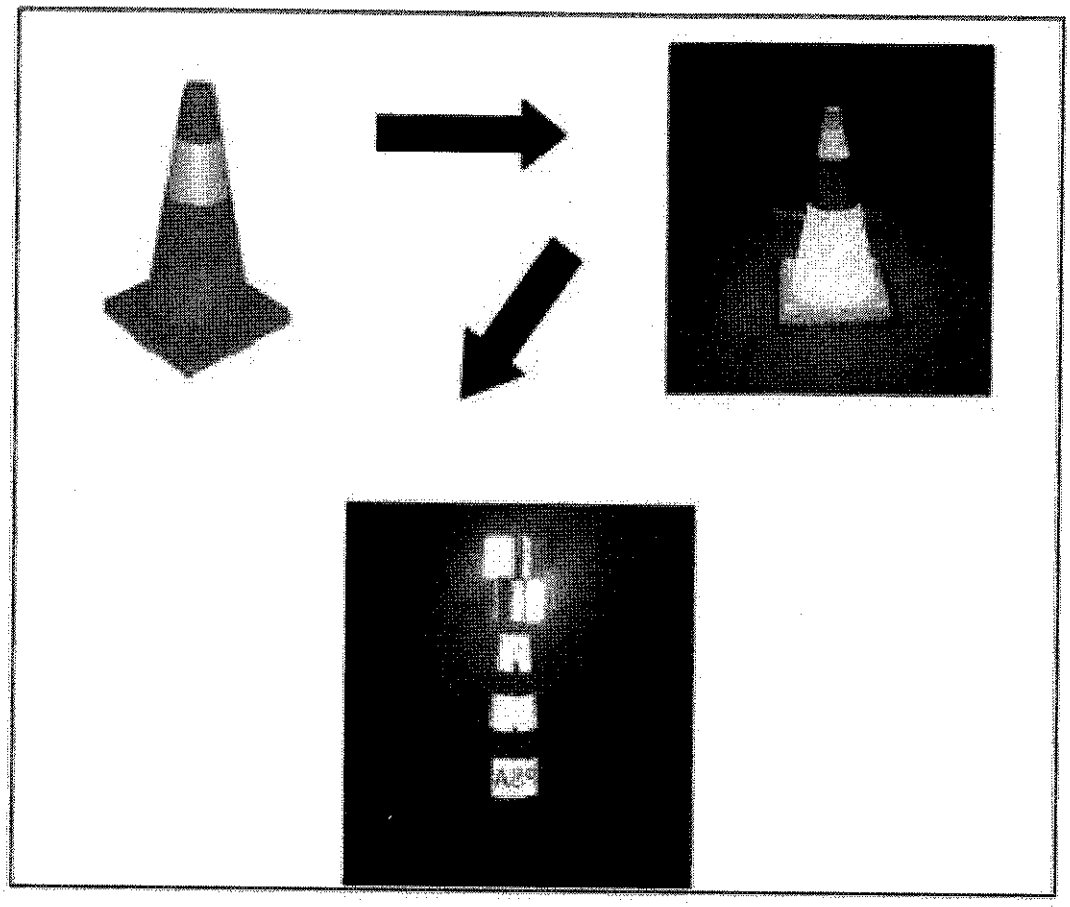


Fig. 3. The evolution process of FEFL



2. DESIGN CONCEPT

The project was designed using Autodesk Inventor Professional 2018. Figure 4 and Figure 5 shows the drawing of the head cone and bearing housing respectively.

Fig. 4. Head cone

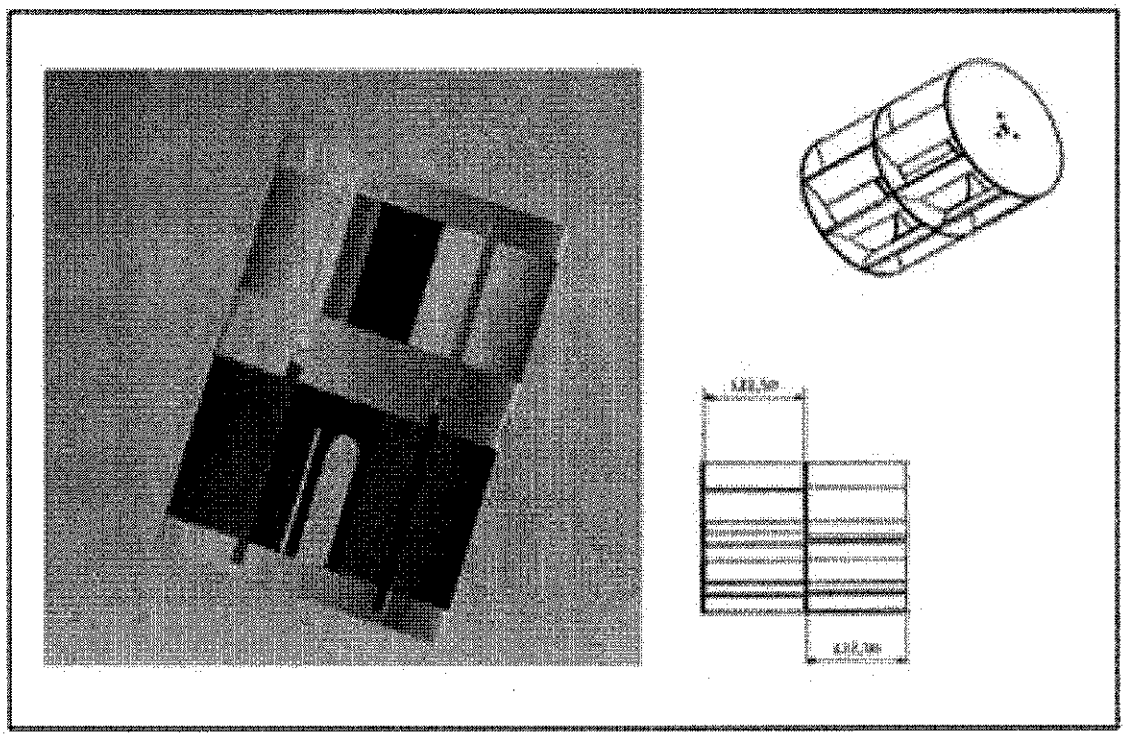
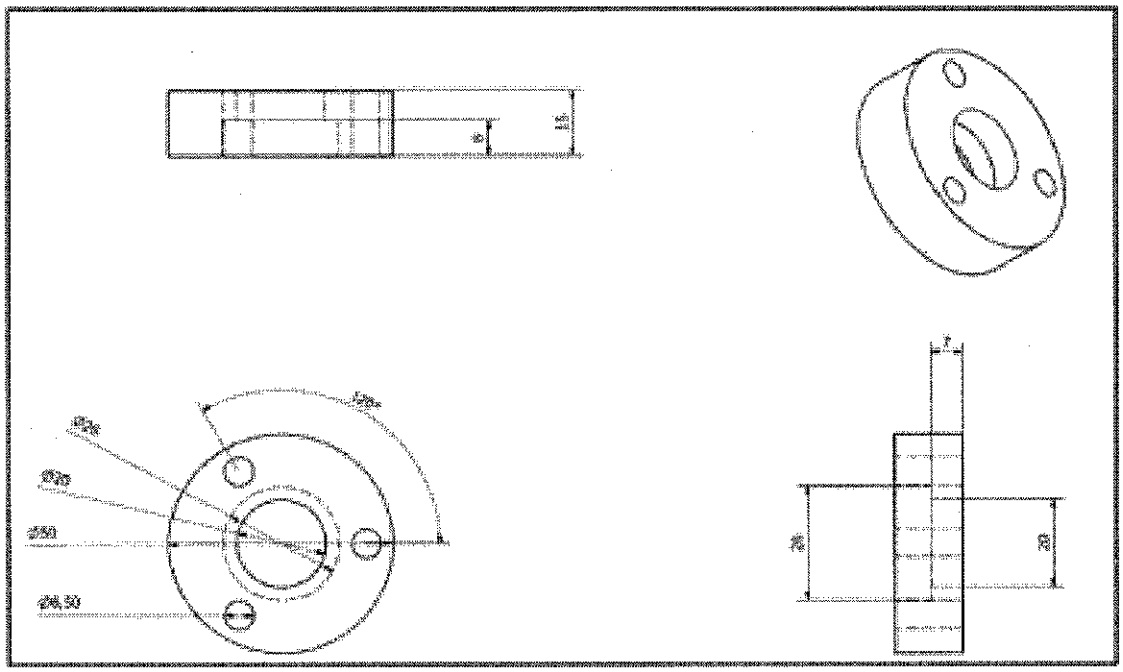


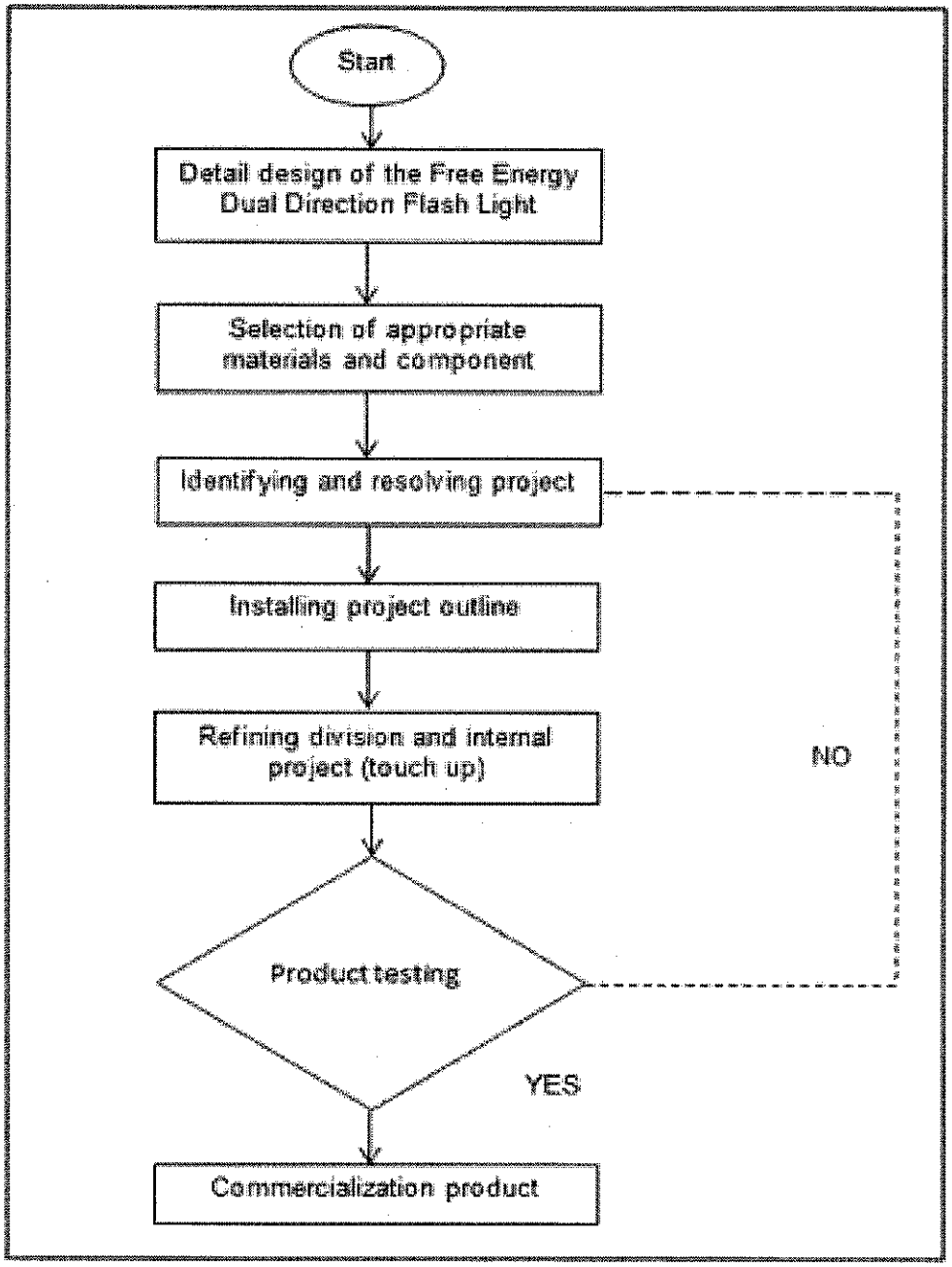
Fig. 5. Bearing housing



3. METHODOLOGY

A flow chart showing the development of the project is presented in Figure 6. It starts with a detailed design of the project, followed by selection of appropriate materials and components. After that, the project was identified and resolved and the project outline was installed. The project needs to be improved after assemble and assembling it was tested to various agencies such as Jabatan Kerja Raya (JKR) and Malaysian Institute of Road Safety Research (MIROS).

Fig. 6. Flow chart of project development



3.1 Selection of appropriate materials and component

The main materials used are aluminium and polyvinyl chloride (PVC). Aluminium is a relatively soft, durable, lightweight, ductile, and malleable metal with its appearance ranging from silvery to dull grey, depending on the surface roughness. It is nonmagnetic and does not easily ignite. Aluminium was chosen as it is light, does not easily rust and is malleable (Figure 7). A fresh film of Aluminium serves as a good reflector (approximately 92%) of visible light and an excellent reflector (as much as 98%) of medium and far infrared radiation. The yield strength of pure Aluminium is 7–11 MPa, while Aluminium alloys have yield strengths ranging from 200 MPa to 600 MPa. Aluminium has about one-third the density and stiffness of steel. It is easily machined, cast, drawn and extruded. In this project, aluminium was used for two divisions namely the shaft and plate.

PVC was used in sections of the head, cover shaft and bearing housing. The components used to develop the project are bearing, shaft, bolt and nut, screw. Bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing provides for free linear movement of the moving parts or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts. Figure 8 shows a bearing used in this project.

Fig. 7. Aluminium plate and rod

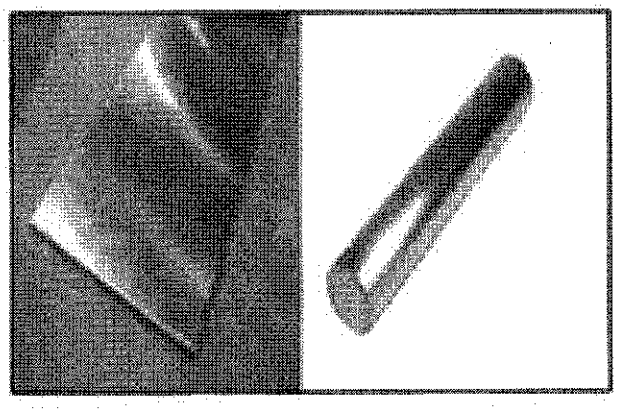
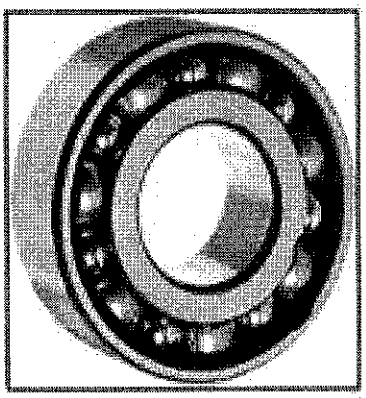


Fig. 8. Bearing



3.2 Measurement and cutting the parts of project

The circular plate was cut using a laser cutting. During the cutting process, the pieces has been arranged correctly to avoid any error. Cutting method and device selection play an important role in producing the right pieces. Lathe machine was used to make the shaft.

3.3 Identifying and resolving project

The project needs a round smooth bearing to rotate the head. In order to get the smooth bearing round, WD-40 was used to spray on all the ball bearing. Also, the surface of the plate connected to the blade was refine using sandpaper. The plate was washed with soap to make sure it was properly attached.

3.4 Installing project outline

The circular plate which has been cut and drilled was joined using MIG welding. The aluminium plates are connected to the 8 blades with an angle of 45 degrees of each blade using glue tools. Perforated aluminium plates joined with the middle of the first bar earlier also using glue tools. Similarly, the bottom bar with a combined inverted blade in the middle and bottom of the aluminium plate. Bearing is placed in the centre of the hole on top and included a plat aluminium bearing housing and cover its head and fastened with a screw. Shaft bearing is placed in the hole and inserted in the middle of the product and is driven on small plates and fastened with a screw. Small plates (base plates) are riveted by 4 rectangle-shaped aluminium plate under the plate at an angle of 90 degrees. The end plate is riveted with a head cone with an angle of 90 degrees and is now ready to be installed

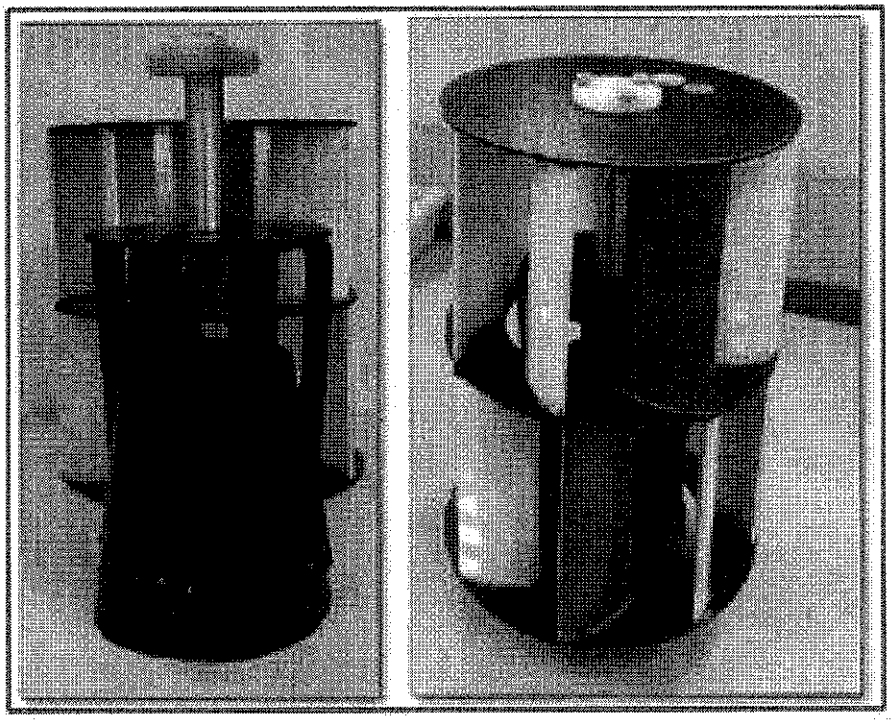
3.5 Refining division and internal project (touch up)

The project needs to be touched up after being assemble. First, the plates were sprayed to avoid from rusting. Black mate colour was chosen because the black mate colour will make the plate more attractive. Next, some thinner and gasoline were applied to remove some of the paint on the blade. The paint from the blade need to be removed to create a neat look. After completing the project, the cover was created to cover the head, if not it will easily rust because it is too open. The PVC rod material was used as a cover.

4. RESULTS AND DISCUSSIONS

The developed project is presented in Figure 9. The blades are curved shape because it is suitable to rotate without the use of battery power or electricity with special characteristics so that it can move around in two directions. Besides, the innovativeness of this project is using wind energy as the primary energy for the functioning of the product and using the concept of two-way round. On the other hand, the special feature of the project is it has a portable port that can be mounted on, such as road divider, safety cone and barrier.

Fig. 9. Free energy flash light

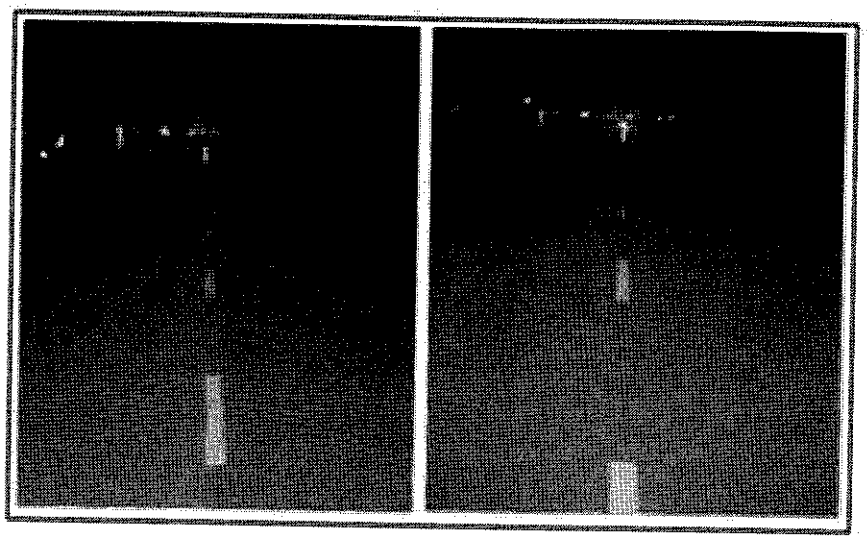


The working principle for this project is the circlip will rotate when the vehicle passes through the safety cone and produces the wind that will move the blade. Moreover, the blade will reflect the light when the vehicle light reflects the lamp towards it. The combinations of these two functions will move the circlip and reflect the light at the same time.

The comparison between existing safety cone and FEFL for a 10 meter view and 50 meter view are as shown in Figure 10 and Figure 11 respectively. It can be seen that the FEFL is brighter as compared to standard safety cone. This result will improve the visibility of the reflection during night time.

Fig. 10. Comparison between existing safety cone (left) and FEFL (right) for a 10 meter view

Fig. 11. Comparison between existing safety cone (left) and FEFL (right) for a 50 meter view



5. CONCLUSION

The free energy flash light has been successfully developed using a new design and meet the objectives of the project. The project was designed to use fully free energy source which is one of the steps to make the world a greener place. The maintenance of the project also can be neglected as the product itself uses kinetic energy from the wind to form an enormous amount of light reflected by the vehicle on the road. The brightness of the free energy flash light will be clearly seen up to an 80 meter direction. On the other hand, this project will help the road users to be more aware of the presence of warnings in front of the road.

ACKNOWLEDGEMENT

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REFERENCES

[1] Crab, G. I. and Crinson, L. (2008). The impact of Street Lighting on Night – Time Road Casualties. Transport Research Laboratory, pp. 1 – 16.
[2] Jatinder, S., Manjote, K. S., Safoora, B., Saleem, K., and Inaamul, H., (2016). Reason for Road Traffic Accident. International Journal of Medical Science and Public Health, Vol. 5, Issue 04, pp. 814 – 818.
[3] Mittal, P., Abhijitsinh, P., Vidhi, P., and Dhaval, M. P. (2014). Road Lighting as an Accident Counter Measure. International Journal of Civil Engineering and Technology, Vol. 2, Issue 12, pp. 296 – 304.
[4] Stanislaw, G., and Mariusz, K. (2013). Risk of Accident During Darkness on Roads with Different Technical Standards. 16th Road Safety on Four Continents Conference.
[5] Talib, R.J., Mohd , F. M., Sutiman, K., and Ramlan, K. (2003). Kemalangan Jalan Raya: Analisa Data Membabitkan Pengguna Motosikal. Jurnal Teknologi, Vol.13 (B), pp. 1 – 14.
[6] Vogel, L. and Bester, C. J. (2005). A Relationship between Accident Types and Causes. Proceeding of the 24th Souther African Transport Conference, ISBN Number 1-920-01712-7, pp. 233 – 241.