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DESIGN AND DEVELOPMENT OF WATER ROCKET LAUNCHER USING SELECTIVE LASER SINTERING (SLS) MACHINE

Muhammad Syafiq Amir Bin Samsudin, Norfariza binti Ab Wahab, Nuzaimah binti Mustafa, Khairum bin Hamzah, and Yusliza Yusuf
Department of Manufacturing Technology, Faculty of Mechanical and Manufacturing Engineering Technology, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, Durian Tunggal, Melaka, Malaysia
E-Mail: norfariza@utem.edu.my

ABSTRACT

The present invention relates to a water rocket launcher that is capable of arbitrarily adjusting the pressure inside the water rocket in addition to supplying water into the water rocket, the water rocket is configured to be inserted into the nozzle when the water rocket is mounted. The main aim of this project is to build a new water rocket launcher by using SLS machine which is to design a new water rocket launcher, to develop a water rocket launcher using SLS machine and to test a water rocket launcher. Solidwork software has been used to design the water rocket launcher. SLS is a method for the sintering and construction of powder-filled particles heated by a CO2 Laser Beam.

Keywords: water rocket launcher, machining.

1. INTRODUCTION

First, the majority of water rocket launches now being used in STEM education are planned accordingly to be more safely to use, lightweight and reduce the cost by using recycle material. The three technologies often employed include engineering concepts analysis, rocket design, production and start testing. In general, engineering concepts are limited and powerful. The aerodynamics concepts and Newtonian physics are discussed and conducted by means of a workbook on the study and review problems (Norfariza Wahab, Hiroyuki Sasahara, 2015), (Todd, Rikowski Butler and Skinner, 2007).

The release mechanism is the most critical component of the launcher. It's the locking mechanism that halts the rocket from escaping the launcher when under strain. Some common mechanisms of release include which is, in this release mechanism, the bottle rocket launcher comprises a bottle plug, a release mechanism, and a base.

The release mechanism involves 3 gripping levers, which are mounted shiftably to a support block for movement between a first position retaining the rocket on the launcher and a second position releasing the rocket, thus allowing the exhausted liquid and gas from the nozzle to lift the rocket off the launcher.

The three-stage launch of a rocket is as follows. Place the rocket vessel in the first stage with the bottle rocket neck hole over the catch and release heart before flexible retainers interact with the bottle neck flange. This catch and release cup slides to the location of the lock. The security monitoring clip is mounted around the base of the capture and release.

The angle when launching the water bottle rocket is the most important, whether or not the rocket is flying high. The previous water rocket launcher nowadays can only be launched at one angle. When a water bottle rocket is to be launched, it moves upwards and forward. All other aspects are equivalent (the rocket mass and size, the pressure it is released at, the angles at which the rocket was fired, and the environmental conditions, would determine its range (the horizontal distance traveling).

(Cengel, Cimbala, & Turner, 2012; National Aeronautics and Space Administration, 2015d), drag forces are characterized by frictional forces induced by the sliding motion between the rocket body and the surrounding fluid, and by the rocket mass resistance of the surrounding fluid.

2. METHODOLOGY

2.1 Development of Water Rocket Launcher

In this project, the construction of this water rocket launcher will be designed using SLS machine with material powder bulks and will come with guide rails to weaken the stability of the launch and compromise the ability to launch the water bottle rocket in the direction desired. Any desired start angle can be set using this launcher. It is designed so strongly that even after repeated use. The water pressure that will put on the water rocket will be higher so the thrust delivered by water expelled at high pressure must be completely powered.

Figure-1. Solidwork sofware.

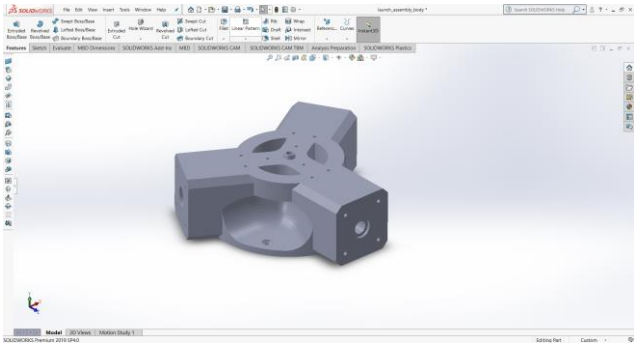

Figure-1.1. Design of water rocket launcher.

2.2 Project Setup

In this study, the invention relates to a process for producing water rocket launcher shape on a plate made of powder bulks or thermoplastic material were 50mm in thickness. This experiment has investigated whether it is possible towards machining on powder bulks. The experiment had a two type to test. First one towards hollow polyamide vacuum block and secondly for hollow delrin vacuum block. SLS is a method for the sintering and construction of powder-filled particles heated by a CO2 Laser Beam. Thermal imbalances of the SLS components are found inside the building chamber during the sintering process. The shrinking effect of SLS is greatly affected by both powder properties and manufacturing parameters. Therefore, the precondition for improving the accuracy of the parts is to consider the connections between the process parameters and the recline. Intelligent process control and automation must also be built and can manufacture the parts with the desired dimensional precision.

Figure-2. Selective laser machine.

Figure-2.1. Process of selective laser machine.

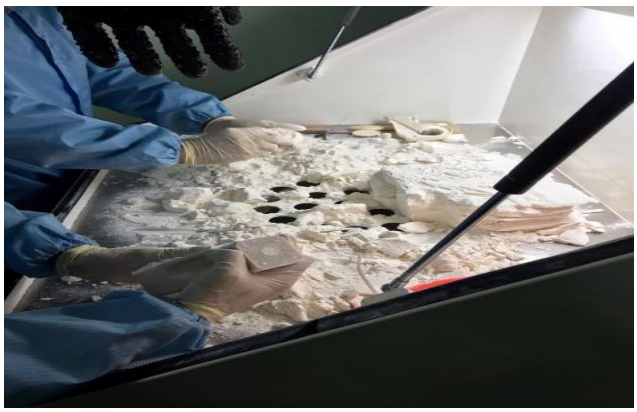

Figure-2.2. Break the block of powder.

3. RESULT AND DISCUSSIONS

3.1 Result Machining for Water Rocket Launcher

A secure frame to link all components must be given by the launcher base. The launch base must be built in a secure manner to avoid a tipping of the water rocket when it begins. The first thing that was done was the installation of a support frame, and a horizontal adjustment was made that suggested mounting of a support system and the starting pad board and the angle could be adjusted afterwards.

Figure-3. Launcher assembly parts.

3.2 Different Water Fill in Water Rocket

The purpose of this test was to research the volume of water necessary for the longest flight time in a water rocket. The results show that the 40 percent water rocket was flying the longest. The entire experiment used the same air pressure and adjusted just the volume of water. All other experimental conditions were preserved in the same way.

If the rocket has enough water and air, it's noisy and won't easily accelerate. It doesn't even have enough air to force out all the water. When the container is filled with water, the bottle air needs to be compounded with the original volume to divert water. Water does not return with the rise in air pressure until the inside pressure reaches the outside pressure.

Table-3.1. Average time of rocket flight.

Water fill level (%)	Flight Time (Seconds)		Average Time (Seconds)
	Test 1	Test 2	
20	4.96	4.50	4.84
30	5.36	4.99	5.26
40	5.55	4.89	5.41

Figure-3.1. Testing water rocket launcher.

4. CONCLUSIONS

The implications of the results from the launch testing are discussed, including the water pressure and air pressure, legitimacy of the results and areas of concern, the generalizability of the results to the use of the water rocket launcher and further limitations and constraints of the findings.

Other than that, the priority of this water rocket launcher project is the safety which is this design is more safely to use in school and university educational programs which is STEM program. Therefore, the use of the SLS machine of making water rocket launcher will enable engineering to enter many STEM water rocket activities largely, hence accomplishing the original goal of the study. Then, it will also be able to make suggestions on how to make changes to the original rocket design to ensure that a desired outcome is achieved, such as maximum height. It will learn the importance of numerical methods in complex analyses and see how a number of theoretical principles collide in an engineering problem.

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