Design and Fabrication of U-Raft

Arjun Takur. K & Dinesh Kumar.K
Department of Mechanical Engineering Park College of Engineering and Technology
Kaniyur - 641659.

Karthi. R & Somnath Das
Department of Mechanical Engineering Park College of Engineering and Technology
Kaniyur - 641659.

ABSTRACT—the main purpose of our project is to design a product which will be an emergency kit to survive during flood. Recently, Southern India had gone through natural disaster (flood). We have designed a product which will serve for multipurpose. Our design is a combination of Hand Pump, Umbrella Skeleton (body) and Life Raft which can be useful for an adult to use it as an umbrella in rainy season and a kit himself to escape to higher land level during flood. This design can be used as umbrella and life raft for an adult. This design is simple in construction and easy to use. This is portable and multipurpose kit, which will be a most need tool for the survival of natural disaster (flood).

Keywords—survival kit, portable, multipurpose kit

I. INTRODUTION

U-Raft is a new product which combines of umbrella frame, bi-cycle hand pump, and round river raft. Its main purpose is to be a device which gone be a self-rescue kit during nature disaster (flood).

Its proto type is made up of aluminum and later (rubber) and nylon.

During flood the critical straggle is about 24 hours because the rescue team and social groups can't reach to every place at once. Due to this the people straggle most without any proper tool for their survival.

This U-raft plays a role to be a kit for the people to escaping from low level area to a higher place after flood impact.

Following are the items required to fabricate the U-Raft proto type:

- Aluminium pipe
- Aluminium shaft
- Aluminium round head Rivet
- Tire Inner Tube 8.25R20 (latex material)
- Nylon sheet and wire

Engineering term used:

- V-shaped metric thread
- Rivet
- Oil seal (O-ring)
- Links and joints

U-raft requires normal installation before its use. The core is taken as fixed component and remaining parts are assembled to it. Head is welded with the 8 links and it is attached to the top of the core with the help of thread provide in it. Secondly, the pump body is attached to the core bottom portion. The pump piston is taken and O-Ring is placed in its respective place and fitted into the pump's body. The frame of the U-raft is over.

Now the canopy, to fix the canopy in the frame Velcro is stitched to the canopy.

Place the 8 rib of the frame over the loop of the Velcro and attach the hook with sufficient tight.

Secondary purpose:

This U-raft is used as normal umbrella during rainy season and the raft setup provided will be also useful while

- fishing ,
- picnic , and
- Swimming pool ring.

The pump provided will serve you as a high volume pump to fill

- bicycle ,
- two wheelers and

- cars

as the hose is provide with connector.

MATREIAL SELECTED

ALUMINIUM:

Aluminium is soft, lightweight, fire-proof and heat-resistant, easy to work into new shapes, and able to conduct electricity. It reflects light and heat very effectively and it doesn't rust. It reacts easily with other chemical elements, especially oxygen, and readily forms an outer layer of aluminium oxide if you leave it in the air. We call these things aluminium's physical and chemical properties. Aluminium really comes into its own when you combine it with other metals to make aluminium alloys (an alloy is a metal mixed together with other elements to make a new material with improved properties—it might be stronger or it might melt at a higher temperature). A few of the metals commonly used to make aluminium alloys include boron, copper, lithium, magnesium, manganese, silicon, tin, and zinc.

Pure aluminium is very soft. If you want to make something stronger but still lightweight, hard-wearing, and able to survive the high temperatures in an airplane or car engine, you mix aluminium and copper. For food packaging, you don't need anything like the same strength, but you do need a material that's easy to shape and seal. You get those qualities by alloying aluminium with magnesium. Suppose you want to carry electricity over long distances from power plants to homes and factories. You could use copper, which is generally the best conductor (carrier) of electricity, but it's heavy and expensive. Aluminium might be an option, but it doesn't carry electricity so readily. One solution is to make power cables from aluminium alloyed with boron, which conducts electricity almost as well as copper but is a great deal lighter and less droopy on hot days. Typically, aluminium alloys contain 90–99 percent aluminium.

ALUMINIUM PROPERTIES:

$\mu = 0.34$

$E = 0.675 \times 10^5$ N/mm^2

Density = 2700 kg/m^3

NYLON:

Nylon possesses many properties that make it a very useful fibre in many applications. It is very strong and elastic; it's also easy to wash, and can usually be washed with similar items and does not typically require specialty laundering arrangements. Nylon dries rather quickly and t retains its shape rather well after laundering, which ensures longevity of the garment. Nylon fibre is very responsive and resilient as well as relatively resistant to heat, UV rays and chemicals. Nylon is a popular synthetic material that has many advantages, including being resistant to heat, and very few disadvantages, including easily losing its shape. It is used in many items, such as clothing, carpet, storage containers, and more.

NYLON PROPERTIES:

Density = 1.15 g/cm³

Electrical conductivity (s) = 10-12 S/m

Thermal conductivity = 0.25 W/ (m*K)

Melting point = 463–624 K

190–350 °C

374–663 °F

HYPALON MATERIAL (alternative Raft material):

CHLOROSULFONATED POLYETHYLENE (CSM)/ HYPALON:

Chlorosulfonated polyethylene or CSM is a synthetic rubber based on polyethylene. This rubber is a material with Neoprene Polychloroprene plus other qualities. The CSM rubber is suitable for continuous use up to about 130 degree Celsius. Chlorosulfonated polyethylene (CSM) is known for its excellent resistance to atmospheric conditions and good resistance to chemicals. Chlorosulfonated polyethylene is used in a variety of industrial and automotive applications that require high performance and have to withstand extreme weather conditions. Some poducts where chlorosulfonated polyethylene rubber is used include rubber linings, hoses, valve seals and gaskets etc.

HYPALON:

Hypalon® is the trade mark of CSM. Hypalon was developed in 1951 and since then it has become the common name for chlorosulfonated polyethylene. It is a product of DuPont Performance Elastomers, a subsidiary of DuPont. However, it is also manufactured by other manufacturers with different trade names. Hypalon® has always demonstrated durability in harsh environments. This type of rubber is known to be used in applications that require high performance and resistance to chemicals, temperature extremes, and ultraviolet light.

PROPERTIES OF HYPALON OR CHLOROSULFONATED POLYETHYLENE (CSM):

- This rubber has excellent resistance to oxygen, ozone and most chemicals, water.
- It has poor fuel resistance.
- It also has poor compression set resistance which limits its utility in dynamic sealing applications.
- It also has poor compression set resistance which limits its usefulness in dynamic sealing applications.
- It is resistant to weather.
- It is also resistant to abrasion.

MANUFACTURING PROCESS

Machining Process

(Additive Manufacturing)

Assembly Process

Surface finishing process

MANUFACTURING PROCESS	OPERATION
Machining Process	**Lathe Machine:** • Facing • Turning • Thread Cutting
	Drill Machine: • Drill
	Mill Machine: • Drilling • Tapping
Assembly Process	**Welding** • Type : TIG Welding
	Rivet • Type : Round Head
	Hemming (stitching)
Surface finishing process	**Buffing**
	Painting & sticker

ADVANTAGES:

1. U-Raft can be used as an emergency kit.
2. It can also be dismantled and used as a separate Pump.
3. U-Raft has long life as Umbrella due to its double layer.

4. It is simple to Operate (assemble & to dismantle).

DISAVANTAGES:

1. As we selected design material as aluminum U-Raft be heavier than Ordinary Umbrella.
2. Number of pump cycle is high to fulfill the raft.
3. As we used single Joint, U-Raft will be higher dimension than ordinary umbrella.

APPLICATIONS:

- U-Raft can be used as an Umbrella throughout rainy – season.
- It can be dismantled and used as during flood.
- As it is capable for an adult, it is also used as Pool – Ring in Swimming pool.

REFERNCES:

- Most of the Material Properties are taken from the P.S.G Data Book compiled by P.S.G College of Technology, Coimbatore – 641004.
- Information about materials are taken from Wikipedia.