Anteneh's Jerry Can

Anteneh Gashaw

September, 2023

Addis Ababa

Ethiopia

Table of Contents

I. EXECUTIVE SUMMARY

Anteneh's Jerry can was created on 2021 and made its first publication on 03/17/2021 which you can see via the link https://hackaday.io/project/178283-antenehs-jerry-can. The project was created for water day challenge hosted by Hackaday contest on the year 2021 which you can see via https://hackaday.io/contest/176995-earth-day-challenge. Anteneh's Jerry Can project is created by Anteneh Gashaw who is the founder of Anteneh Engineering which is currently unregistered company.

According to resources, there are more than 1 billion migrants in the world today and water deficits are linked to 10% of the rise in global migration. The World Bank's released flagship publication "Ebb and Flow: Water, Migration, and Development" shows that it is a lack of water, rather than too much, that has a greater impact on migration. Water has always influenced where we live. Today, as climate change accelerates the global water crisis, the relentless increase in the movement of people around the world requires a considered response to turn crisis into opportunity.

This project seizes this opportunity to solve one of the biggest challenges faced by water shortage which is manual water fetching using Jerry cans. The scope of the project is easing the manual water transport technique so that if water scarcity cannot be solved at least we minimize the pain of people who fetch water by travelling long distances.

This project is about building a new kind of Jerry can for water transport for rural areas that ease the pain for the person carrying the load with lower cost. Instead of the standard shape of the 25 litters and 20 litters Jerry Can, Anteneh's Jerry Can has a torus shape with the same volume as the standard jerry can. This will reduce the pressure of the water by distributing the weight of the water in 360 degrees comparing to the concentrated weight of standard jerry can and utilize all part of our body for support rather than using only spinal chord.

This project does not completely solve their water need problem but it will ease their pain on the process of water fetching big time because it reduce effort to carry the water than any other container while providing lower cost compared to standard jerry can used to this date.

Currently the product has passed through testing and validation and we believe that the next step is installation of manufacturing workshop. To do that there needs to be an investment to manufacture equipment especially the mold that is used to manufacture the Anteneh's Jerry can. This investment starts from minimum of 1,000,000 ETB because the manufacturing of the mold price and plastic melting equipment are needed. The expected return funder from the enterprise for their contribution depends on the investment they put in which will be decided up on negotiations.

BACKGROUND INFORMATION

1.1 THE PROJECT

- **Name:** Anteneh's Jerry Can
- **Address:** Addis Ababa, Yeka Sub-City
- **Type of business :** Manufacturing
- **Legal Form of Business:** Sole Proprietorship
- **Status:** Start-up

1.2 BRIEF HISTORY OF THE INVENTOR

Anteneh Gashaw who is an inventor/ mechanical engineer with invention more than 100 inventions which you can see via the links https://hackaday.io/projects/hacker/856765 and https://contest.techbriefs.com/profile?user=89682

Some of the successful climate, COVID-19, energy, agriculture and water inventions of Anteneh are as following

1. Anteneh's jerry can
   Project page- https://hackaday.io/project/178283-antenehs-jerry-can
   Media publication- https://hackaday.com/2021/03/25/earth-day-challenge-a-better-way-to-wrangle-water/
2. Anteneh's overgrazing shield
   Project page- https://hackaday.io/project/178403-antenehs-overgrazing-shield
   Media publication- https://hackaday.com/2021/05/03/keep-livestock-from-razing-your-field-with-an-overgrazing-shield
3. Anteneh's Gojo
   Project page- https://hackaday.io/project/183663-antenehs-gojo
   Media publication - https://hackaday.com/2022/01/24/rainwater-storing-gojo-is-a-stroke-of-genius/

4. Anteneh's Ventilation against COVID-19

   Project page- https://hackaday.io/project/179763-antenehs-ventilation-against-covid-19

5. Max Thabiso Generator and Motor

   Project page- https://hackaday.io/project/185893-max-thabiso-generator-and-motor and so many more.

Some of the international honors received by Anteneh Gashaw are

- ☑ Winner of Mechanical maker challenge by NASA/ JPL- 2019 with his design invention "Mechanical eye"
- ☑ Finalist in the TIC AMERICAS 2020 contest with his project "Caribbean Sargassum Problem" https://ticamericas.net/finals/finalist/caribbeansargassumproblem.php
- ☑ Finalist in TKF plastic innovation challenge 2019 with his invention "Smart green washer" https://2019.spaceappschallenge.org/challenges/earths-oceans/trash-cleanup/teams/the-saviors/project
- ☑ Top 100 inventions of 2022 by create the future contest by tech briefs with his project "Anteneh's Gojo" https://contest.techbriefs.com/2022/entries/sustainable-technologies-future-energy/11456
- ☑ Top 100 inventions of 2019 by create the future contest by tech briefs with his project "Cone solar panel" https://contest.techbriefs.com/2019/entries/sustainable-technologies/9622
- ☑ Top 10 winner of TIA challenge 2019 with his multiple unique solutions and invention
- ☑ Finalist in Enel challenge on MV & LV distribution challenge 2019 with his invention "Turbine for avoiding birds in MV & LV distribution lines"
- ☑ In the recent Hawaii natural problem challenge which is the saving the Ohi'a challenge (https://conservationx.com/challenge/invasives/ohia), Anteneh

submitted more than 30 possible solution which you can see via the link https://conservationx.com/challenge/invasives/ohia/projects

- ☑ Anteneh has developed more than 20 inventions for solution, management and prevention of the Coronavirus (COVID-19) which you can see via https://solve.mit.edu/challenges/health-security-pandemics/solutions/22229 or https://contest.techbriefs.com/profile?user=89682
- ☑ In 2020 Anteneh have invented more than 15 technologies related to increasing efficiency of energy generation, transmission and utilization through a clean environmentally friendly way which you can see via https://hackaday.io/projects/hacker/856765

1.3 KEY SUCCESS AND RISK FACTORS OF THE PROJECT

I. KEY SUCCESS FACTORS

- There is stable political and economic environment in the country
- The country has registered economic growth for the last 12 consecutive years.
- There is a meaningful improvement in basic infrastructure facility such as roads, electricity, telephone, and etc across the country.
- There is stable and conducive investment environment in the country. There are different incentive schemes that the government availed to attract investment, especially of medium and small scale industries.
- There is improvement in service delivery and execution capacity of public institutions which can facilitate timely implementation of projects.
- There is a clear gap between the demand potential for promotional products and its supply implying untapped of the sector.

II. RISK FACTORS

There is only one potential risks when it comes to the design of this product which is the potential oscillation caused by inertia of the person carrying the Anteneh's Jerry Can. This is not a big risk because during the first test conducted I used my Arm by putting my hands on the Anteneh's Jerry Can to stabilize the oscillation. Putting your hands on the Anteneh's Jerry Can will solve the problem and you will have a way you can rest your hands at all times. But when you have some other objects you wish to carry on your hands while carrying Anteneh's Jerry can on your shoulder, the potential oscillation will become a problem. This can be solved easily by adding additional two straps on the opposite side pipe of the Anteneh's Jerry can which is on the left and the right position of the carrier. The first strap is fixed on the front of stomach of the carrier while the second strap is fixed to the back of the spinal cord of the carrier. The two straps acts as an anchor stabilizers for potential oscillation due to inertia.

1.4 SCOPE AND OBJECTIVE OF THE PROJECT

Do you know that people in many part of the world travel many kilometers carrying water jerry can every day or few times a day to bring water for drinking, cooking, watering their plants and for many other reasons? If you are not aware, well you are about to.

Water scarcity, which is broadly understood as the lack of access to adequate quantities of water for human and environmental uses, is considered to be one of the most important global risks for society. Global water demands are expected to increase in the future because of increasing populations, urbanization, and industrialization. In addition, aspects of climate change and anticipated increases in extreme weather events are expected to contribute to increases in the frequency, severity, and duration of droughts, which can exacerbate water availability problems. In an area where there is lack of water supply at home, people travel very far to fetch water. In almost all society this task falls under the women. It is very common to see women carrying 25 and 20 liter Jerry Can on their back or on their head and travel many kilometers from the source like river, lake or well to their homes.

Describing how challenging it is can only be achieved if you try it yourself but to give you an idea on the challenge,

- The first problem is the concentrated weight of the 25 litter jerry can which will force you to use only one or two part of your body for support which requires enormous amount of force to overcome the high pressure.
- The second problem is the distance they have to travel in a very rough terrain full of mountains, muddy ground during rain, hole and sloppy ground, which is impossible even for a wheel aid transport.
- The third problem is the damage it makes on the spinal chord of the carrier from high pressure of the jerry can as well as the friction between spinal chord and bottom edge of the jerry can when they try to consistently adjust elevation of the jerry can on their back while carrying and transporting it.

The following pictures illustrate how people on rural areas transport standard 25 litter jerry cans in rough landscape at least one time per a day.

Figure 1- women carrying standard 25 litter jerry can

Figure 2- women carrying standard 25 litter jerry can in rough slope grounds

MARKET STUDY

1.5 Overview of the project

This project is about building a new kind of Jerry can for water transport for rural areas that ease the pain for the person carrying the load with lower cost. The basic scientific concept for the development of this product is based on the fact that distributed force generates less pressure or impact than concentrated force. Instead of the standard shape of the 25 litter Jerry Can, Anteneh's Jerry Can has torus shape with the same volume as the standard jerry can. For prototyping simplicity, the shape of torus is made square with center to center length of 66cm with pipe diameter of 11cm. At two opposite side of the pipes there are two attached lathers that are used to hold the Anetenh's Jerry can on your shoulder. This will reduce the pressure of the water by distributing the weight of the water in 360 degrees comparing to the concentrated weight of standard jerry can and utilize all part of our body for support rather than using only spinal chord. To maintain the load close to center of gravity which is the person carrying it, the diameter of the pipe can be varied and the length of the pipe will be varied depending up on the amount variation of the diameter based on the size model of the user. Which means for thin peoples the diameter is increased and length will be decreased and for plus size people the diameter is decreased and the length will be increased. Both lathers are attached to each other with a lather for hand grab incase two peoples want to transport one Anteneh's Jerry Can.

This project does not completely solve their water need problem but it will ease their pain on the process of water fetching big time by providing a means to transport water with lower physical and mental energy expenditure, better comfort, better safety of physical health and lower cost. Lower physical and mental energy expenditure means the reduction in the amount of physical energy generation to overcome the concentrated weight which also leads to reduction in mental exhaustion because as the body gets tired so does the mind. Meaning imagine carrying x weight material on either left side or right side of your body. What will happen if you then carry x/2 weight of the same material on each side of your body? It will definitely add more stability because of the balance which leads to less effort to overcome the weight. This system will distribute not only on two side but also 360 degree equally. Currently when people carry the Jerry Can either on their back or their head they always lift their hands upward to support the Jerry Can. This hand elevation crates discomfort when walking in rough train but with this design there will not be any need of hand upward elevation beyond the chest area. The maximum hand lift they will make is only to support either the front part of the structure or the sides which has maximum elevation in the chest area. It also solves the friction problem between spinal chord and bottom edge of the jerry can when they try to consistently adjust elevation of the jerry can on their back.

Also, for people who fill water into a Jerry Can using a small can, it is very time consuming because the water inlet hole has small diameter and you will take longer time when you are pouring the water from the small cup. Anteneh's Jerry Can will solve this problem because the new Jerry Can have large diameter and will take less time to fill depending on the filler speed.

1.6 Demand Forecast

According to reports some 2.2 billion people around the world do not have safely managed drinking water services, 1.1 billion people lack access to water and 2.7 billion experience water scarcity at least one month a year. By 2025, two-thirds of the world's population may be facing water shortages and countries with the highest percentage of the population lacking basic access to water are in great risk like

- Eritrea (80.7% lack basic water services),
- Papua New Guinea (63.4% lack basic water services),
- Uganda (61.1% lack basic water services),
- Ethiopia (60.9% lack basic water services),

- Somalia (60% lack basic water services),
- Angola (59% lack basic water services),
- Democratic Republic of the Congo (58.2% lack basic water services),
- Chad (57.5% lack basic water services),
- Niger (54.2% lack basic water services),
- Mozambique (52.7% lack basic water services) and so on.

Therefore it is inevitable that people living in these zones will have to go to places where there is water source to fetch water. The location of the water is usually in places where there is no accessibility for wheel aid transportation and even if there is one the majority of the people do not afford it. So the peoples will have to use a Jerry Can to collect and transport the water just like they are doing to the current times.

1.7 Supply analysis of the product

Short term

In a study conducted by Water.org they found that 42% of the population in Ethiopia has access to a clean water supply. That means only 47,082,000 peoples out of the 112,100,000 have access to clean water. The remaining 65,018,000 needs to find clean water source which usually involves fetching water from some source using Jerry can to transport the water.

My goal is to distribute the product on a large scale but it is important to start with a small margins to 10,000 - 20,000 customers in the first year of launch. This will enable us to test the market and get feedback to improve any potential problems from the end users from all topography usage. On the second year of the product launch, we will progress to delivering 100,000 - 200,000 product per year. On the third year of the product launch, we will progress to delivering 300,000 - 400,000 product per year. On the fourth year of the product launch, we will progress to delivering 400,000 - 500,000 products per year. On the fifth year of the product launch, we will progress to delivering

600,000 - 1,000,000 products per year. In five years we will deliver 2,100,000 products at or maximum capacity.

Long term

The main measurement that is used to indicate the importance of implementing this solution is the reduction of health risk it creates for the society especially the women by providing a means to solve their water and sanitation problem leading to no poverty and no hunger. It is one of the very important measuring indicators in the 17 UN sustainable development goals which are Good Health and Well-being, no poverty, no hunger, clean water and sanitation, decent work and economic growth in sustainable cities and communities with industry, innovation and infrastructure. In the long run when we start delivering our product globally, we will be contributing to all UN sustainable development goals.

1.8 Price analysis of the product

This version of Anteneh's Jerry Can cost 295 Ethiopian birr. The cost analysis of the components that make up the total cost is listed below

- PVC pipe (110 millimeters in diameter and 2 meter in length) * 1 = 90.00 ETB
- PVC 90 degree elbow (110 millimeters in diameter) * 4 = 120.00 ETB PVC
- T connection (110 millimeters in diameter) * 1 = 50.00 ETB
- PVC tap (110 millimeters in diameter) * 1 = 35 ETB

There has been some development to solve this problem and the only other solution the world has come up with is rolling jerry can that avoids carrying the water. This is great invention but there is no way people like in the video can utilize that because for one the obstacles of the rough landscape, the holes, stairs and the slops will not allow them especially in muddy ground during rainy season and it is just easy to carry the jerry can than rolling. The other reason is the price of the rolling jerry can. In Kenya the rolling jerry can is sold at 60 US dollars and in India 30 US dollars and if you convert it in to our currency it reaches more than 2000 and 1000 Ethiopian birr respectively. And rural communities are complaining the normal jerry cans are becoming expensive which is sold from 250 to 300 Ethiopian birr. This version of Anteneh Jerry Can cost 295 Ethiopian birr. This cost will be reduced once we start manufacturing the Anteneh's Jerry Can using mold without any fitting in mass. It is not hard to see the level of innovation for this product because there is no similar product up to date and no one has ever thought of distributing the weight of jerry can to minimize its pressure impact on the body of the carrier. This design is very innovative in its core idea and approach to solve the problem.

1.9 Marketing strategy

1.9.1. The Product

In the first prototyping phase PVC is used to construct the Anteneh's Jerry Can because it is easily accessible and cost effective but PVC can become brittle and crack when placed in a few scenarios for prolonged periods of time like Ultraviolet Light Exposure, cold temperature, age and chemical exposure. This can be avoided by using other materials like Polypropylene. In this case there will not be any fittings and no glue will be used.

Figure 3 - Anteneh's Jerry Can

Figure 4 - Anteneh's Jerry Can

Figure 5 - Anteneh's Jerry Can

Figure 6 - Anteneh's Jerry Can

Figure 7 - Anteneh's Jerry Can

Figure 8 - Anteneh's Jerry Can

Figure 9 - Anteneh's Jerry Can

Figure 10 - Anteneh's Jerry Can

Figure 11 - Anteneh's Jerry Can

Figure 12 - Anteneh's Jerry Can

There have been many studies concerning effect of head load, hand load, single side shoulder loads on the spinal chord and lower back disorder. In the study of impact of load carriage on lumbar spine mobility among Indian workers during load carriage there has been found alterations in posture, gait, trunk and spine activity, which could be linked to lower back problem as seen in the following pictures

I iLMM fixed on the back of a subject.

Figure 13 – iLMM fixed on the back of a subject

Head load.

Figure 14 – head load analysis

Shoulder load.

Figure 15 – shoulder load analysis

There is no data to talk about the effect of Anteneh's Jerry Can due to lack of testing equipment but I want to test it to verify my claim. After I had the idea, the first thing I did was try to lift and travel 25 liter jerry can filled with water but I could not go too far. Then I build the prototype and filled 25 liters of water and then carried it. That is when I knew that I can travel long distance carrying this Jerry Can. This version of Anteneh Jerry Can cost 295 Ethiopian birr. This cost will be reduced once we start manufacturing the Anteneh's Jerry Can using mold without any fitting in mass.

1.9.2. Promotion

Newsletter by hackaday

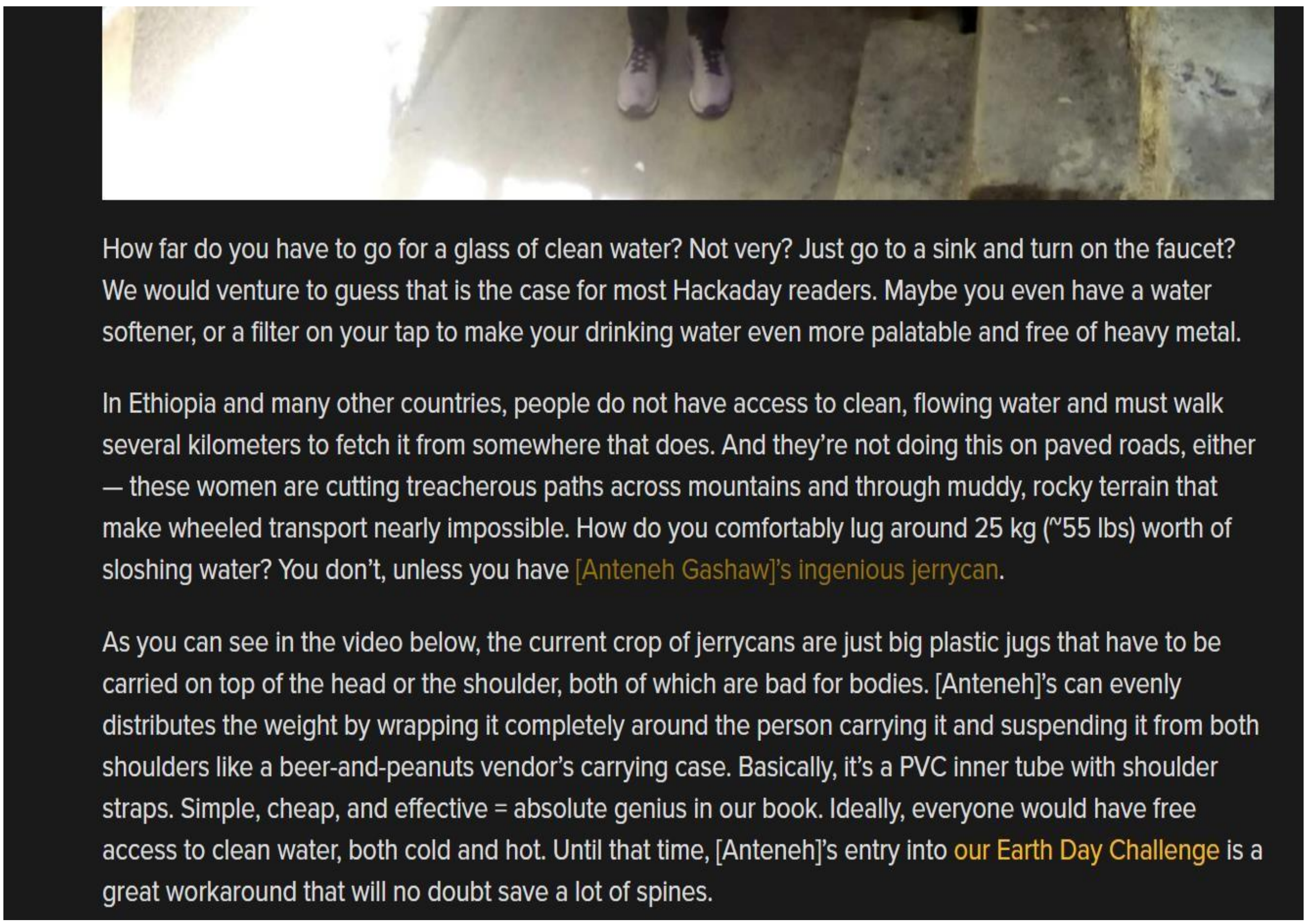
Fitting Hardware to the Human Body

It's easy to forget that a lot of the projects we work on are meant to be used by humans. You may have solved a problem, but has it been done in a way that's comfortable for a person to use?

In many parts of the world, the challenge of hauling water long distances is part of everyday life. From an economic perspective, a perfect sphere is the best shape for a water jug — it has the best overall strength while using the least amount of material. But hauling an orb of water is a challenge. Even a rectangle of water is not much better, and that's why Anteneh Gashaw designed a water jug built from a square of PVC pipe. It has shoulder straps and distributes the weight all around the wearer's torso.

Figure 16 – newsletter publication by hackaday

In the development of this project the writer contacted many experts of different fields to consider every possible aspect of problem that the writer can solve on making easy to carry the Jerry Can. When the writer asked a local doctor for his opinion concerning the health impact of carrying Anteneh's Jerry Can VS the standard Jerry Can, he said "it is preferred no one to carry water at all but if one must do it for survival I prefer the Anteneh's Jerry Can because I cannot think of any damages caused by carrying your product except a little body exhaustion depending on the carrier strength. It great product; there is no problem on the biological aspect". Blog by hackaday [https://hackaday.com/2021/03/25/earth-day-challenge-a-better-way-to- wrangle-water/](https://hackaday.com/2021/03/25/earth-day-challenge-a-better-way-to-wrangle-water/)



How far do you have to go for a glass of clean water? Not very? Just go to a sink and turn on the faucet? We would venture to guess that is the case for most Hackaday readers. Maybe you even have a water softener, or a filter on your tap to make your drinking water even more palatable and free of heavy metal.

In Ethiopia and many other countries, people do not have access to clean, flowing water and must walk several kilometers to fetch it from somewhere that does. And they're not doing this on paved roads, either — these women are cutting treacherous paths across mountains and through muddy, rocky terrain that make wheeled transport nearly impossible. How do you comfortably lug around 25 kg (~55 lbs) worth of sloshing water? You don't, unless you have [Anteneh Gashaw]'s ingenious jerrycan.

As you can see in the video below, the current crop of jerrycans are just big plastic jugs that have to be carried on top of the head or the shoulder, both of which are bad for bodies. [Anteneh]'s can evenly distributes the weight by wrapping it completely around the person carrying it and suspending it from both shoulders like a beer-and-peanuts vendor's carrying case. Basically, it's a PVC inner tube with shoulder straps. Simple, cheap, and effective = absolute genius in our book. Ideally, everyone would have free access to clean water, both cold and hot. Until that time, [Anteneh]'s entry into our Earth Day Challenge is a great workaround that will no doubt save a lot of spines.

Figure 17 – blog publication by hackaday

PROTOTPE DEMONSTARTION VIDEO LINK- https://vimeo.com/653211188

This project has been published in many websites as seen below

- Hackaday web site- https://hackaday.io/project/182062-antenehs-jerry-can
- MIT https://solve.mit.edu/challenges/resilient-ecosystems/solutions/39325
- Create the future https://contest.techbriefs.com/2021/entries/consumer-product-design/10856

II. TECHNICAL ANALYSIS

2.1 Load distribution

In order to analyze the actual numerical load distribution of the structure, we need to figure out the weight per length of the pipe throughout the entire structure. This can be calculated through the following analysis

$$\textbf{Water filled Pipe Weight} = \textbf{Weight of empty pipe} + \textbf{Weight of water}$$

Weight of empty pipe

$$\textbf{Weight of empty pipe} = \textbf{Density of the pipe X Volume of the pipe}$$

$$\textbf{Volume of the pipe} = \textbf{Pipe cross sectional area X length of pipe}$$

$$\textbf{Pipe cross sectional area} = \pi \frac{(OD^2 \times ID^2)}{4}$$

Weight of water

$$\textbf{Weight of water} = \textbf{water density} \times \textbf{internal pipe cross sectional volume}$$

$$\textbf{Internal pipe cross sectional volume} = \textbf{length of pipe} \times \pi \frac{(ID^2)}{4}$$

Large size

Internal diameter (ID) = 110mm = 0.11m

Outer diameter (OD) = 112mm = 0.112m

Length of the pipe (L) = One side length × 4 = 660mm × 4 = 2,640mm = 2.64m

Density of pipe = 1380Kg/m^3

Density of water = 1000Kg/m^3

$$\text{Water filled Pipe total Weight} = \left(1380\text{Kg/m}^3 \times \pi \frac{(\text{OD}^2 \times \text{ID}^2)}{4} \times \text{L}\right) + \left(1000\ \text{Kg/m}^3 \times \text{L} \times \pi \frac{\text{ID}^2}{4}\right)$$

$$= \left(1380\text{Kg/m}^3 \times \pi \frac{((0.112\text{m})^2 \times (0.11\text{m})^2)}{4} \times 2.64\text{m}\right) + \left(1000\ \text{Kg/m}^3 \times 2.64\text{m} \times \pi \frac{(0.11\text{m})^2}{4}\right)$$

$$\text{Water filled Pipe total Weight} = 0.43\text{Kg} + 25\text{Kg}$$

$$\text{Water filled Pipe total Weight} = 25.43\text{Kg}$$

$$\textbf{The load distribution of the single side} = \frac{(0.66\text{m} \times 25.43\text{Kg})}{2.64\text{m}}$$

$$\textbf{The load distribution of the single side} = 6.3575\text{Kg}$$

Small size

Internal diameter (ID) = 160mm = 0.16m

Outer diameter (OD) = 162mm = 0.162m

Length of the pipe (L) = One side length × 4 = 310mm × 4 = 1,243mm = 1.24m

Density of pipe = 1380Kg/m^3

Density of water = 1000Kg/m^3

$$\text{Water filled Pipe total Weight} = \left(1380\text{Kg/m}^3 \times \pi \frac{(\text{OD}^2 \times \text{ID}^2)}{4} \times \text{L}\right) + \left(1000\ \text{Kg/m}^3 \times \text{L} \times \pi \frac{\text{ID}^2}{4}\right)$$

$$= \left(1380\text{Kg/m}^3 \times \pi \frac{((0.162\text{m})^2 \times (0.16\text{m})^2)}{4} \times 1.24\text{m}\right) + \left(1000\ \text{Kg/m}^3 \times 1.24\text{m} \times \pi \frac{(0.16\text{m})^2}{4}\right)$$

$$\text{Water filled Pipe total Weight} = 0.9\text{Kg} + 24.9\text{Kg}$$

$$\text{Water filled Pipe total Weight} = 25.8\text{Kg}$$

$$\textbf{The load distribution of the single side} = \frac{(0.31\text{m} \times 25.8\text{Kg})}{1.24\text{m}}$$

$$\textbf{The load distribution of the single side} = 6.45\text{Kg}$$

Center of gravity

In order to find the centroid of the structure let us divide the compound shape into basic shapes. In this case, it has four rectangles. Now let us name the four divisions as Area 1, Area 2, Area 3 and Area 4.

Area 1 = 0.782m × 0.162m = 0.126684m^2

Area 2 = 0.458m × 0.162m = 0.074196m^2

Area 3 = 0.782m × 0.162m = 0.126684m^2

Area 4 = 0.458m × 0.162m = 0.074196m^2

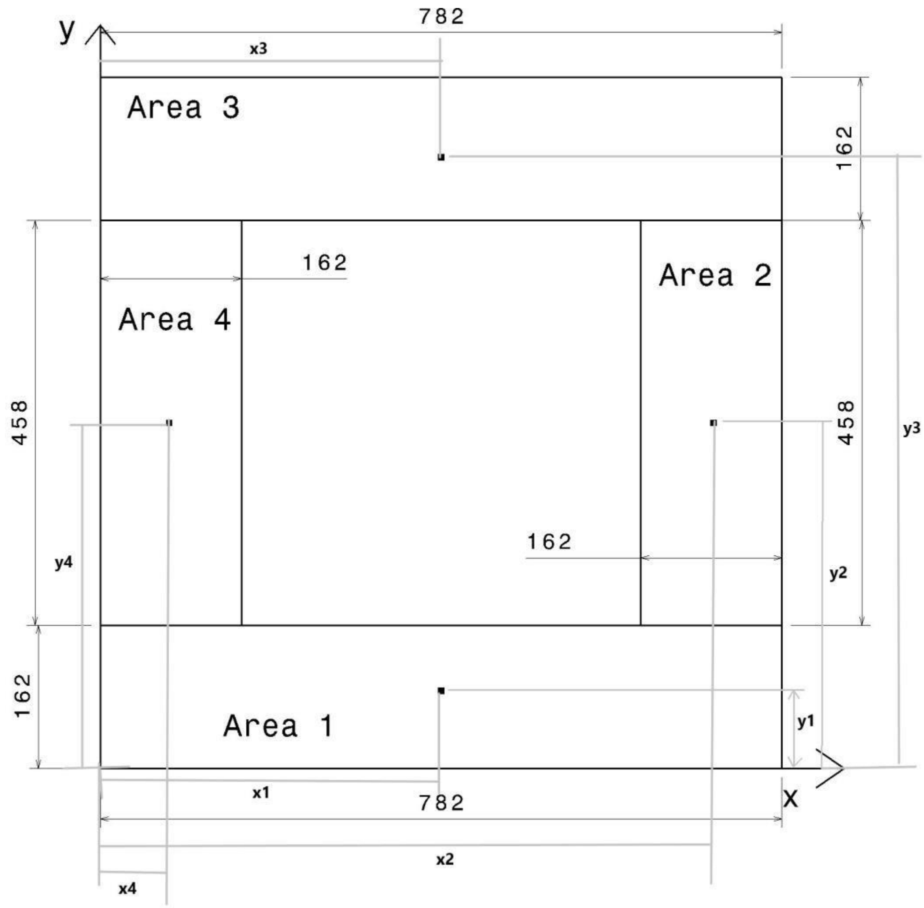


Figure 15- Anteneh's jerry can design analysis

Area Name	Area (A)	x	y	Ax	Ay
Area 1	0.126684	0.391	0.081	0.0495	0.01
Area 2	0.074196	0.701	0.391	0.052	0.029
Area 3	0.126684	0.391	0.701	0.0495	0.0888
Area 4	0.074196	0.081	0.391	0.006	0.029
Total	0.4			0.157	0.157

Cx = ∑Ax / ∑A = 0.157 / 0.4 = 0.3925

Cy = ∑Ay / ∑A = 0.157 / 0.4 = 0.3925

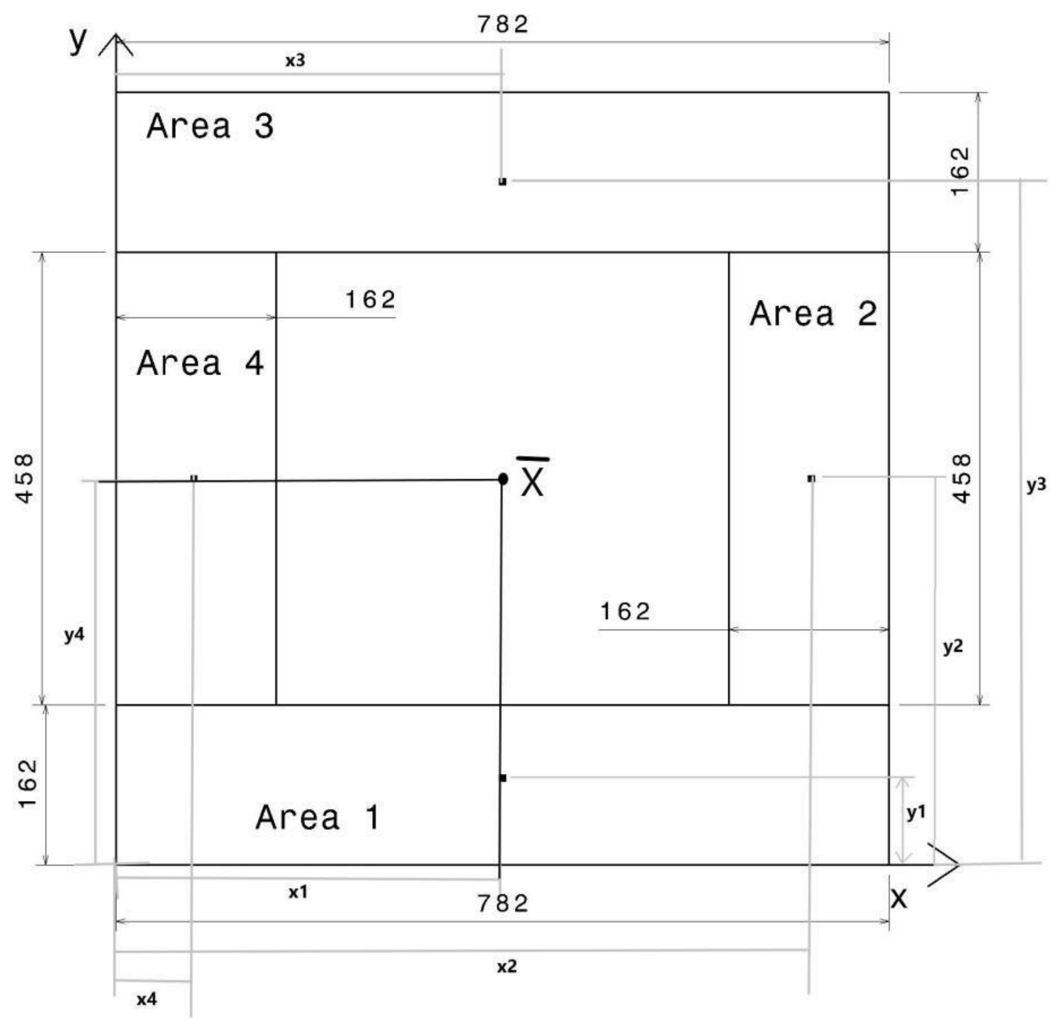


Figure 16 – center of gravity