

**A**  
**MAJOR PROJECT-1**  
**on**  
**SAND FILTER MACHINE**

submitted in partial fulfillment for the award of the Degree of

Bachelor of Technology

In

Mechanical Engineering

By

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# Rajiv Gandhi University of Knowledge Technologies

(A.P. Government Act 18 of 2008)

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## CERTIFICATE

This is to certify that the Major project Study report on “**SAND FILTER MACHINE**” submitted by **B.Hareesh (R170655), T.Jagadeesh(R170330), S.Balaji (R170188), K.Raj kumar (R170723), M.Dileep kumar (R170988), C.Jaswanth Sai (R170508)** is the bonafide record of the work carried out by him, is accepted as the Major Project Study Report submitted in partial fulfillment for the award of the Degree of Bachelor of Technology in Mechanical Engineering during (2022-23) at IIIT-RK Valley, RGUKT-AP.

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WE are grateful to **Mr G.Naveen Kumar**, HOD of Mechanical engineering for providing excellent computing facilities and a congenial atmosphere for progressing with my project.

At the outset, I would like to thank RGUKT for providing all the necessary resources for the successful completion of my course work.

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# **SAND FILTER MACHINE**

## **Abstract**

In recent years, the use of sand filter machines has gradually increased. However, most sand filter machines are quite large and difficult to move. Also, the price to own it is quite expensive.

With that, there are a large number of construction workers who have to exert their energy to make their own sand filter in the traditional way. However, there are some problems that arise with using traditional sand filters. Among them, the workers have to exert their energy to build a sand filter. In addition, fine sand will mix with foreign matter when fine sand falls to the ground. Therefore, we have created a product that can facilitate the work of construction labor on construction sites. Our main goal to create a sand filter machine is to reduce the workload of construction workers when they want to filter or use a sand filter. It runs using an electric motor that will shake the filter.

We just need to put the sand on the filter and the sand will be filtered with the resulting shake. The sand filter machine is equipped with a funnel as a path for the fine sand to fall. All we have to do is park the wheelbarrow next to the sand filter and the sand will go directly into the wheelbarrow. It is different from the traditional sand filter where the fine sand falls to the ground and we have to put it in a wheelbarrow. It will use more construction workers. The most important thing is that this filter machine is easy to move in the construction area because it is equipped with two suitable wheels. It will make it easier for construction workers to filter sand from one place to another.

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# **1.INTRODUCTION**

The project that we intend to implement for the final year project is a sand filter machine. This idea came about when we saw the difficulties of contract workers who needed to build sand filters on their own using the wood. It has wasted energy consumption as well as time as it is necessary to build the filter before it can be used. Additionally, the sand filters use a lot of energy as users need to take the sand and dump the sand on the filter nets. After that, the filtered sand would have to be taken again using a sand shovel to be placed in a stroller and taken to a site that needs to use the fine sand. With that we think of an innovation to reduce the energy and time of contractor workers by creating a sand filter machine that uses engine power to get the good qualities of sand. By using an existing sand filter, contractor workers do not get the good qualities of sand because the filter has only one layer of filter net. Furthermore, filtered sand with existing sand filters will mix with foreign objects because the sand falls on the ground and there is nothing lining the sand. With the machine we wanted to create this, filtered sand could be inserted into the wheelbarrow. With that, sand will not mix with foreign objects and it can also save energy.

The sand filters we want to create will help contractor workers to facilitate their work. Manpower can be reduced when using this sand filter machine. We put two wheels on this machine so that the machine is easy to move on the construction site. This filter machine we put three different types of filter coating so that it can get good qualities of sands. We use the vibrator engine to vibrate the filter part so that the sand can descend quickly.



## **1.1 Background of Study**

This study deals with generating a new idea to produce a sand filter machine with a new design. Producing sand filter machines for small building's construction and household because of some problems that occur. Plus to realize our goal in technological advances based on modern principles. Explosive ideas based on statements of problems that have been recorded from studies on quality of fine sand and workload used. Many things and research support us to create this product as our main project. We create and upgrade a product that can filter the quality sand without mixing it with foreign matter and reducing the workload of filtering sand. It would present 2 functions in 1 concept as well.

## **1.2 Problem Statement**

The reason for the idea of building this sand filter is that we have seen contractor workers use their energies in abundance just to get fine sand. They need to build sand filters that need to be made using the used wood to filter the sand. From there, they waste their energy as well as their own time. Additionally, we realize that filtered sand using the existing sand filter will mix with foreign matter because the filtered sand falls directly onto the ground without any reason. We do not know that there are many foreign objects in construction sites such as nails, iron, stone and so on. The existing sand filters cannot be brought anywhere because there is no wheel. It makes it difficult for workers to bring fine sand to areas requiring fine sand. This is because they need to put the sand in the cart beforehand and then bring the sand to where it should be.

## 1.1 Objectives

- Get the good quality of sands

Our goal to build the sand filter machine is to get the good quality of sands. This sand filter machine is equipped with a funnel where the fine sand will be dropped into the funnel. After that, the fine machine will be dropped into the wheelbarrow that is placed beside the sand filter machine. Contrasts with the traditional sand filter where the sand will drop on the ground. So, the sand will mix with the foreign things. But, using this sand filter machine will avoid the fine sand from being mixed with foreign things because the fine sand will drop into the wheelbarrow.

- Reduce workload

Using the traditional way, the construction workers need to build the sand filter first before they are able to use that to filter the sand. That will use a lot of workload just to build it. So we built this sand filter machine to reduce the construction worker workload. Besides, this sand filter machine uses the electric motor that will shake the net. Users just need to put the sand on the net of the sand filter machine.

- Easy to moving at construction area

This sand filter machine has two wheels that can make this sand filter machine able to move easily at construction areas. At construction sites, fine sand might be required at different areas. So the workers just need to bring this sand filter machine to that place.

## 1.4 Scope

- i. Accommodate 20 – 25 kg of sand - Can accommodate sand for 20 to 25 kg at a time.
- ii. Site construction – For the purpose of this sand filter machine can be moved to the construction site.
- iii. Small building – Suitable to use it for small buildings like houses, huts, mosques and so on.

## **2.LITERATURE REVIEW**

### **2.1 INTRODUCTION**

Sand substance is one of the most important things in the industrial world. Nowadays the industry needs the sand sub stand that is already a process known as sand product. As we know the sand sub stands are mixtures with a variety of other components such as dirt and metal.

Usually, people use their hands to sieve sand and absolutely it will take much time to do it. But now, we have some ideas to modify this sieve sand machine by using the power of a vibration motor system. With the invention of this sieve sand machine, it can be overcome and makes the construction contractor's work more convenient. It can also be used in the manufacturing of mold industries especially for the sand casting process. By using this sieve sand machine, we can save more time, energy and cost. Indirectly, it will improve the manufacturing qualities. This machine is fixed with wheels, so it is easy to move and to keep. Besides, it is easy to use even by unskilled workers. Furthermore, it is easy to operate and the spare parts can be obtained easily on the local market Therefore, this machine is suitable to use in the "Industri Kecil dan Sederhana (IKS)" and training institutes such as Polytechnic and MARA Training Institutes (IKM) for training purposes

So to make the process more efficient new technology is needed to help increase the productivity so the human power can be reduced and also can cut the cost of the process.

### **2.2 History Of Sand Filter Machine**

For years sand has been the most important thing in the human community. Most sediments, including sand, are made up of the fragments that result when rock is broken down by wind and rain (weathering). Generally, they start as larger fragments (gravel), which are broken

down as rivers carry them downstream; the finer the particle, the further it has traveled. In other words, large bits of gravel are plentiful on the banks close to the head of a river. As you travel downstream, gravel becomes finer into cobble, pebble, granule, and eventually turning into sand, and finally flowing into the ocean, where these sediments deposit. That is why, by carefully analyzing the mineral content and chemical composition of sand on riverbanks, beaches and ocean floors, we are able to determine which formation, indeed what kind of rock, it originated from. Most sediment, including sand, is made up of the fragments that result when rock is broken down by wind and rain (weathering). Generally, they start as larger fragments (gravel), which are broken down as rivers carry them downstream; the finer the particle, the further it has traveled. In other words, large bits of gravel are plentiful on the banks close to the head of a river. As you travel downstream, gravel becomes finer into cobble, pebble, granule, and eventually turning into sand, and finally flowing into the ocean, where these sediments deposit. That is why, by carefully analyzing the mineral content and chemical composition of sand on riverbanks, beaches and ocean floors, we are able to determine which formation, indeed what kind of rock, it originated from. Most sediments, once formed in the ocean, subduct to the Earth's interior (mantle) from a trench with a subducting tectonic plate. However, some pieces tear loose from the whole, and accreted to the hanging wall continental plate, once again becoming part of a continent. Geological structures formed in this way are called accretionary bodies (prisms). Accretionary bodies are characteristic to the subduction zone like Japan, which make up a large part of the Japanese islands. Formations and rocks form and break down, form and break down, again and again. During that process minerals also break down and alter, even transform into other minerals, again and again. However, some stubborn minerals simply ride these cycles out, refusing mechanical breakdown or chemical alteration at all. These minerals bear the marks of the processes of geological history. By carefully analyzing them, geologists are able to infer the geological history of the earth itself. Most sediments, once formed in the ocean, subduct to the Earth's interior (mantle) from a trench with a subducting tectonic plate. However, some pieces tear loose from the whole, and accreted to the hanging wall continental plate, once again becoming part of a continent. Geological structures formed in this way are called accretionary bodies

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**Figure 2.1-Traditional sand filter [1]**

The figure 1.1 above shows the process has been used by people before us the ancestor way to sieve the sand. And collect the sand they wanted. This process sieves the sand into its size depending on the size of the net being used. This smooth sand or the product is usually used as the main material in construction to build buildings or houses. Smooth sand is required to achieve better quality product examples in making sand casting or making any product based on sand.

### **2.3 Sand**

Sand is a quartz-based material. The sand is practically sized between 4.75mm and 0.15mm and is common sand used to produce concrete and plaster. According to research, sand is available from mines or rivers. The sand mining is sand which was excavated from the mine. This sand is widely used and usually divided into two types, namely fine and rough sand. Fine sand which contains little soil is usually used for mixing along with fine sand from rivers and cement. The mix produces

a mixture of plastic and is easy to attach although its strength is somewhat less. Coarse sand is suitable for use to combine concrete and make blocks and cement bricks. According to research, river sand's quality is good and does not contain excessive impurities. Concrete mixing using sand from the river is harder to work. Therefore the additives are named facilitators and are sometimes used to improve workability. If the mixer is not used, the mix needs more cement to get that work pleasure the same. Sand obtained from seafront is not suitable for use. The beach sand contains salt that will cause a pelvic event on the building's surface.

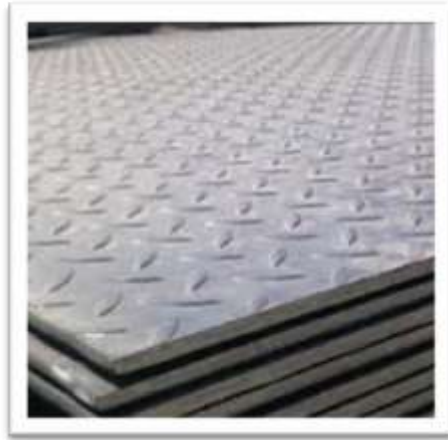


**Figure 2.2- Sand [2]**

## **2.4 Comparison of Plates**

### **2.4.1 Steel Plate**

This steel plate is usually used for the construction of artificial materials because the steel plate has no strength. Usually this steel plate is used as the connector material of building structure building. Due to its strong steel properties making this kind of steel plate hard to shape. And of course the selling price of this steel plate is quite good for every single piece



**Figure 2.3-Steel Plate [3]**

#### **2.4.2 Aluminium Plate**

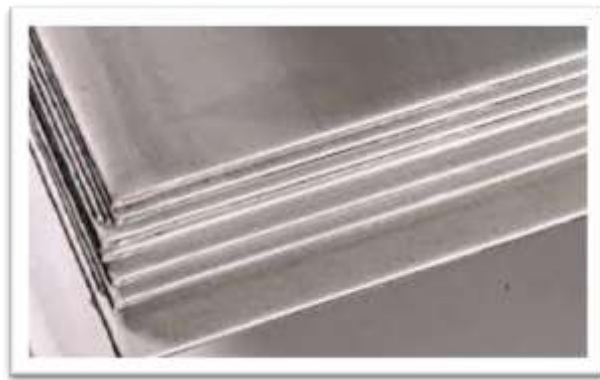
Aluminum plates are lightweight and strong sheet plates or metal plates. Aluminum plates have anti-corrosion properties, are non-flammable and resistant to any kind of weather. This type of plate itself is easily formed, so widely used in industry as in advertising needs. There are two types of aluminum in it, aluminum cast which can transmit electrical and aluminum forged tensile strength. Aluminum also produces electric conductors that can deliver electricity well, so usually for aluminum plates that are used as raw materials in advertising or advertising industries will be carried out anodizing process if the process of making aluminum does not deliver electricity that is then heated to resist heat or heat water.



**Figure 2.4-Aluminium plate [4]**

### **2.4.3 Stainless Steel Plate**

Stainless Steel Plates is a type of plate. This one is a stainless steel plate that is often used in the automotive industry as a material of vehicle bodybuilders and is also widely used as a material of household appliances. Many of the advantages of stainless steel plates are one of them is having a high rust endurance. And many industrial manufacturers do combinations or finish increasing or producing better stainless steel quality. So we will use this stainless steel for our project.



**Figure 2.5-Stainless Steel Plate [5]**

## **2.5 Comparisons of Wheel**

### **2.5.1 Wheelbarrow wheel**



**Figure 2.6-Wheelbarrow Wheel [6]**



We use wheelbarrow tires as wheels for this sand filter machine moving. We put as much as two wheelbarrow tires to accommodate the load of the sand filter machine as well as facilitate the movement of this machine to move even in a muddy area. In the event of damage to the wheels or the wheel is leaked, it is easy to repair. Additionally, wheelbarrows are very easy to find at any hardware shop.

### **2.5.2 Trolley wheel**



**Figure 2.7 Trolley Wheel [7]**

The trolley wheels are too small and cannot afford to bear heavy loads. The wheels are not able to go through uneven construction areas. The wheels are also durable and easily broken.

### **2.5.3 Bicycle tyre**



**Figure 2.8 Bicycle Tyre [8]**

This tyre is also capable of being used as a wheel on our sand filter machine. But there are some factors that negate the suitability to apply as a wheel on our machine. Among the factors is because the sizing of this tyre was too big. Besides that, the width of this tyre is not suitable to use at construction areas. The rubber of this is very thin and easy to leak when used at construction sites. This is because at the construction site, there are many sharp objects like nails, stones and so on. The rim also cannot accommodate overloaded loads.

## **2.6 Electric motor**



**Figure 2.9-Electric Motor [9]**

This electric motor is used to shake the filter at this sand filter machine. This motor speed is 1500 rpm and 4 UF. There was an adjustable one to adjust the speed.

## **2.7 Sand filter net**



**Figure 2.10-Sand Filter Net [10]**

This sand filter machine uses a sand filter net of suitable size. The size of the sand filter net's particle hole is not too big and not too small. So the sand might be able to go through over the net.

## **2.8 Summary**

In this chapter, we talk about the history of sand, sand, and materials we will use to make our products. A careful study is made to identify the materials used to make our products appropriate into the costs we estimate. The material that we identify is affordable with the cost we spend.

## **3 METHODOLOGY**

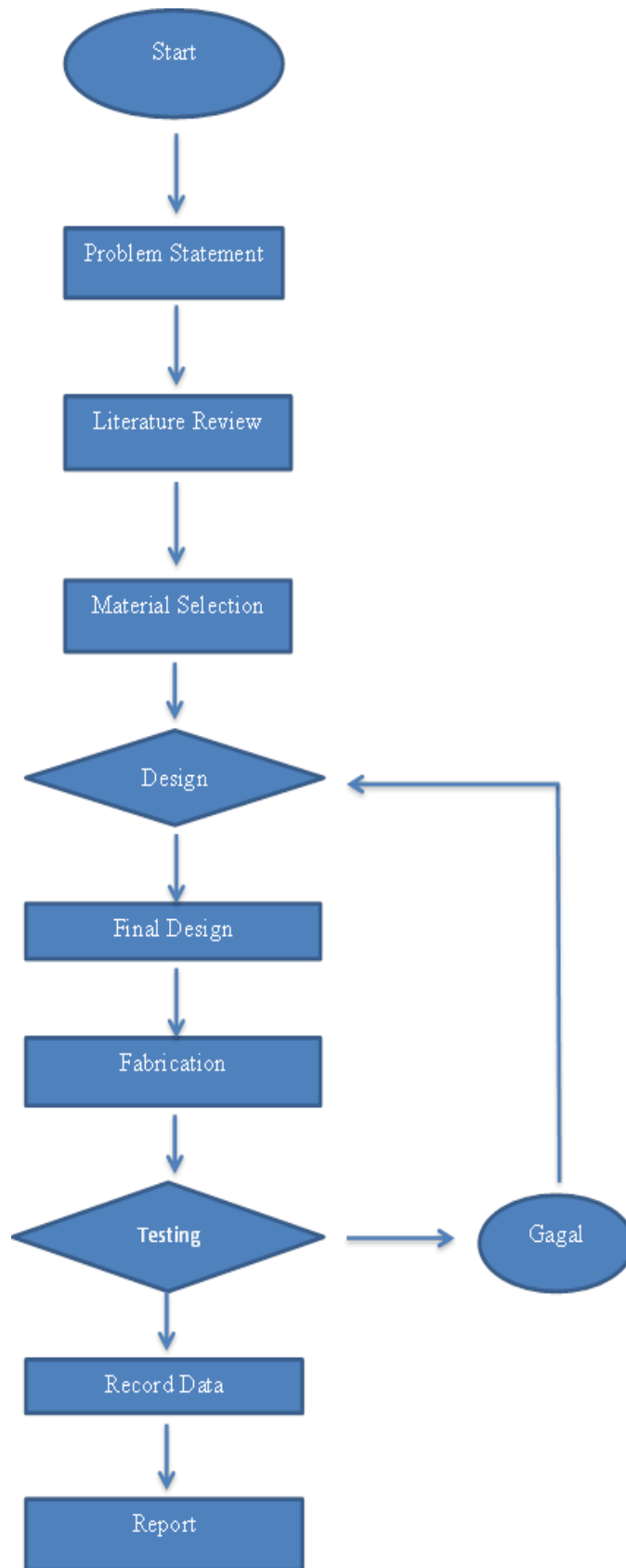
### **3.1 Introduction**

This chapter will cover the detailed explanation of methodology that is being used to make this project complete and working well. Many findings from this field mainly generated from research of others to improve this project.

Methodology is the process of preparing a project that you want to create. Design method or methodology is one of the methods used in developing or designing a project. The methodology used is to help create a creative and innovative project to achieve production objectives in the final project. The design of this machine takes into account all aspects and must also meet the needs of the user to make sand separation in a construction. The design you have created is not that complicated. In addition, the design of the "Modern Sand Filter" project tool is also easy to understand because it has its own basic parts. The size and balance of this project have also been taken into account to facilitate the learning session.

### **3.2 Flow Chart**

The diagram shows the flowchart of the process for the success of this project. In addition, there are also several steps to be taken as well should be followed in implementing this project. The step is as shown in figure. From the charts of this flow, the activity record for the success of this project can be done smoothly and consistently.



**Figure 2.11-flow chart**

### **3.3 Design Process**

The inventive process is part of the work which needs to be done to create a new project or modifications to a project or better known as process improvements. Some of the necessary steps done in the inventive process are:

- i. Identifying problems.
- ii. Creating ideas.
- iii. Design and selection of projects.
- iv. Project planning.

#### **3.3.1 Project Selection**

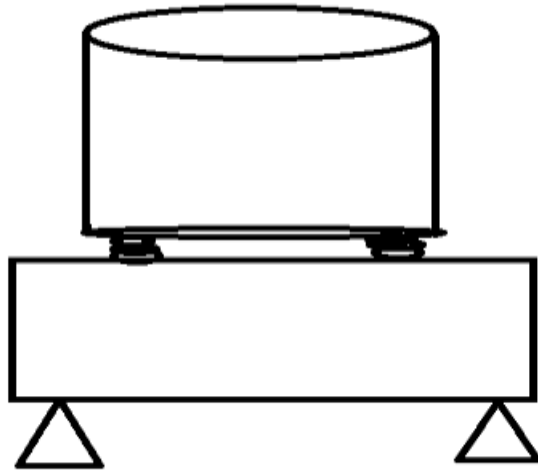
In the process of project selection, criteria and certain factors should be emphasized in terms of selection of materials, costs, and security. The material used must match with the product generated.

#### **3.3.2 Project Planning**

The process of forming the appropriate framework and manufacturing techniques as well need careful planning and planning because of its structure to be made in line with the product among which review the requirements appropriate equipment and materials, material selection of the economy, and quality and user-friendly. To plan a project-making process this requires a neat plan to be able to conform to what is required in addition to saving costs so there is no available faulty execution or purchase of excessive equipment implementation of this project.

### 3.4 Research Design

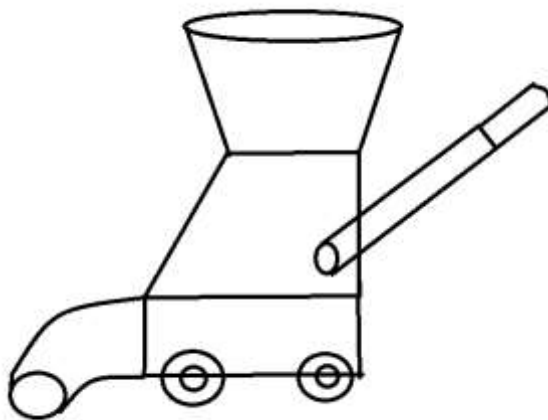
#### 3.4.1 First Design



**Figure 3.1-First Design**

This is the first design of our project. But after having a discussion with our supervisor, this design is irrelevant to being created because it is difficult to filter for sand.

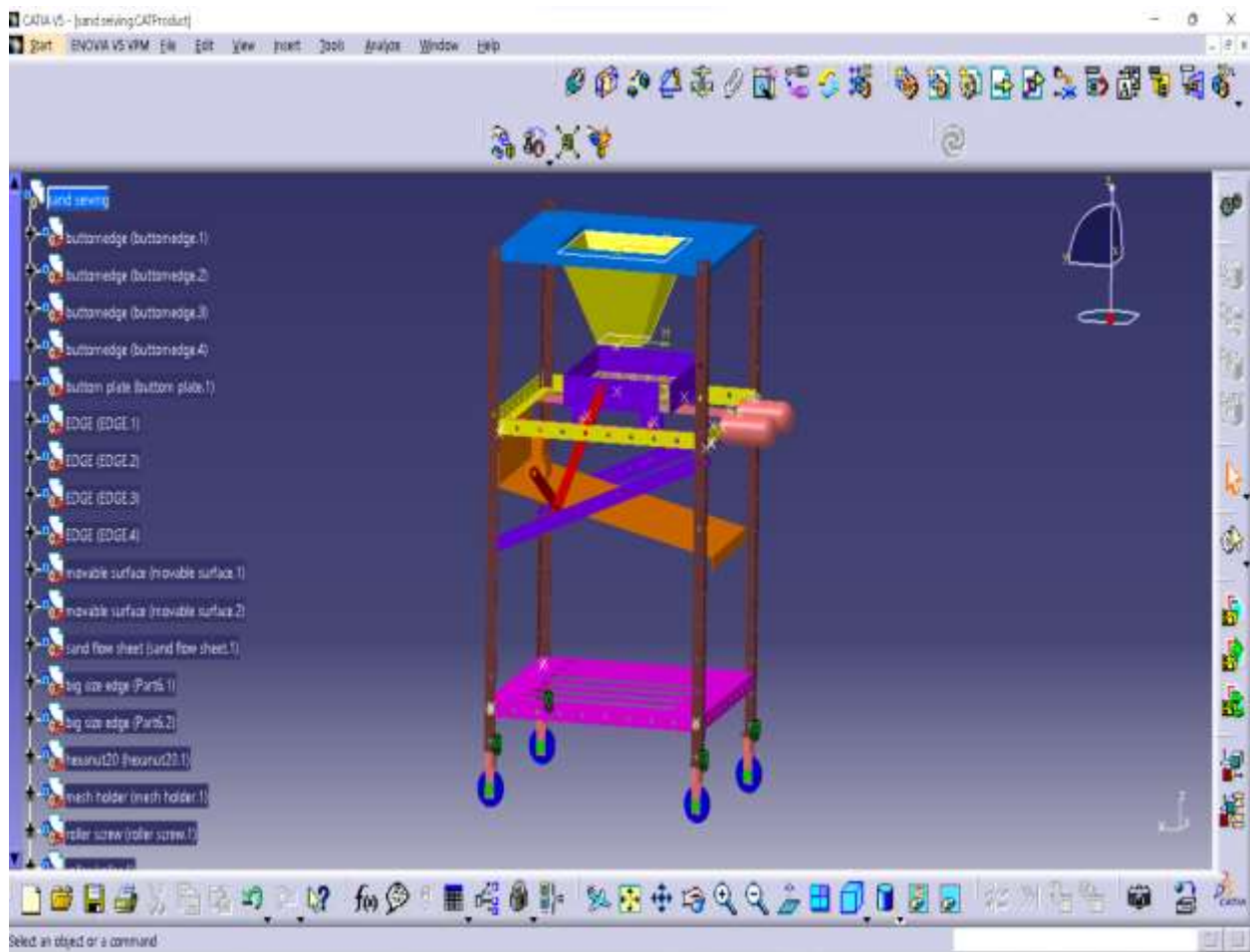
#### 3.4.2 Second Design



**Figure 3.2-Second Design**

This is the second design for our project. There have been improvements made for this second design. But once we reviewed it, we looked at it more thoroughly and all the discussions had been made, we decided to create another design for our project.

### 3.4.3 Third Design



**Figure 3.3-Third Design**

The third design is our final design that we will choose. Based on our discussion with each other and our supervisor, we made the decision that we will take this design as our last design.



## 4. DESIGNING PROCESS

### 4.1 MODELING OF SAND FILTER MACHINE USING CATIA

The modeling of the sand filter is done in CATIA V5R21 software , it is designed according to the required measurements . all the designed parts are having different types of geometrical cross Sections. all the design parts were done by using part design toolbar and sketcher toolbar.

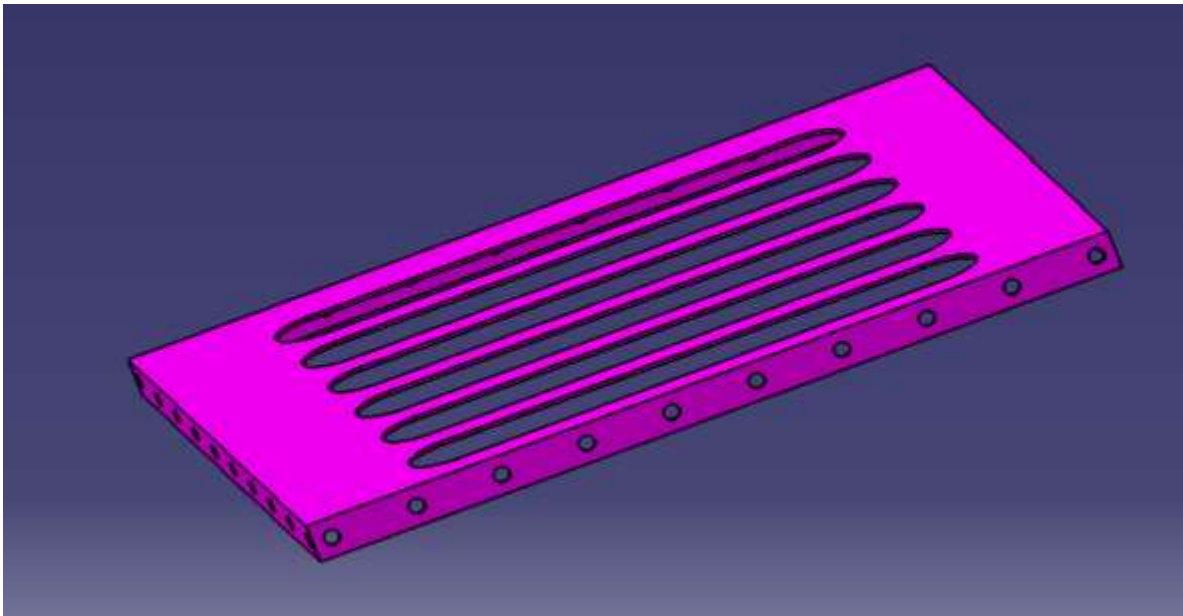


Figure 4.1-bottom plate Design

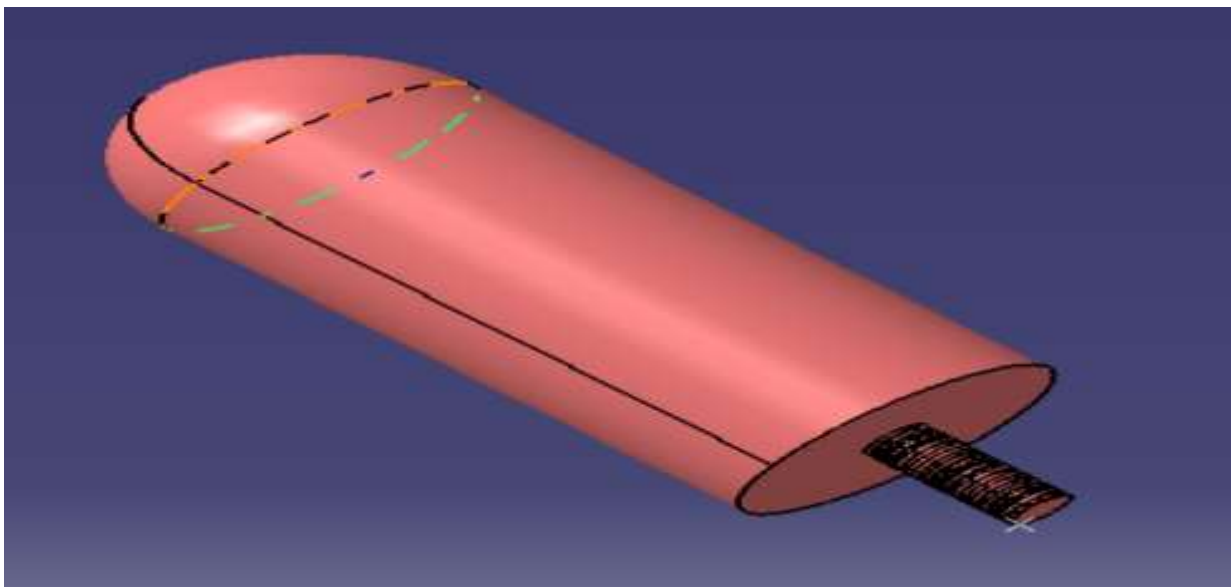


Figure 4.2-Handle Bar Design

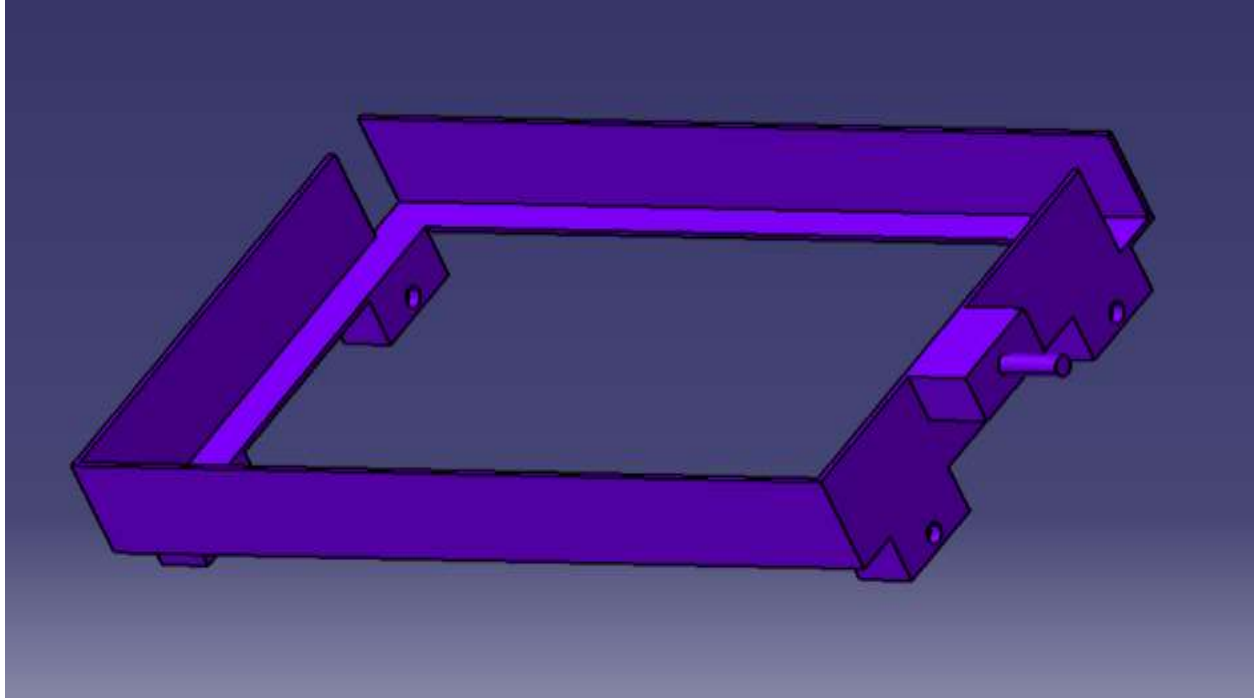


Figure 4.3-mesh holder

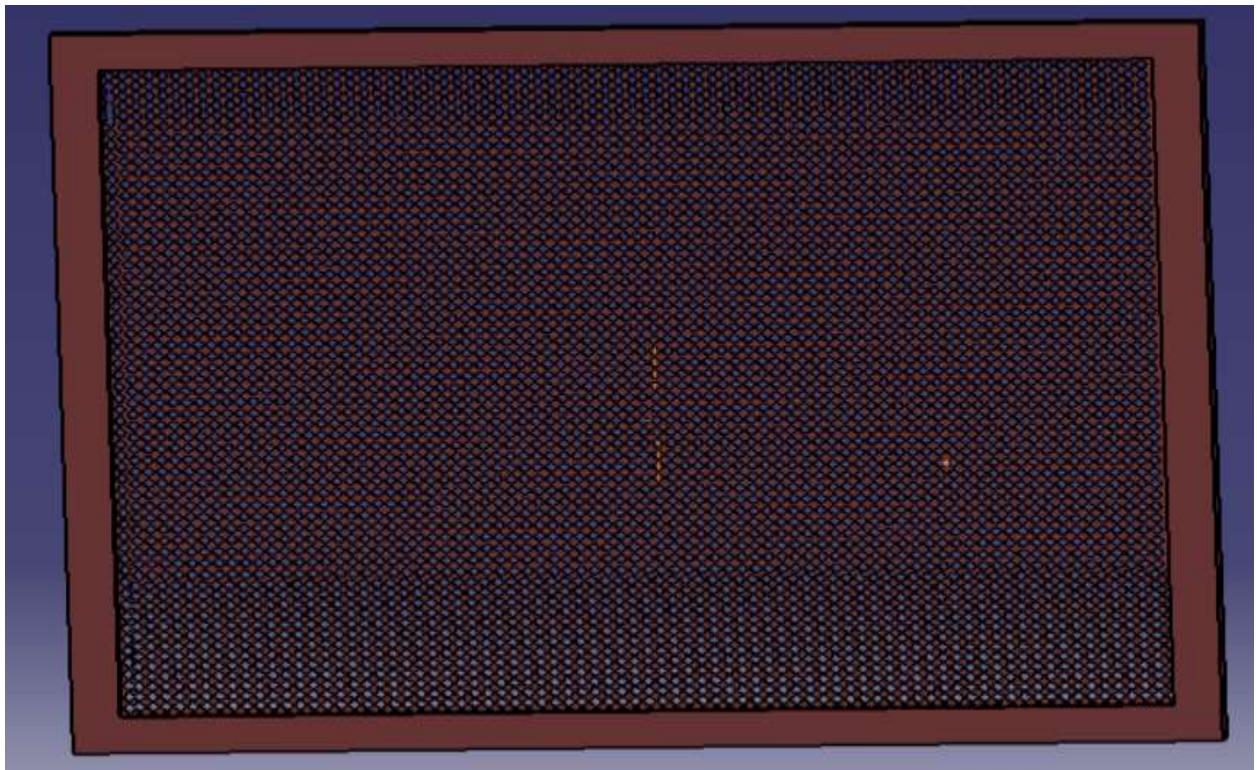
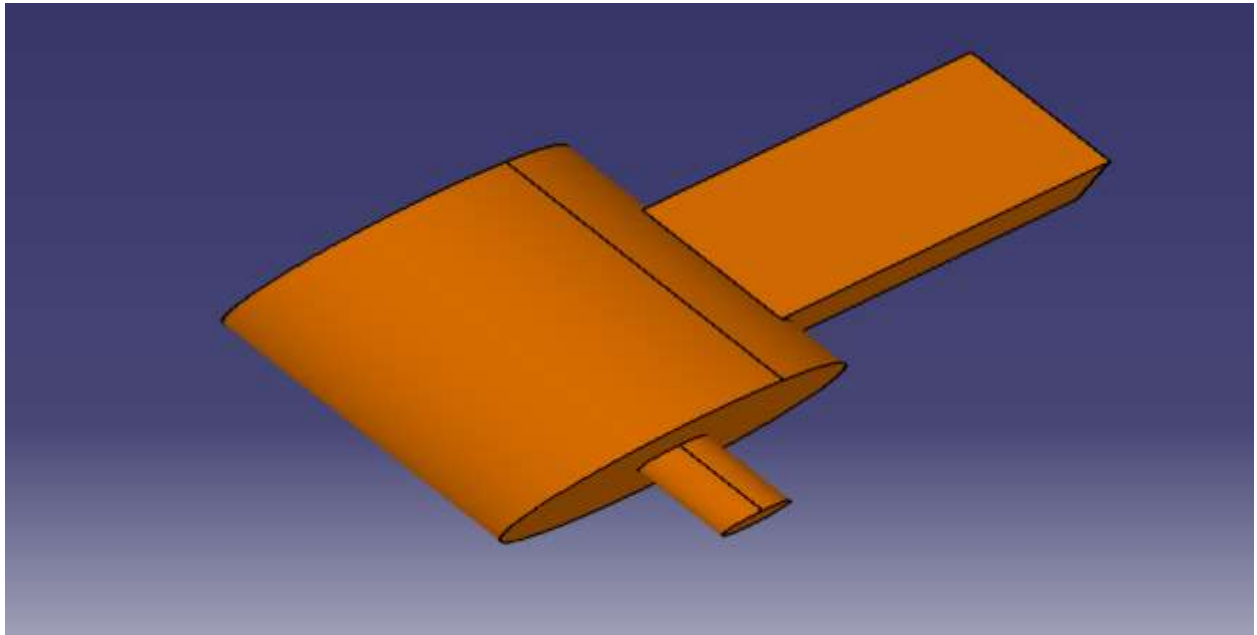
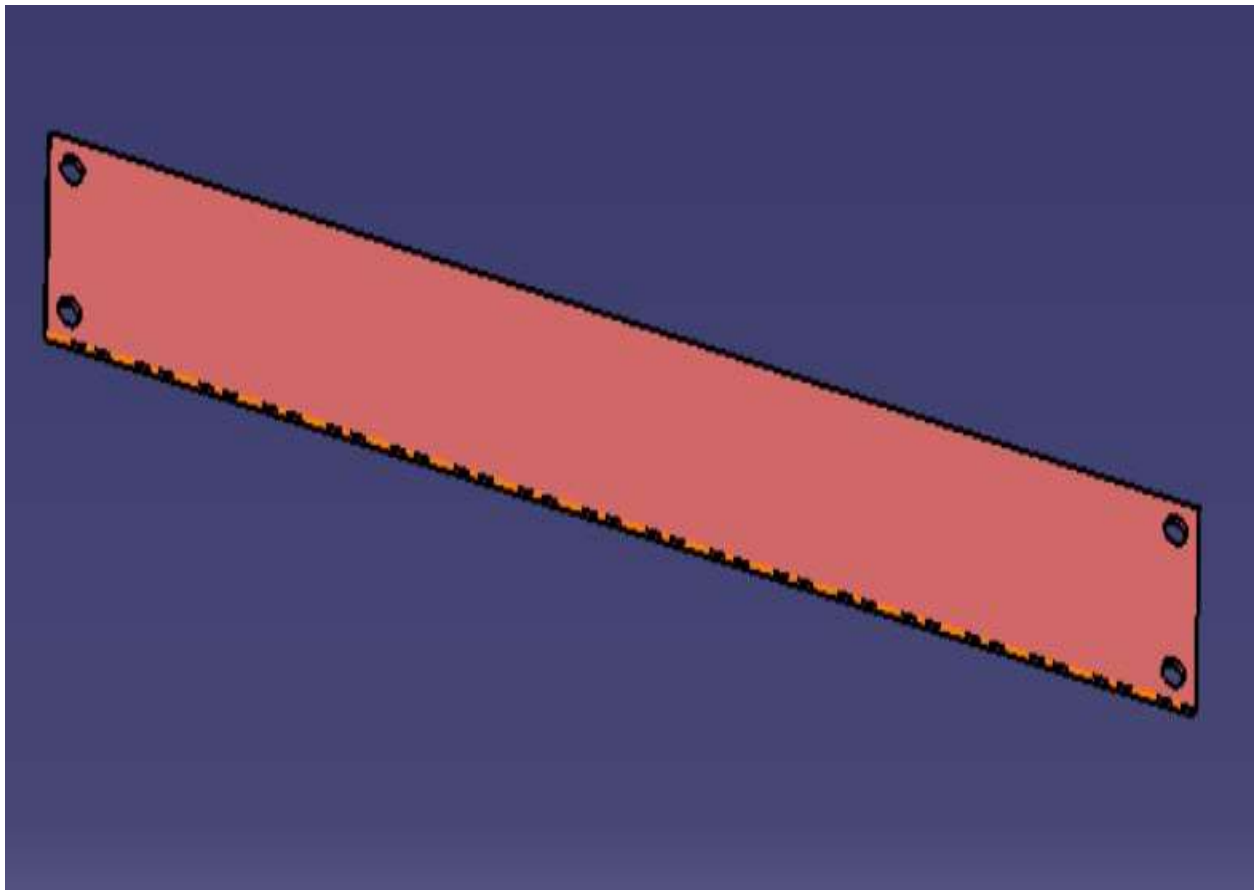


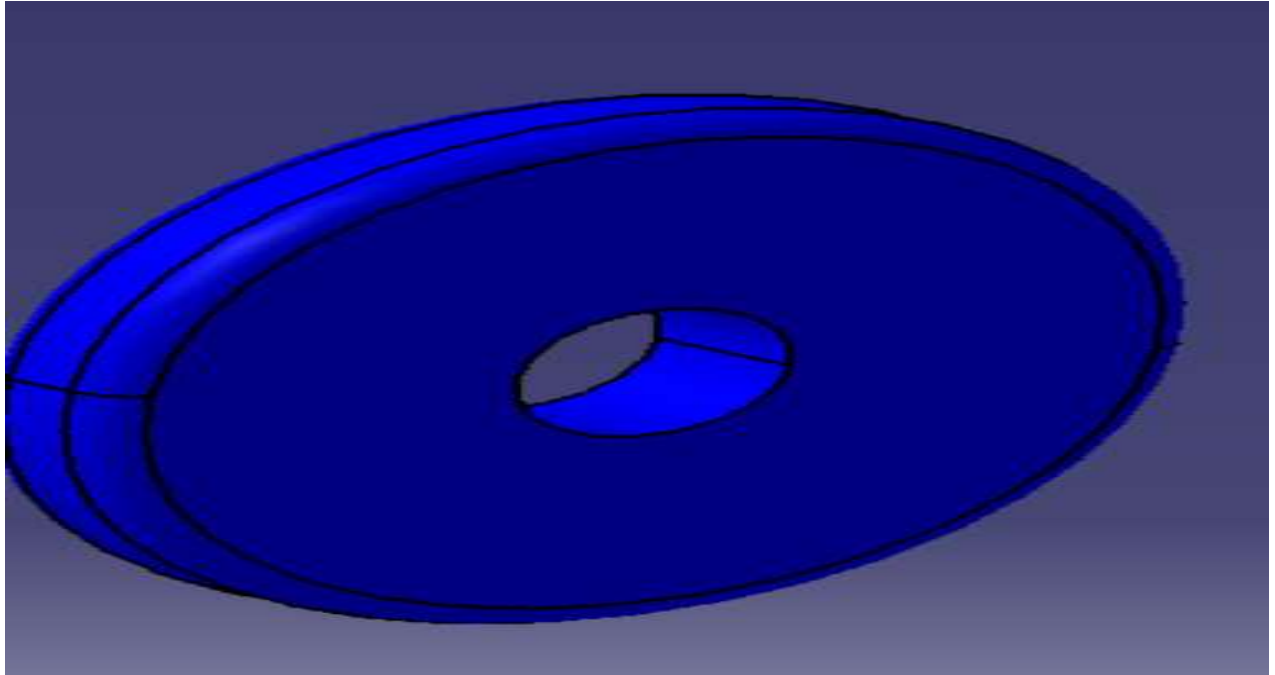
Figure 4.4-mesh



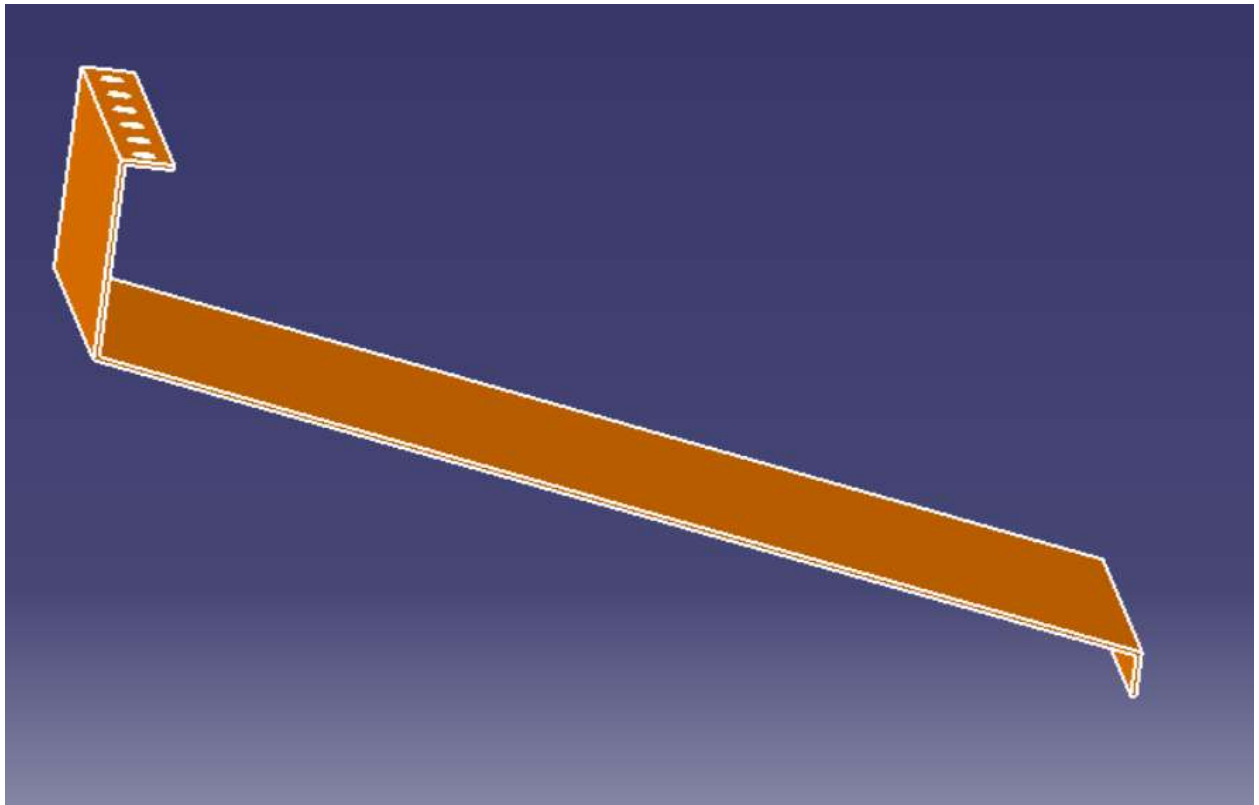
**Figure 4.5-motor**



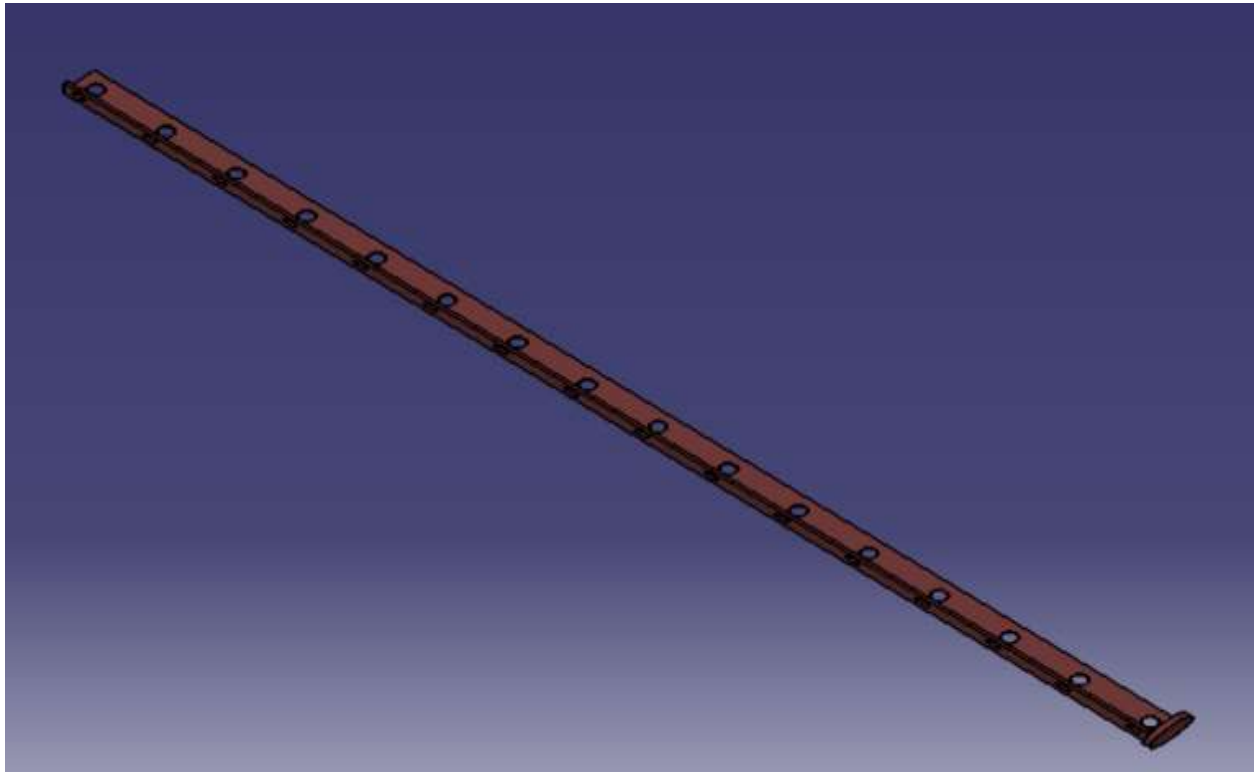
**Figure 4.5-movable surface**



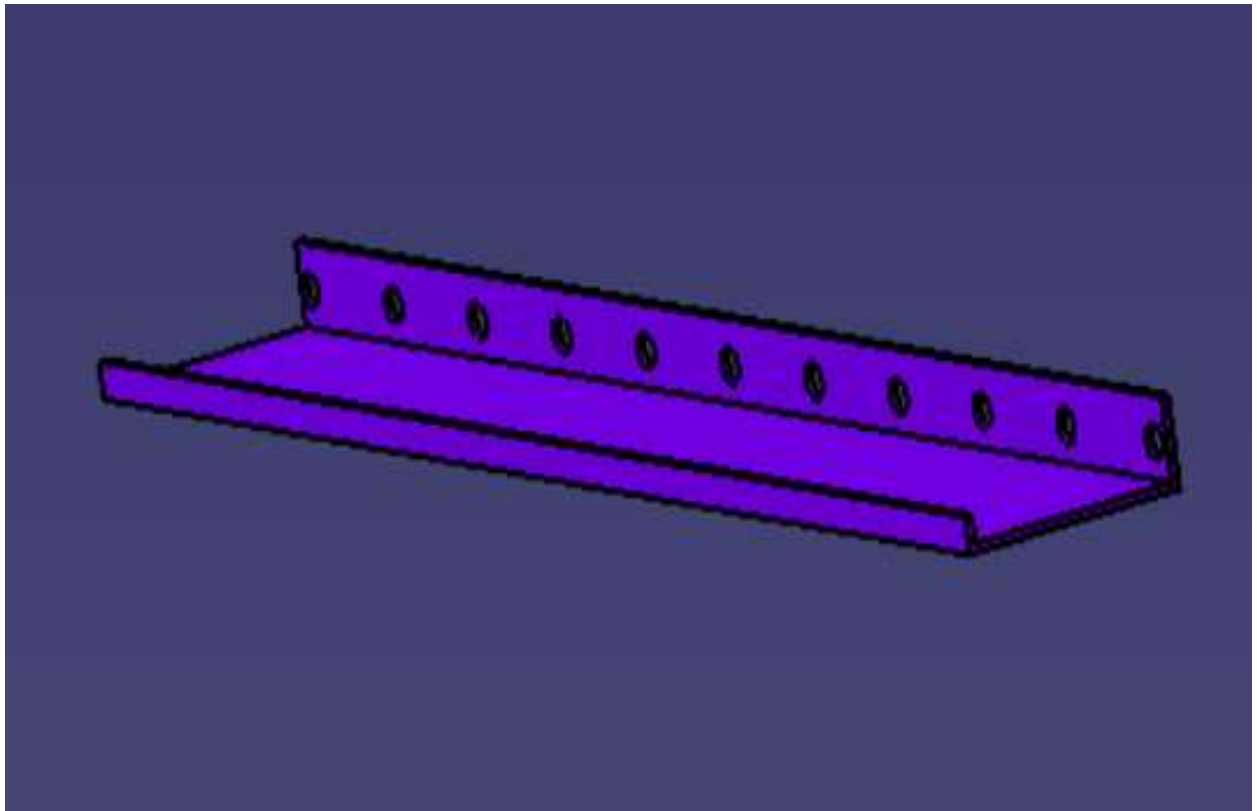
**Figure 4.6-wheel**



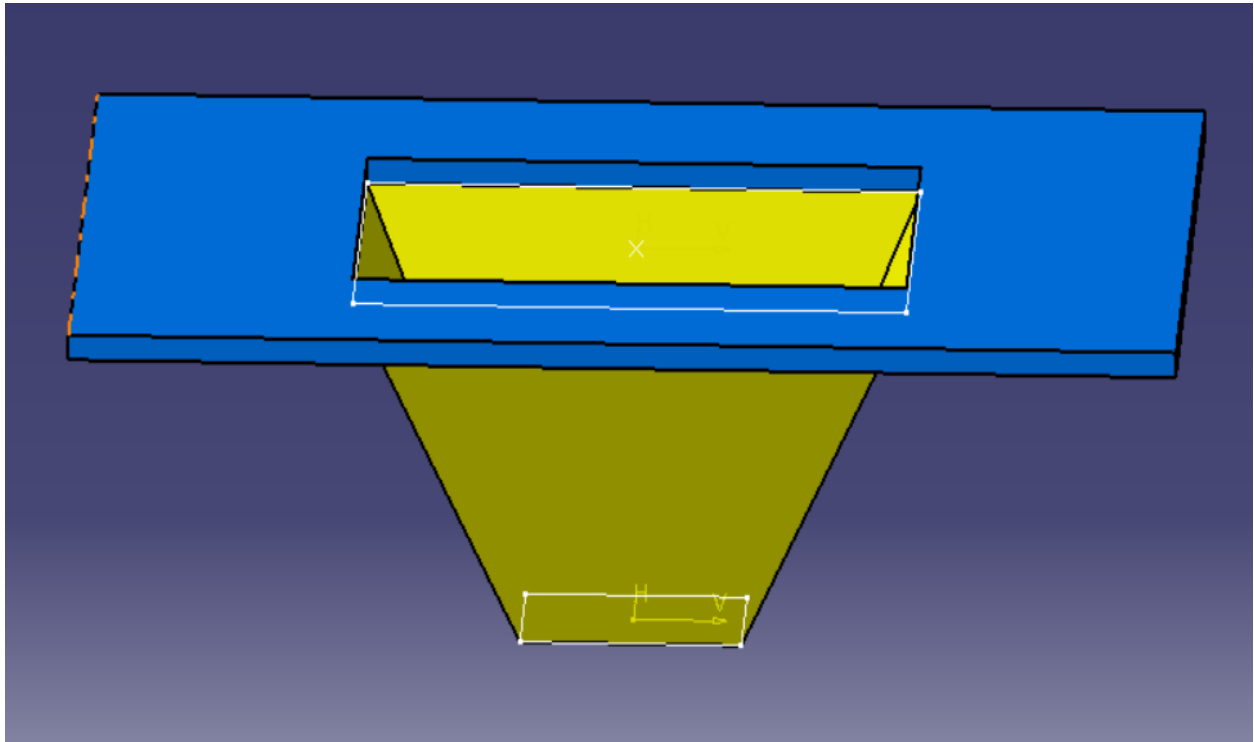
**Figure 4.7 sand flow sheet**



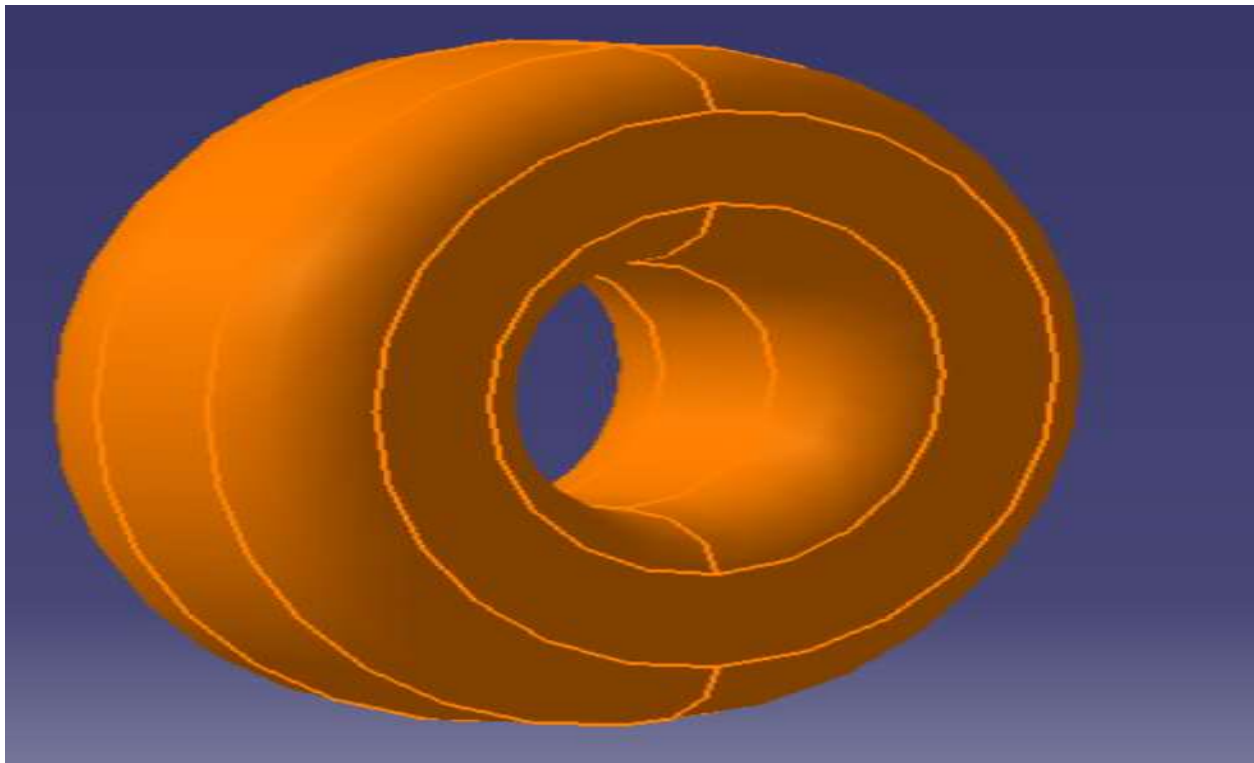
**Figure 4.8 side edge**



**Figure 4.9 sand flow bar**

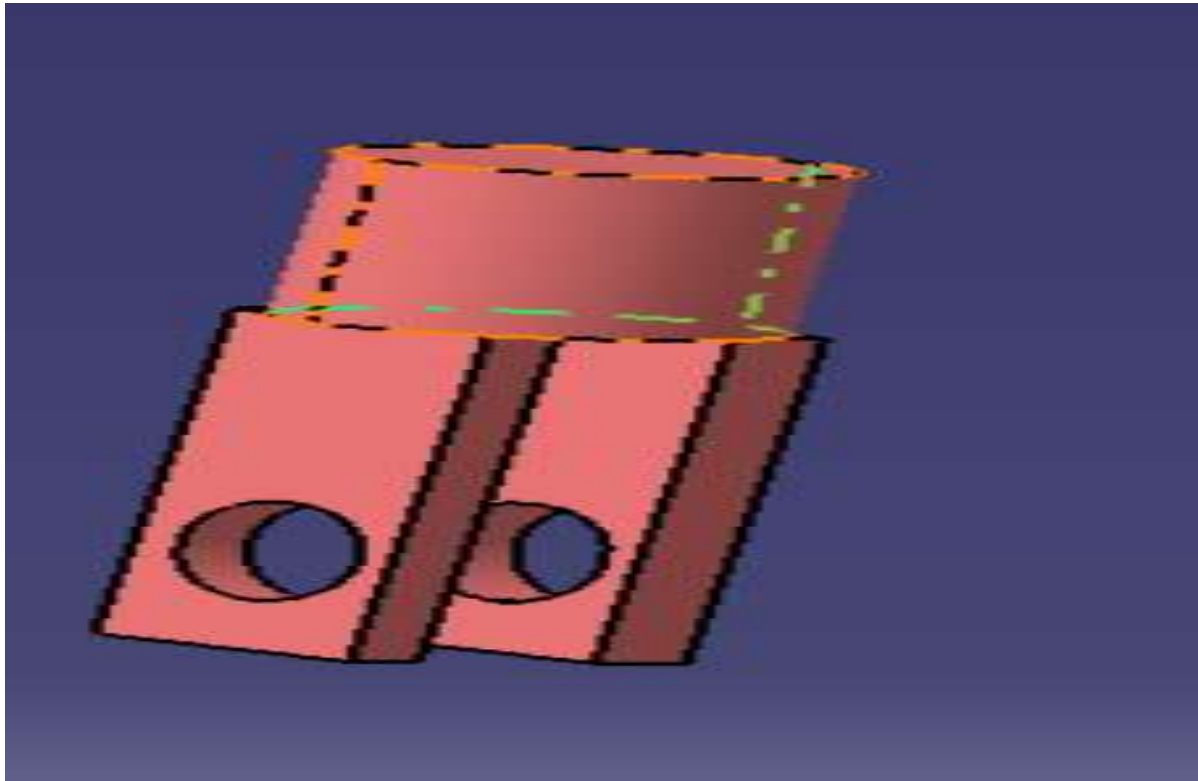


**Figure 4.10 cone surface**

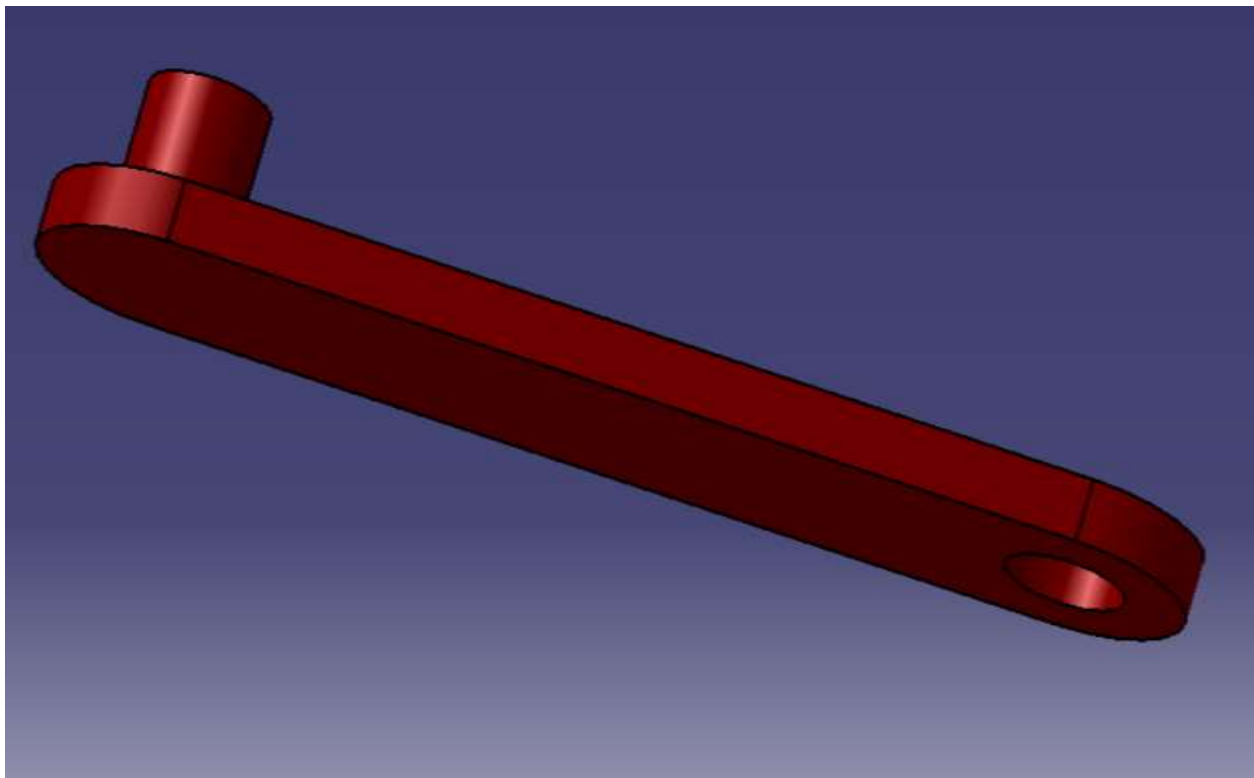


**Figure 4.11 roller wheel**





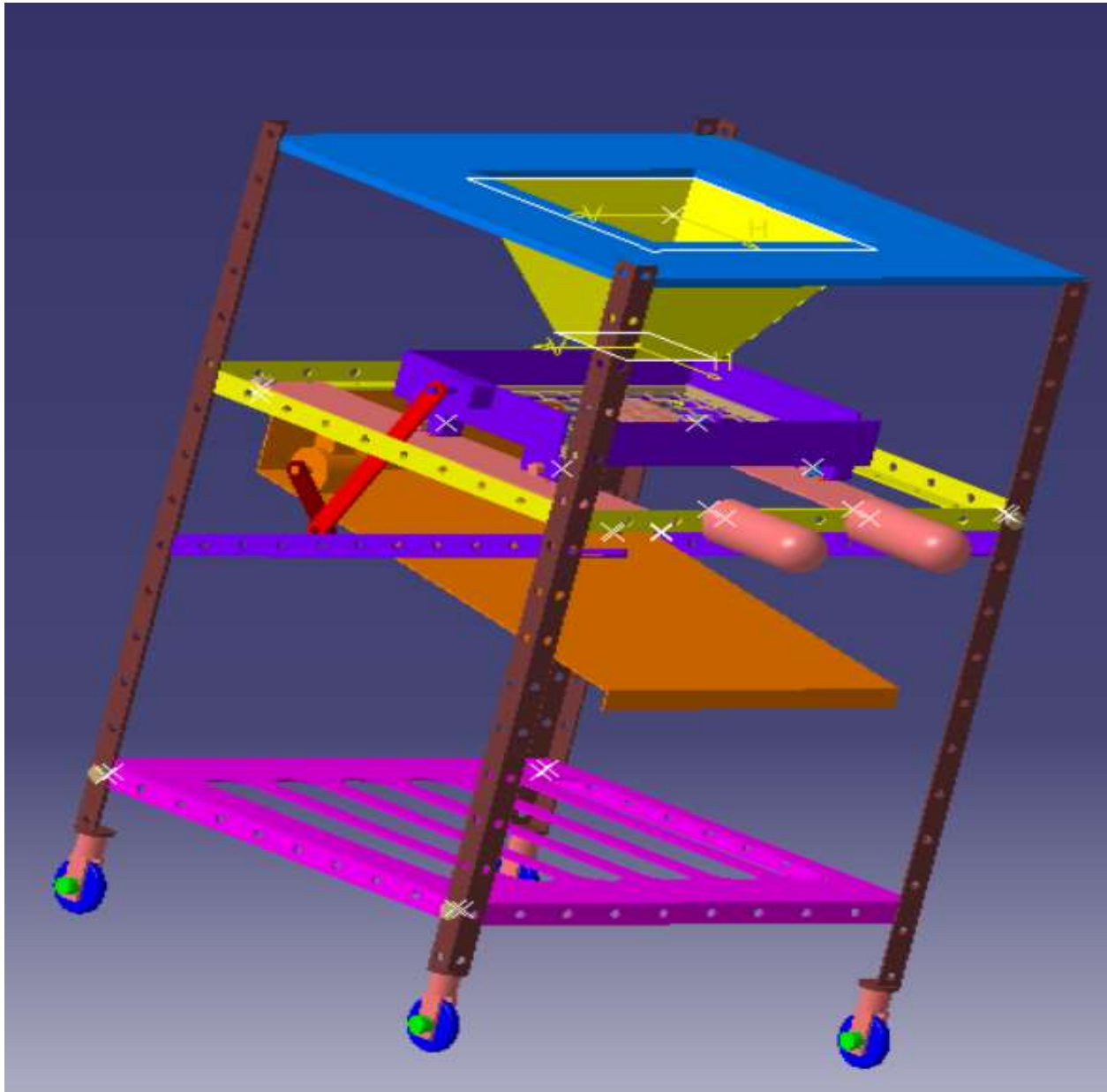
**Figure 4.12-wheel frame**



**Figure 4.13-shaft connector**

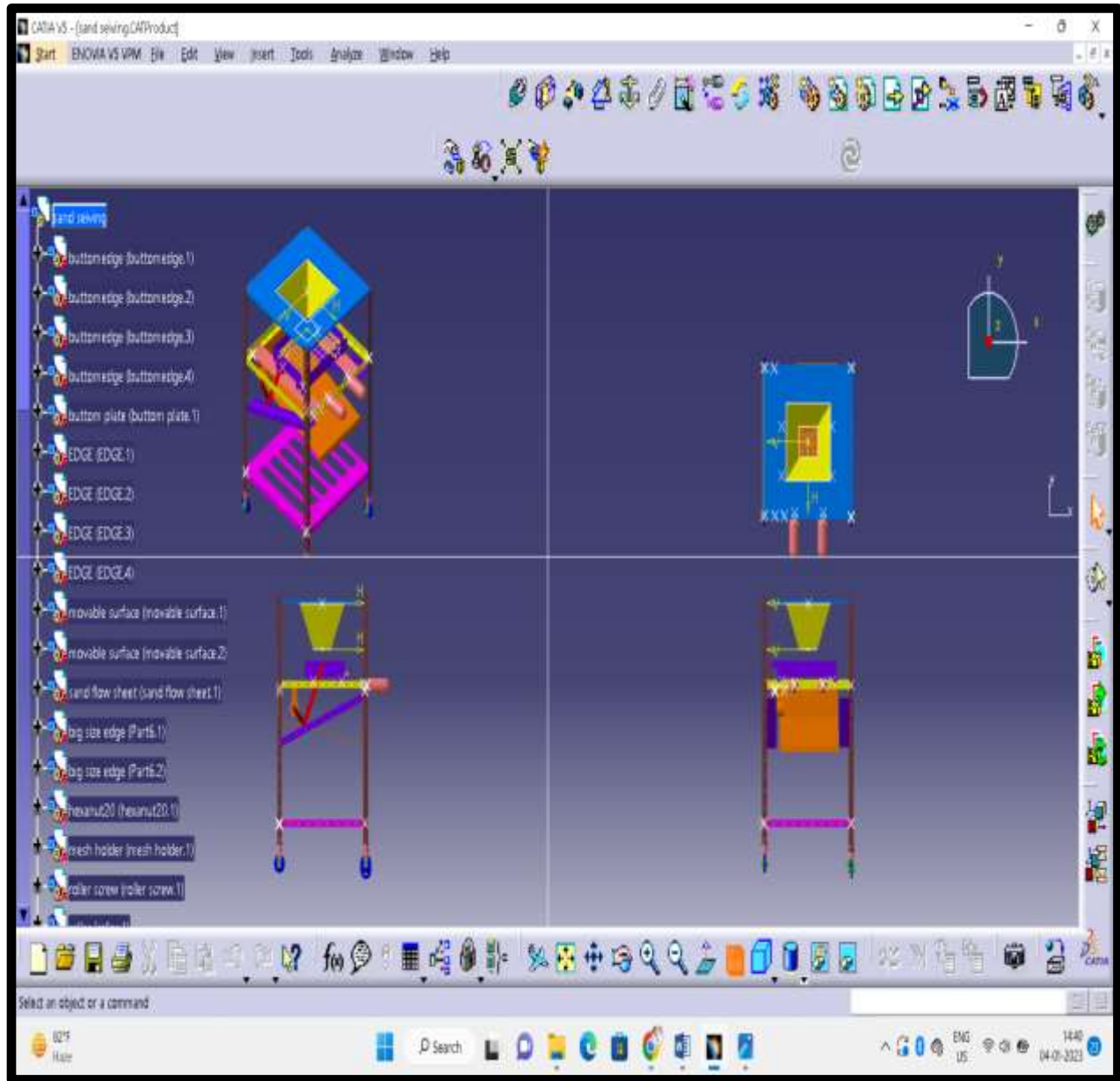
From figure 4.1 to 4.13 parts are designed by using part design by using tool bar operations and tool commands and tool features under the given dimension diagrams . All this part is assembled by using the assembly design module to make a sand filter machine .

## **4.2 Assembly of all parts of SAND FILTER MACHINE**



**Figure 4.14-SAND FILTER MACHINE**





**Figure 4.15-MULTI VIEW SAND FILTER MACHINE**

## **5.RESULT:**

We design SAND FILTER MACHINE and its parts according to the given dimensions by using CATIA V5 Software.

## 6.ROAD MAP

PROJECT ACTIVITY/WEEK	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL
Discussion and initial purpose of the project							
Background study and research about its history							
Discussion on sand particles and material study							
Comparison study on plates , wheels.							
Discussion on components required for the fabrication of machine							
Designing the rough sketch of sand filter machine.							
Preparation of proposal presentation							

## 7.REFERENCE

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- [2] <https://www.indiamart.com/proddetail/river-sand-supplier-19769740212.html>
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