

# The Wonder Factory



**Yousef Almutairi**

**Faisal Alanezi**

**Saad Albarazi**

**Barjas Albarazi**

**Khaled Alhusainan**

# Project Description

- ▶ **Description of Project.**  
To create an entertaining and educational STEM(Science, Technology,Engineering and Mathematics) + Art Project for the Wonderfactory company in Flagstaff.
- ▶ **What is the Wonderfactory?**  
Wonderfactory is a local company located in Flagstaff,AZ that provides STEM projects to the children.

# Why is it important?

- ▶ Give children a chance to learn about STEM.
- ▶ Give children chance to have fun while learning.
- ▶ Give children the ability to think about some Engineering projects.

# Brainstorming Ideas

**We Generated almost 100 Ideas such as**

- The house of circuits
- Hydraulic bridge
- Power bike
- Gravity simulator
- Nerf rifle.

**And we kept eliminating Ideas until we got to our design.**

# Background

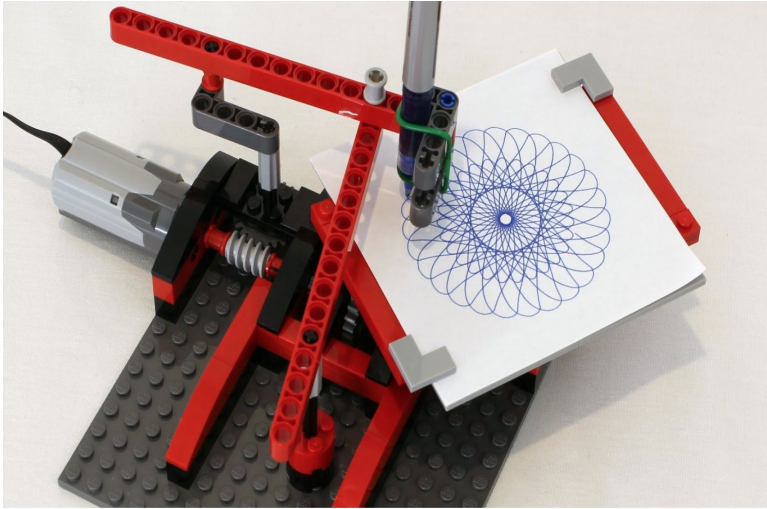
## ► What is a Spirograph?

A Spirograph is a geometric drawing machine that produces a curved drawings.



# Background

## ► Types of Spirographs

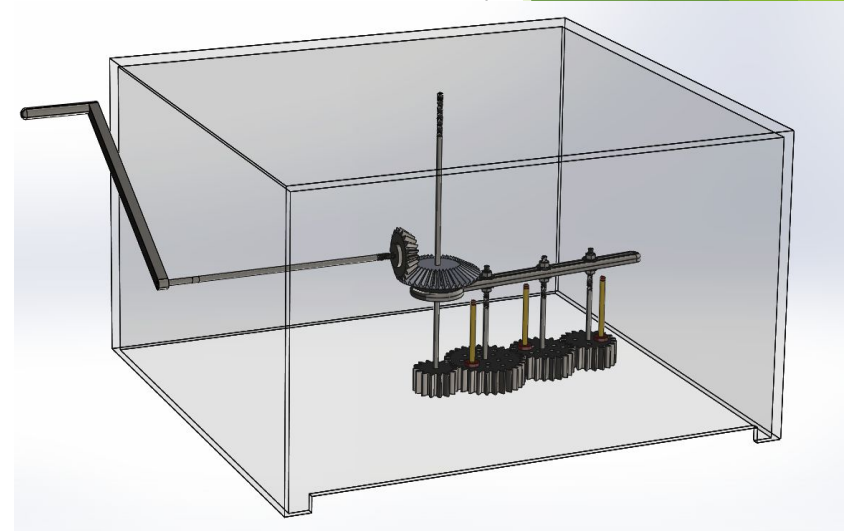


# Customer and Engineering Requirements

Customer Requirements	Engineering Requirements
Lightweight	Less than 60lb
Variety drawing options	Different gear sets
Durable	Well supported
Easy to assemble and operate	Less than 5 min
Safe to use	No exposed gears

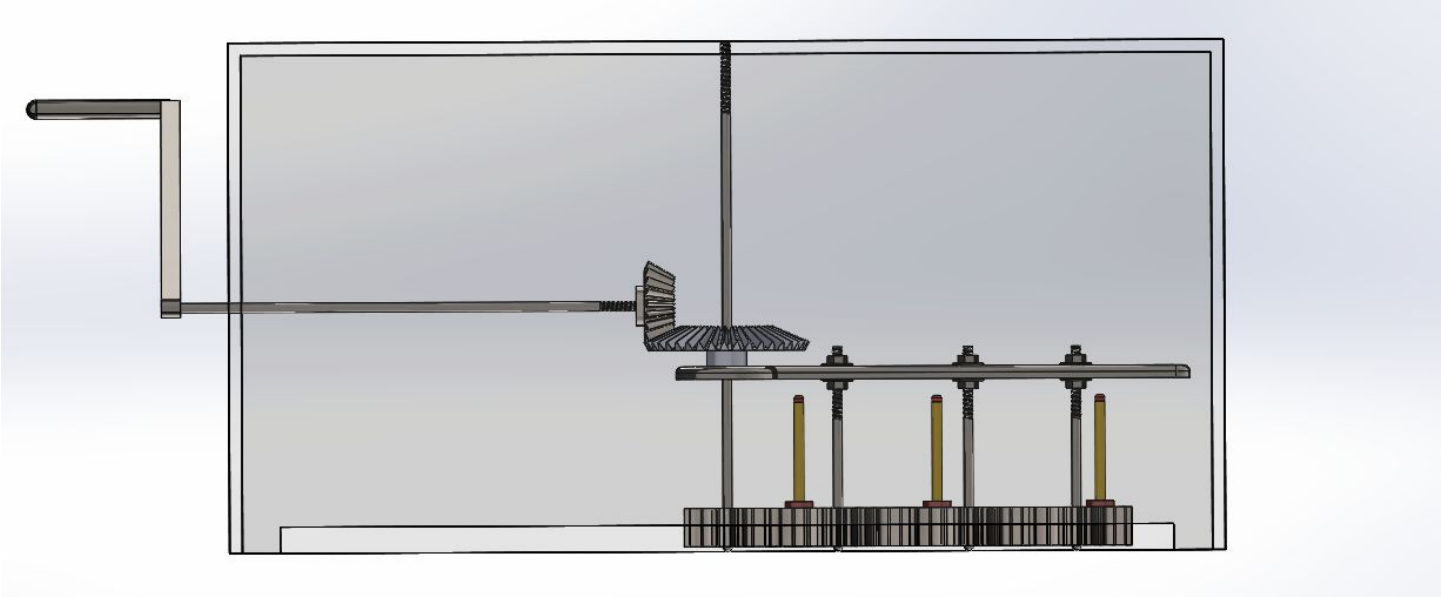
# Design Considered

- ▶ A box that contains the whole system.
- ▶ Main arm that holds gears in place.
- ▶ Colored markers to draw with minimal applied force.
- ▶ A driving system that contains bevel gears and a crank.
- ▶ Hold the markers in place.

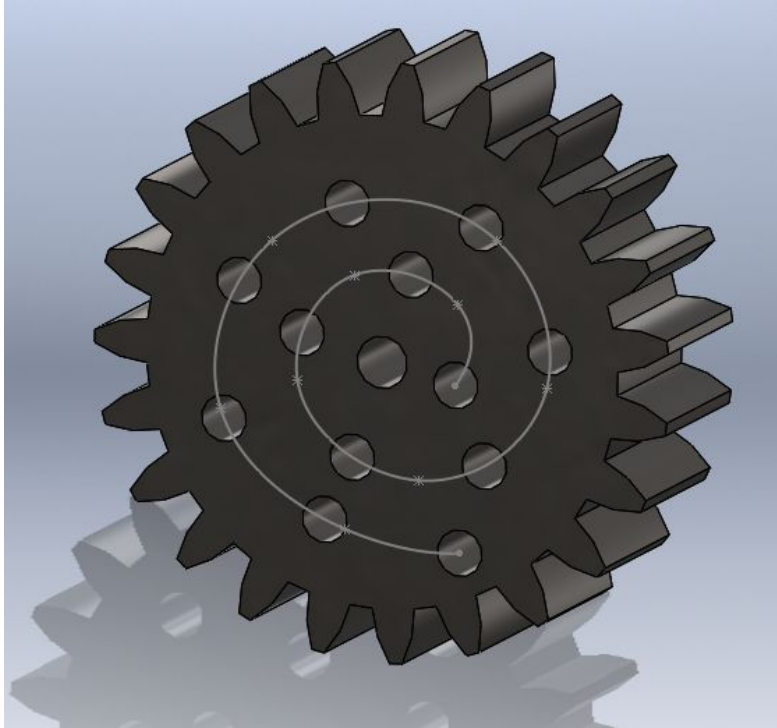




# Design Considered



# Design Considered

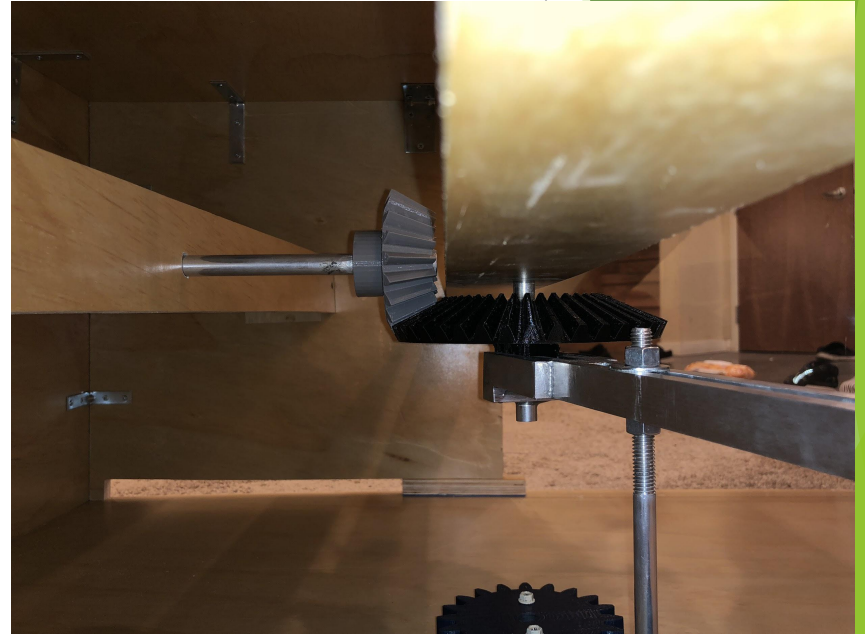


# Design Solution

- ▶ Half wood and half acrylic box.
- ▶ Increasing the face width to be 1.5 in to prevent gear slipping.
- ▶ Changing the gears properties to let them mesh properly.
- ▶ Opening slits for reaching the gears and the butcher paper to slide underneath.



# Design Solution



# Design Solution



# Manufacturing of The Design

- ▶ **3D printed parts:**
  - 1-Four spur gears
  - 2-Two bevel gears
  - 3-Fifteen magnet holders
- ▶ **The machined parts:**
  - 1-Four rods
  - 2-Crank
  - 3-Main arm
  - 4-Box

# Manufacturing of The Design

## ► Metal Parts

- 1- The rods were threaded to enable us to use washers that can fix the rods in the main arm slit.
- 2- The crank was originally two pieces but it had to be welded eventually to keep it intact.
- 3- The main arm was machined with the given dimensions.

# Manufacturing of The Design

## ► The box

1- The box was designed to be all acrylic with enough space to contain the gear system.

2- The main arm went through the whole box from top to bottom.

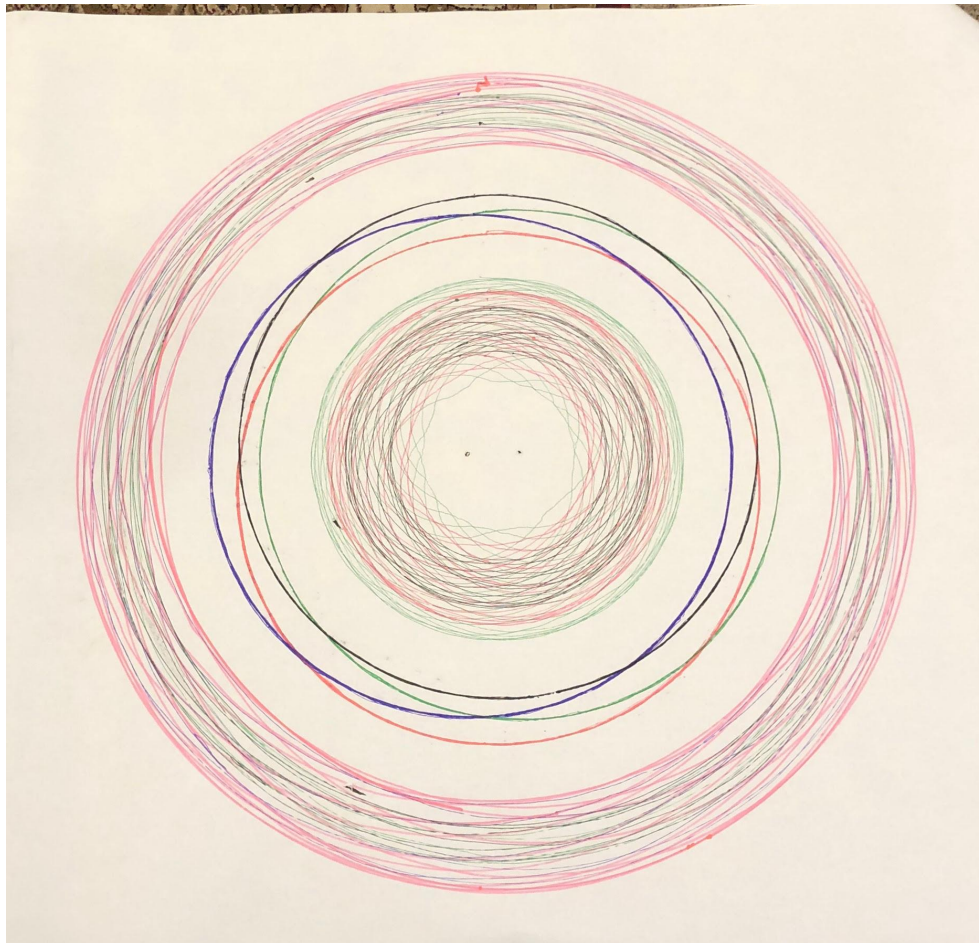


# Manufacturing of The Design

## ► Testing procedure and changes:

- 1- The box was changed to be half acrylic and half wood to give it higher endurance.
- 2- the main arm was cut in half allowing the center gear to be removed.
- 3- a support bridge was added to support the driving system.
- 4- push blocks were added to the connection of the crank and the box to prevent axial movement.

# Result



Faisal, 04/27/2018, Wonder Factory

# Conclusion

- ▶ In this project we learned how to work as real engineers and how to look at the problem we have and to properly approach the solution.
- ▶ All engineering requirements are met successfully.
- ▶ Project was built on the scheduled time period.

# Acknowledgment

- ▶ We would like to give our sincere thanks to Dr. David Trevas and to The Wonder Factory family.

# Questions ?

# References

- ▶ [1] [http://4.bp.blogspot.com/-nYZ3rGgaRqQ/WRnznfZrYil/AAAAAAAAAC1M/DvK0MBwrCxMhpesUjl6OV\\_OA3XGSsSSOACK4B/s1600/TWFLogoNoTag.png](http://4.bp.blogspot.com/-nYZ3rGgaRqQ/WRnznfZrYil/AAAAAAAAAC1M/DvK0MBwrCxMhpesUjl6OV_OA3XGSsSSOACK4B/s1600/TWFLogoNoTag.png)
- ▶ [2] <https://images-na.ssl-images-amazon.com/images/I/81gPF3H7PPL.SL1500.jpg>
- ▶ [3] [https://i.ytimg.com/vi/1lhjh\\_F7jn0/maxresdefault.jpg](https://i.ytimg.com/vi/1lhjh_F7jn0/maxresdefault.jpg)
- ▶ [4] <https://rukminim1.flixcart.com/image/1408/1408/art-craft-kit/a/a/q/fun-skool-classic-spirograph-original-imadhd7jmszbf32a.jpeg?q=90>