न हि ज्ञानेन सदृशं पवित्रमिह विद्यते।
Smt. S. R. PATEL
ENGINEERING COLLEGE

The automation applied on Brick production using Powder Metallurgy concept

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Definition

- Numerous manufacturing process in which automation required for reducing number of labour.
- The concept of Automation in Powder metallurgy is one of the leading processes which is useful to produce any component with minimum time.
- By using this concept of Automation in Bricks Production reduce labour requirment ,production cost and material handling process.
- In Bricks making process automation created with use of mechanically concerned.

How to select this project?

- We inspired from the project *Development of Automation Foundry* prepaired by our seniors.
- The concept of Automation used in Powder Metallurgy
- Brick kiln needs more labour reqirement where applying automation labour cost can be reduced.

How to select this project?

Project background

- Nowadays the modem clay brick production process in western countries is an optimal mechanized and automatic process, fully controlled to get the best quality products out of the process.

History

- Since time immemorial, fired clay bricks have been the preferred building material of mankind.
- Fired bricks were in use in 4000 BC and were extensively used in the river valley civilizations of Egypt, Mesopotamia and Harappa.
- In the Western world, Romans, through their conquests, propagated brick and tile production and introduced brick-making in Spain, France, England, Holland, and Germany.
- For several thousands of years, until the 19 th century, the technology for brick-making changed very little. Bricks were made by hand, dried under the sun and then fired in clamps kiln using firewood or coal.

Objective

With use of Powder metallurgy on Automation we get follwing advantages:

- Reduce labour cost
- Improve production
- Improve quality of product
- Reduce manufacturing time

Scope of Project

- Powder metallurgy industries

Scope of Project

- Manufacturing of brick

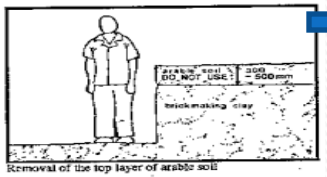
Brick production process in India

- Minimum Conditions Necessary To Produce Fired Clay Bricks
- Standardization
- Extraction
- Clay Preparation
- Moulding
- Building A Field Kiln Which Uses Firewood As Fuel
- Firing A Field Kiln With Firewood
- Building And Firing A Coal-Fired Brick Kiln

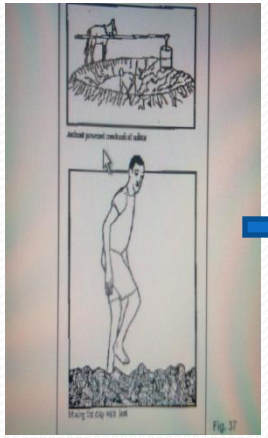
Site's Process of Brick

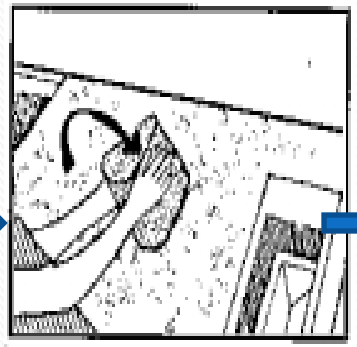
Process Chart

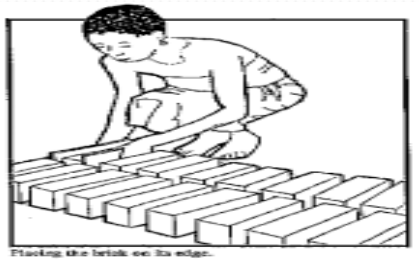

General Cleaning of the Site

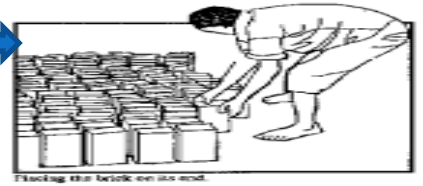


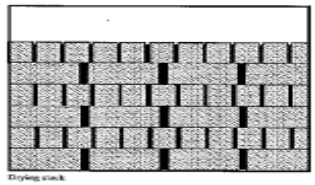
Removal of the top layer of arable soil

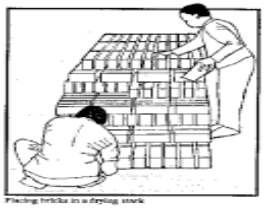


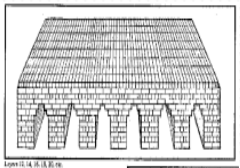


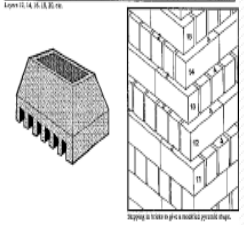

Placing the brick on its edge.


Placing the brick on its end.

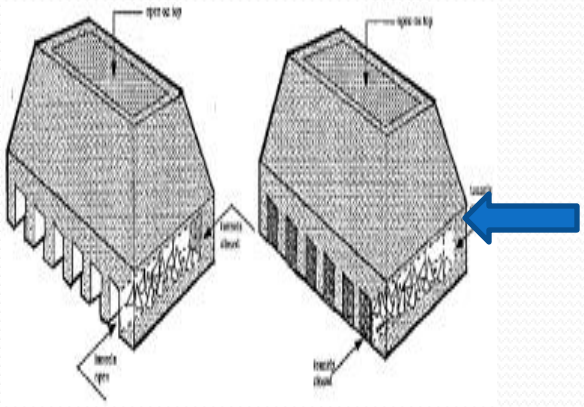



Placing bricks in a drying stack



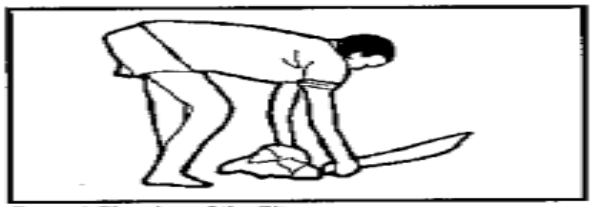



Insulating the kiln with brick and mud.

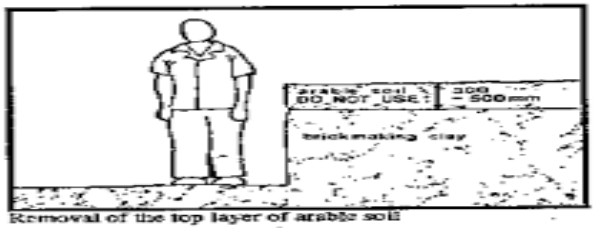


Extraction process

- When the area is clean, remove the top layer of soil which will probably contain rocks, dead vegetation, and roots until you reach the layer of clay below. This top layer of soil will be at least 300 mm to 500 mm deep.Remove it all; none must remain.



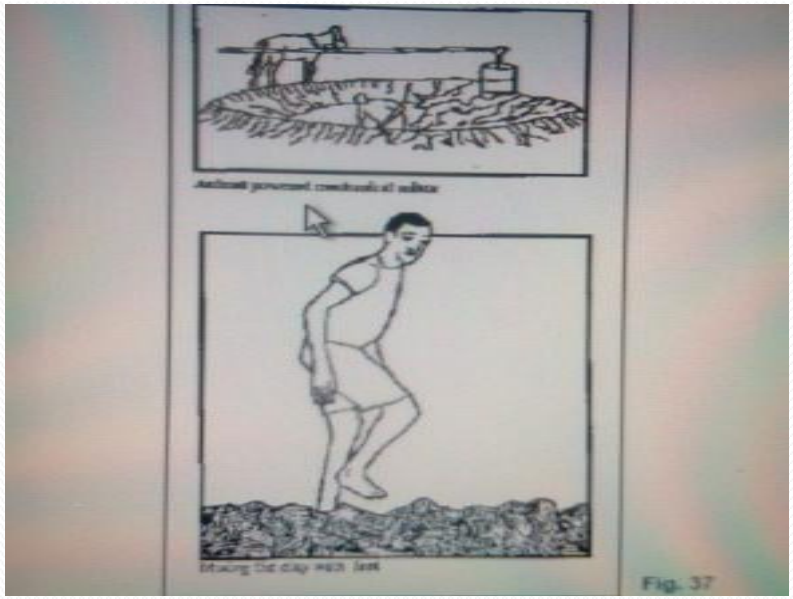
General Cleaning of the Site



Removal of the top layer of arable soil

Mixing process

- After the soil has been tempered well, it needs to be mixed and kneaded. The purpose-of mixing is to ensure that the clay is a smooth, soft, homogeneous mixture that contains no hard lumps.

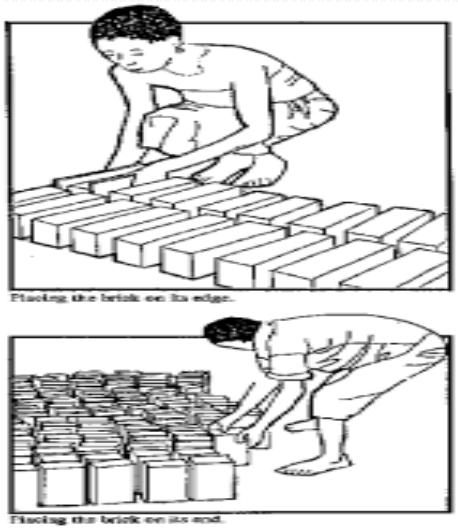


Moulding process

- Moulding is the process where the prepared clay is placed in a mould which forms it into the shape of a brick.

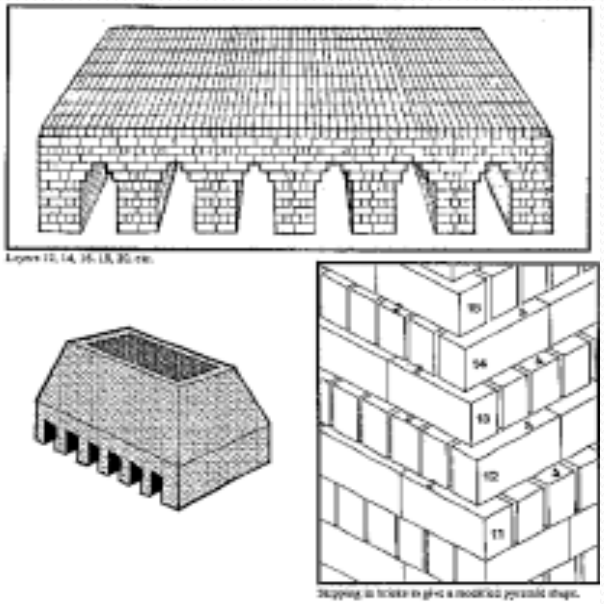
Drying process

- During the preparation of the clay, water is added to make it soft and easier to shape into bricks. But, before the bricks can be fired, it is essential to remove this water. It is during the drying stage that the majority of this water is removed.



Building a Field Kiln

- For building kiln a certain process is done by engaging many people .
- Coal and Firewood is used as fuel for firing process

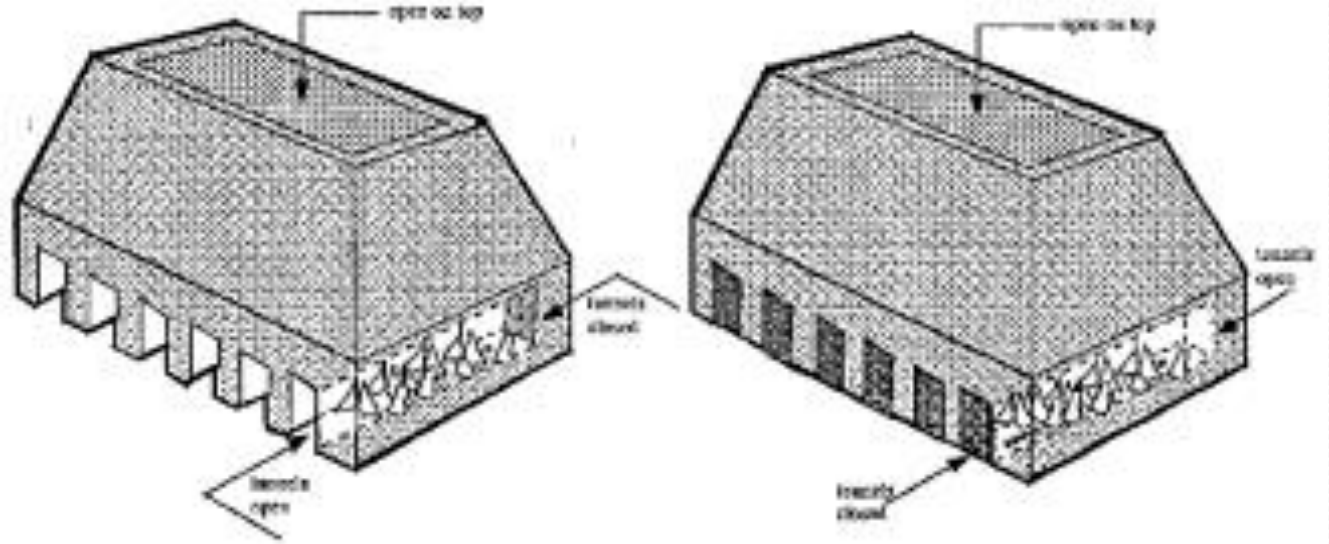


Insulation

- After finishing the construction of the field kiln, and before beginning to fire it, the exterior of the kiln must be insulated with mud and broken bricks.
- The insulation is necessary to prevent the excessive loss of heat from the kiln during firing.When a kiln is well insulated, the bricks will be fired better and you will use less firewood.

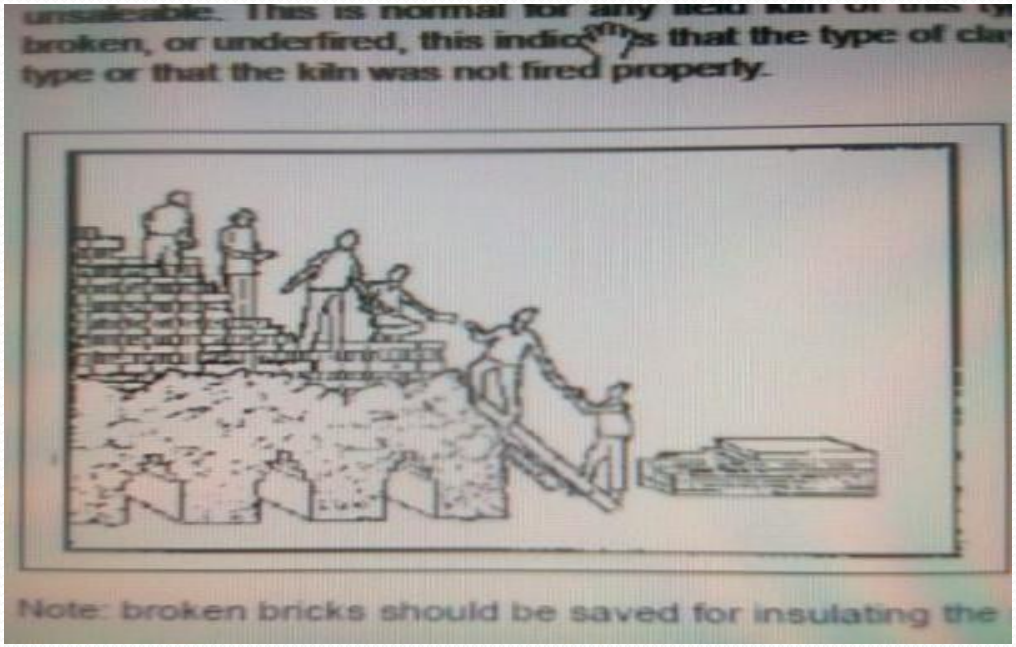
Firing A Field Kiln With Firewood

- The firing of the field kiln is the last step in making the bricks and is the most important. If the bricks are fired well, they will be of a good quality and an ideal building material for building permanent structures such as schools, homes and clinics.



Opening of the Kiln

- Once the kiln has cooled, it can be opened and dismantled. You will find that up to 10% (or 10 bricks out of every 100) of the bricks removed from the kiln are either cracked, broken, underfired, or unsaleable.



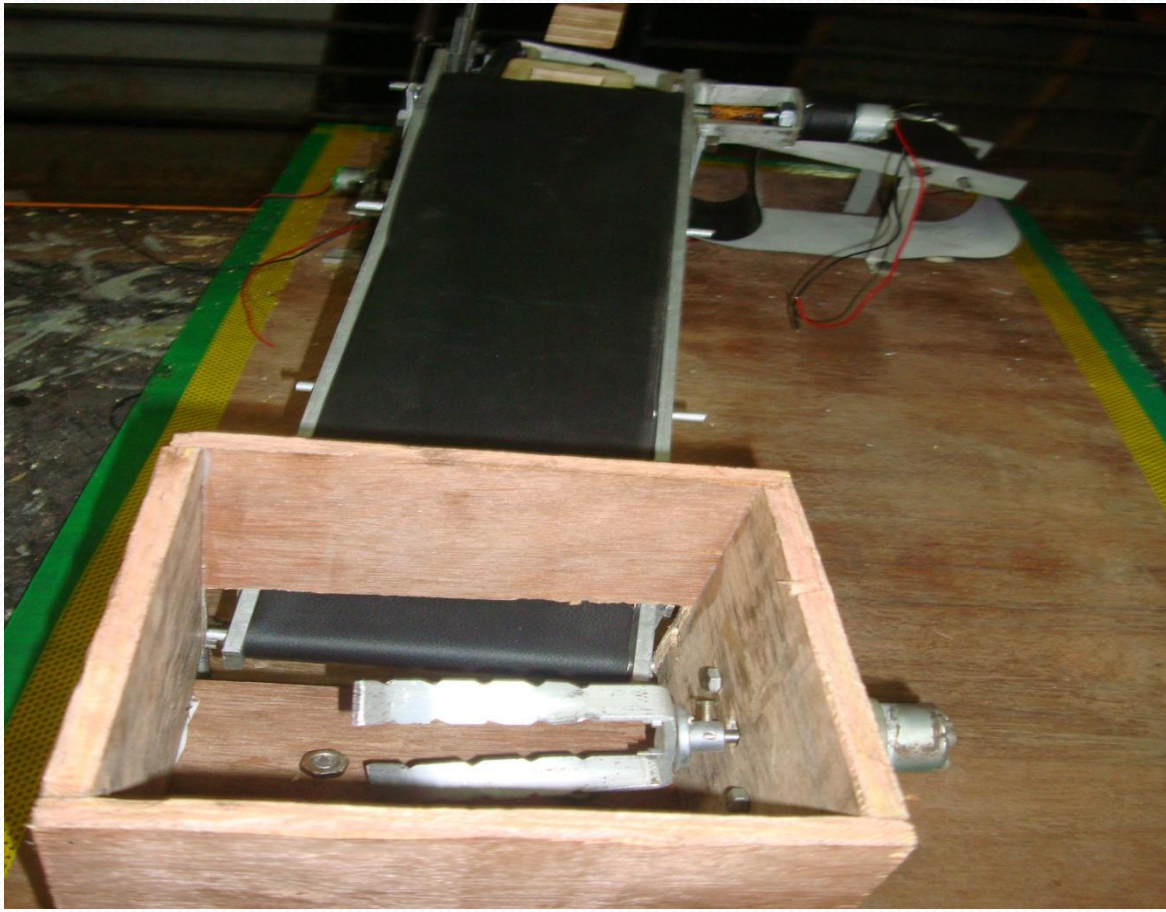
THE TRADITIONAL INDIAN BRICKS INDUSTRY

A MODERN BRICK FACTORY

Automation Steps

Mixing

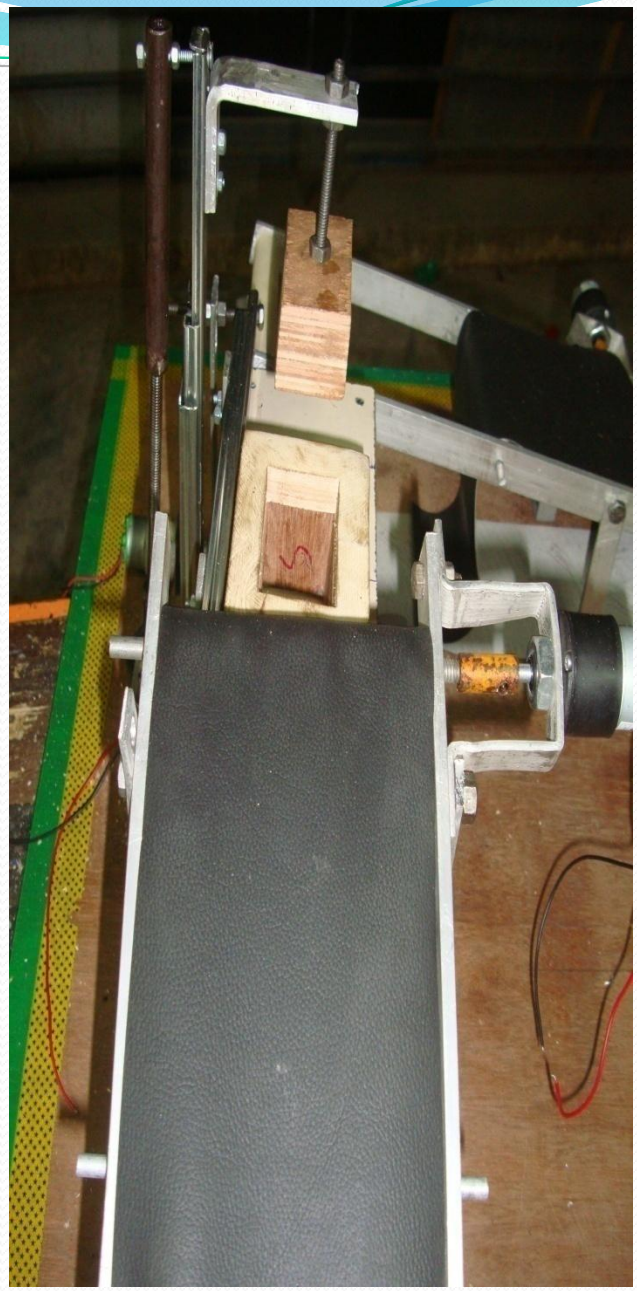
Automation Steps



Belt conveyor used for conveying material

Automation Steps

Moulding



Automation Steps

Firing

Marits

- Lot of time saved in Mixing the clay process.
- Lot of time saved in Moulding process.
- Man power and also saved in making Kiln.

Literature review

Sr. no.	Author	Year	Journal	Description Of work	Points to be taken
1	SEMEL, FREDERICK, J.	2010	-	The present invention provides iron-based infiltration methods for manufacturing powder metallurgy components, compositions prepared according to those methods, and methods of designing those infiltration methods.	In this process of Powder Metallurgy we have understood that compaction and sintering techniques have been used to increase density.

Sr .no.	Author	Year	Journal	Description Of work	Points to be taken
2	JAI HARI DALMIA	2009	-	Acordlng to the invention, the enhanced thermal shock resistance Is the unique characteristic of magnesite brıck originates from the controlled process which has ın developed by the inventors.	Binders and Dead Burnt Magnesite are tested prior to mixing.
3	EDWARD MAY	2010	-	The object of the invention is to provide a piston. In particular a shockabsorber piston, which can be manufactured more easily.	The present invention relates to a powder-metallurgy manufactured shock-absorber piston body and a method of manufacturing thereof.

Sr. no.	Author	Year	Journal	Description Of work	Points to be taken
4.	KRISHNA GOPA KUMAR WARRIER	*2013*	-	The present invention is based on the finding that the incorporation of the tannery sludge to clays and shaping the resulting mixture to bricks/ tiles, drying the resulting bricks / tiles to the desired moisture and firing by heating the tiles/bricks and cooling to room temperature under reducing atmosphere results in bricks/tiles which are useful as building materials.	No existing processes can utilise so effectively the pollution creating sludge.

Sr. no.	Author	Year	Journal	Description Of work	Points to be taken
4.	KANNAN ANANDA KRISHNAN	2007	-	At present, as known in the state of art, bricks of cutting with the help of a wire the existing machine is know as wire cut brick machine. In the existing system, the material is pressed into a narrow shaped wooden die while the material coming out like a cake form that is cut with the help of wire and preserved under a roof to dry.	At present, as known in the state of art, bricks of cutting the existing machine is know as wire cut brick machine.

Methodology

How works?

Define problem

Literature review

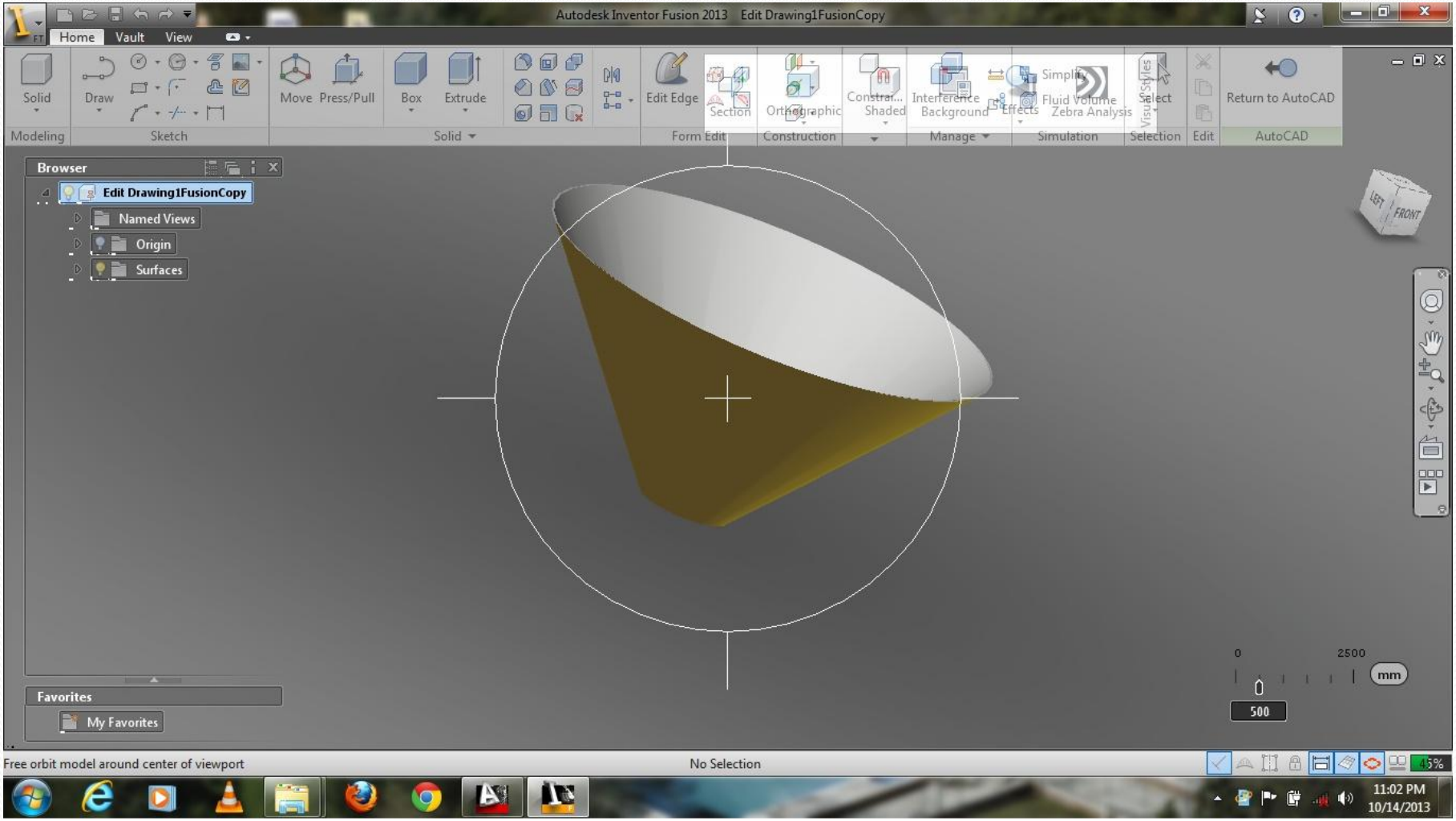
Theoritical analysis of Powder Metallurgy concept and Brick making process

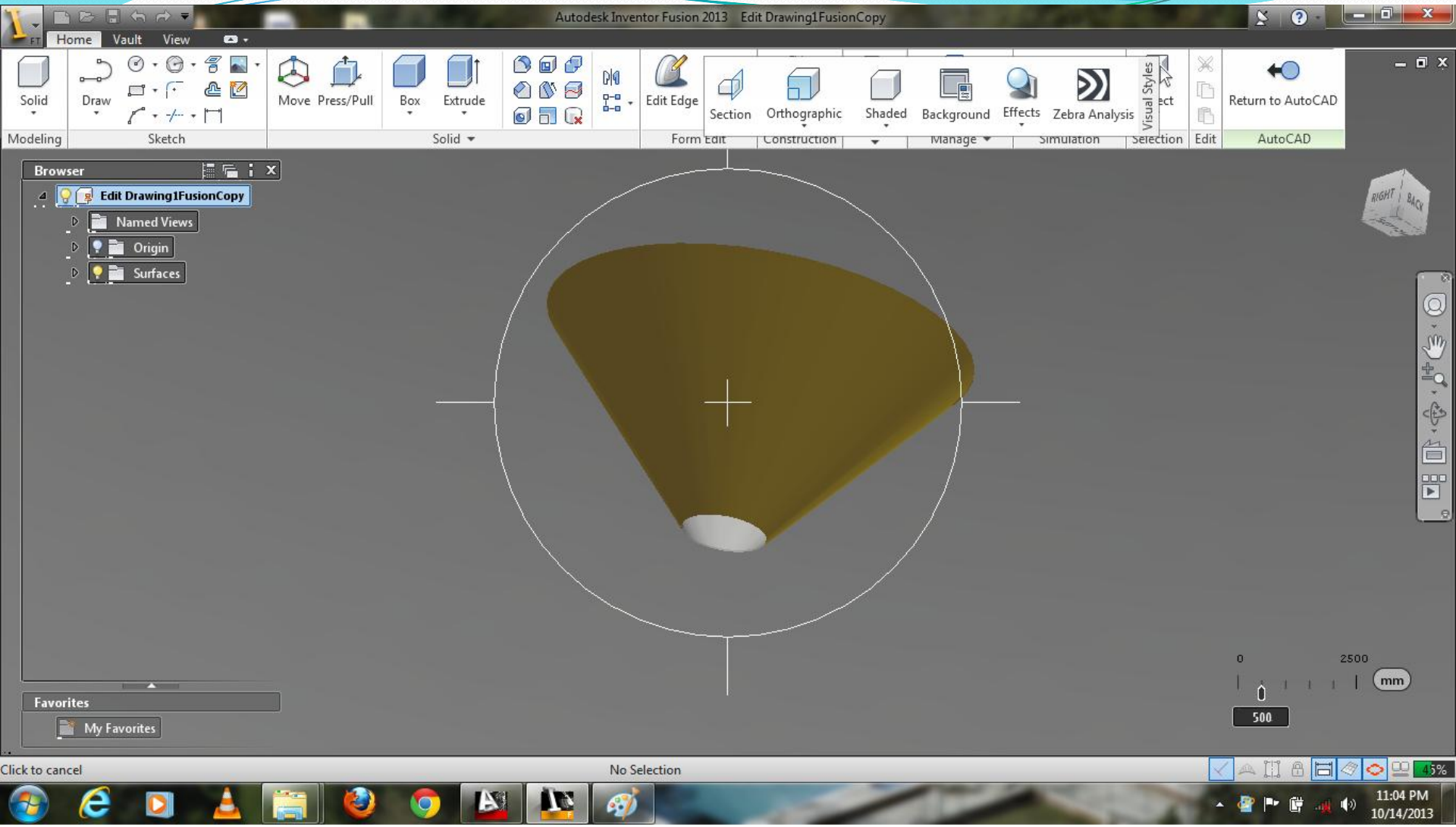
Decide the sequence of Brick making process then after construct model according to sequence afterwards analysis

Do Automation using PLC

Conclusion

Design of sand hopper

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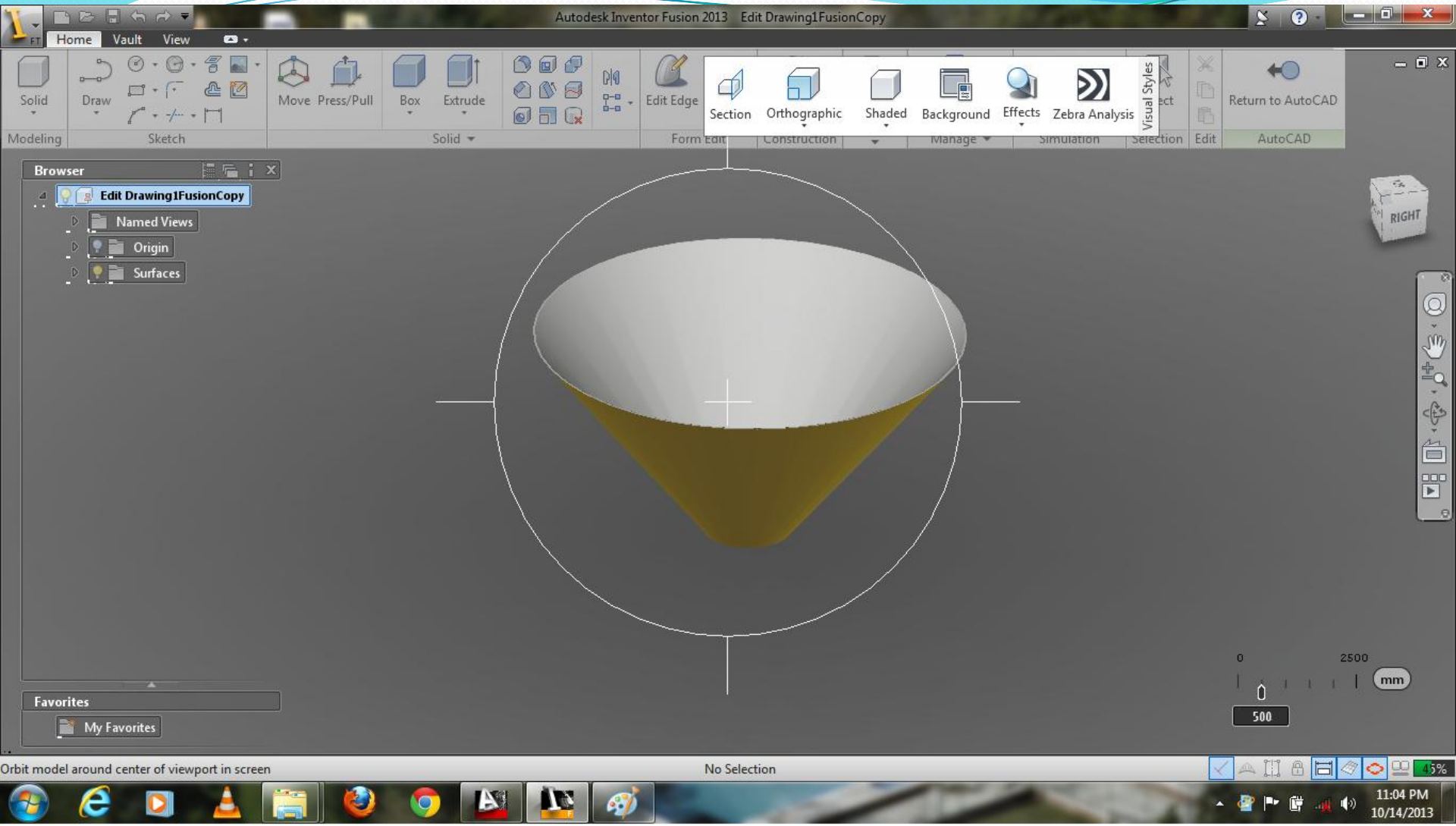
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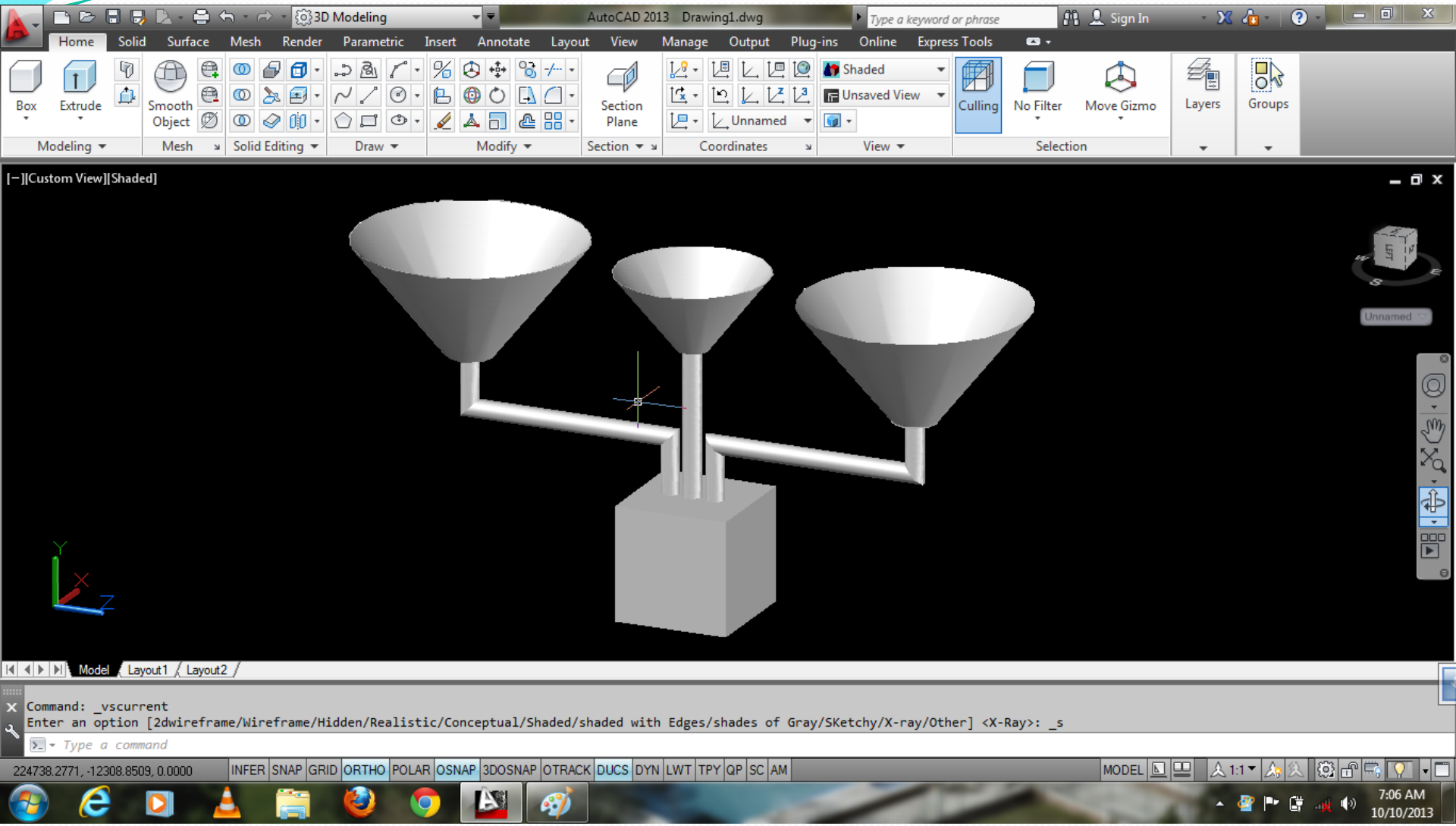
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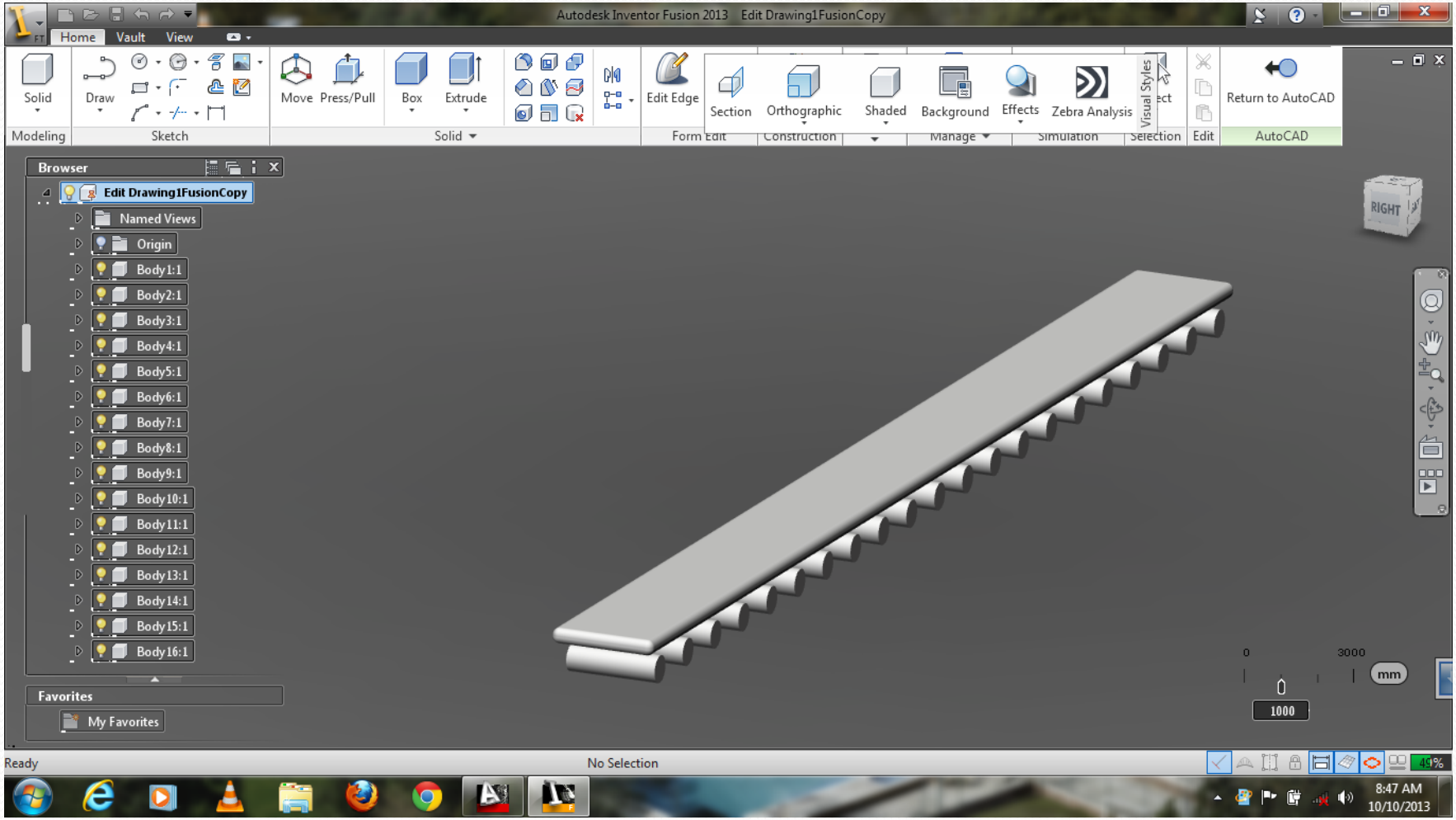
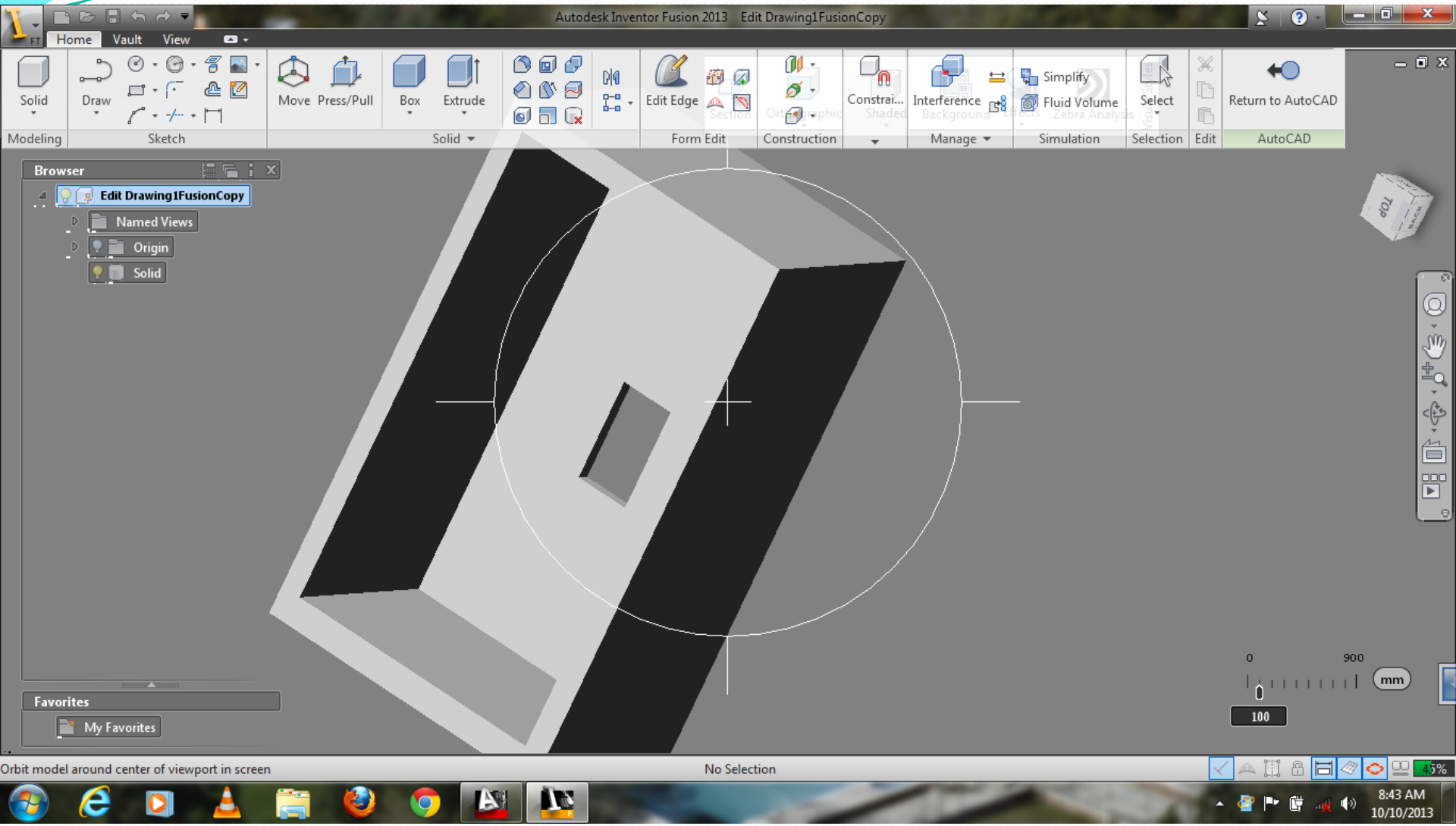
Design of belt drive

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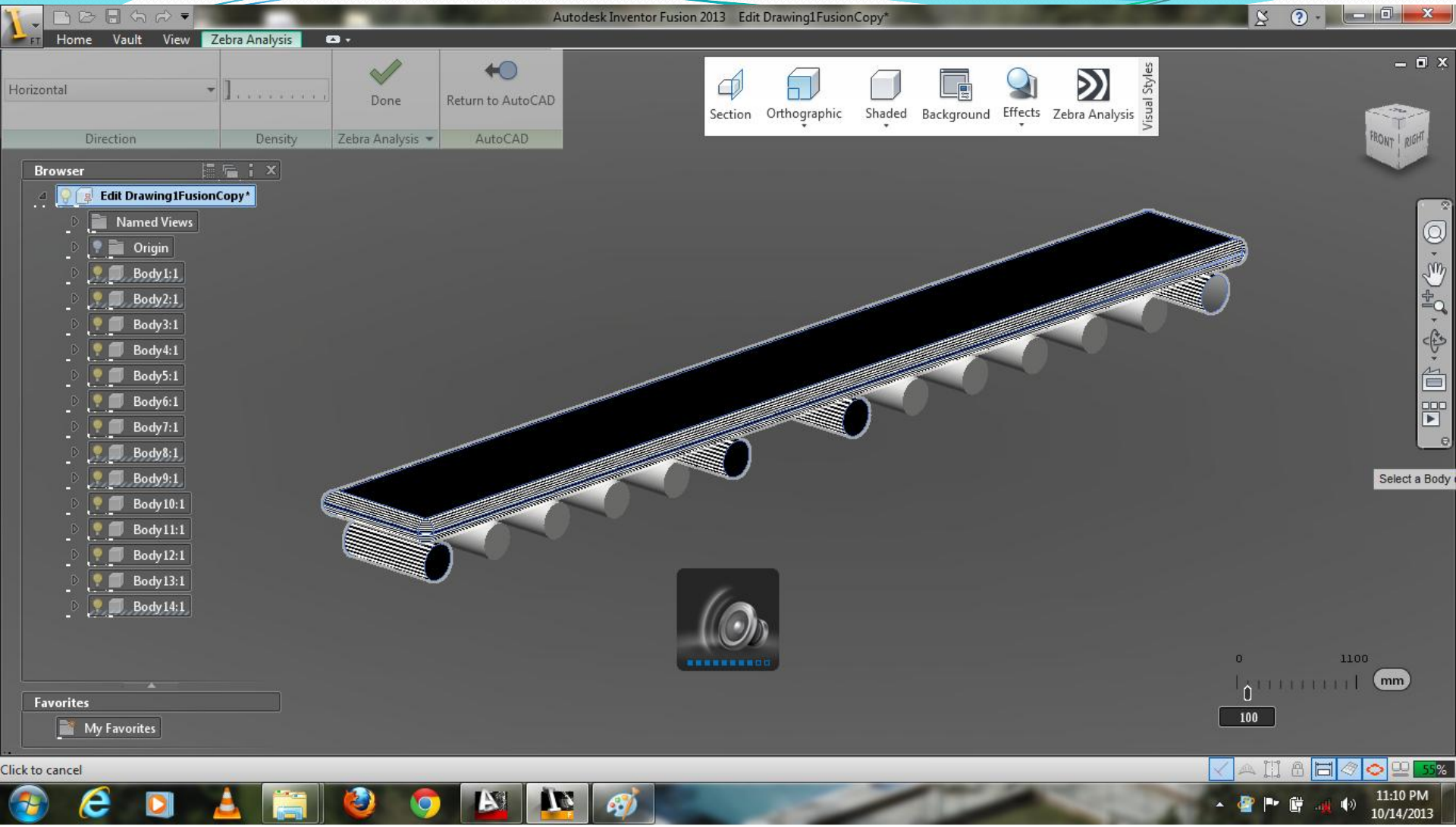
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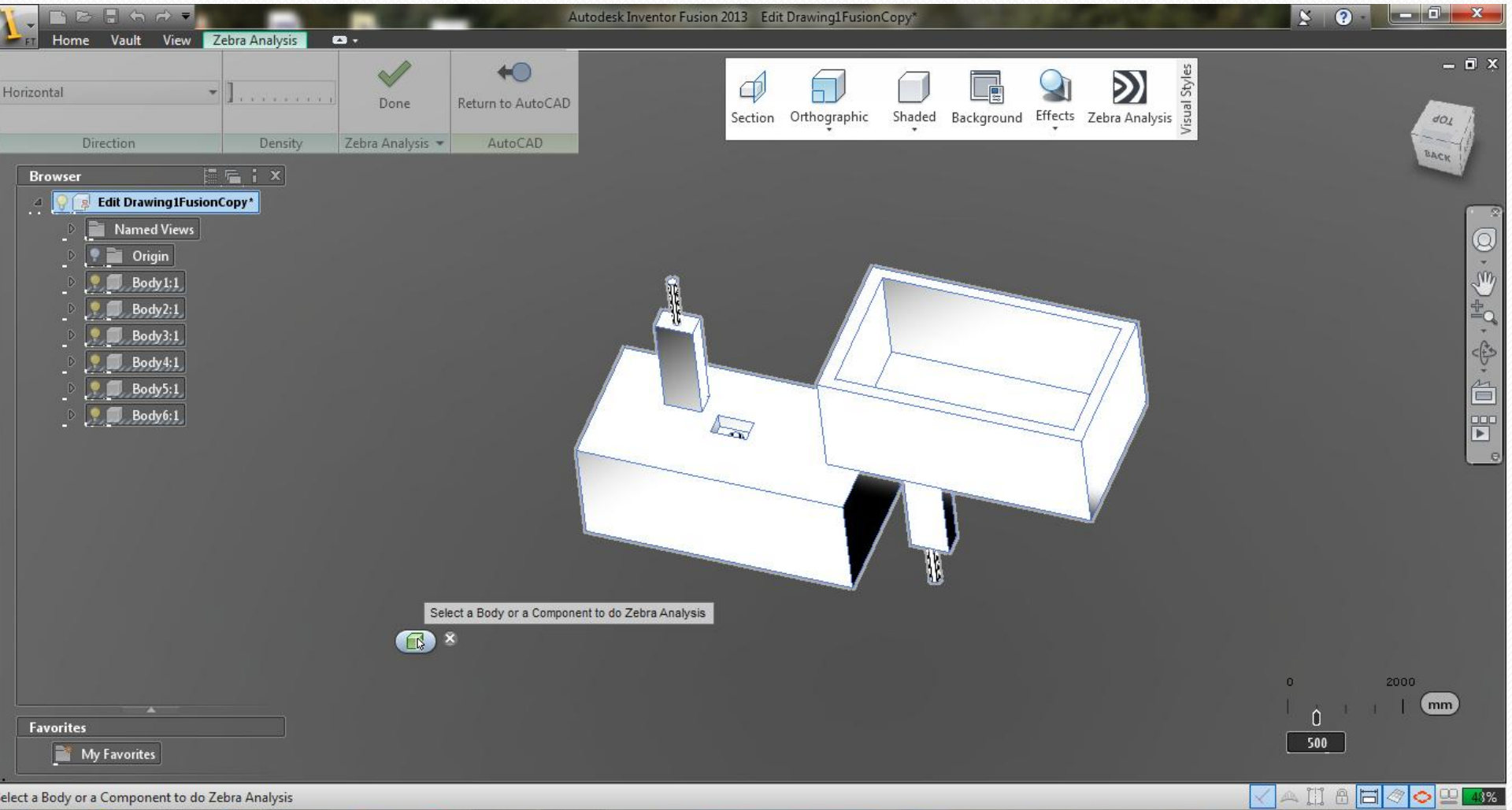
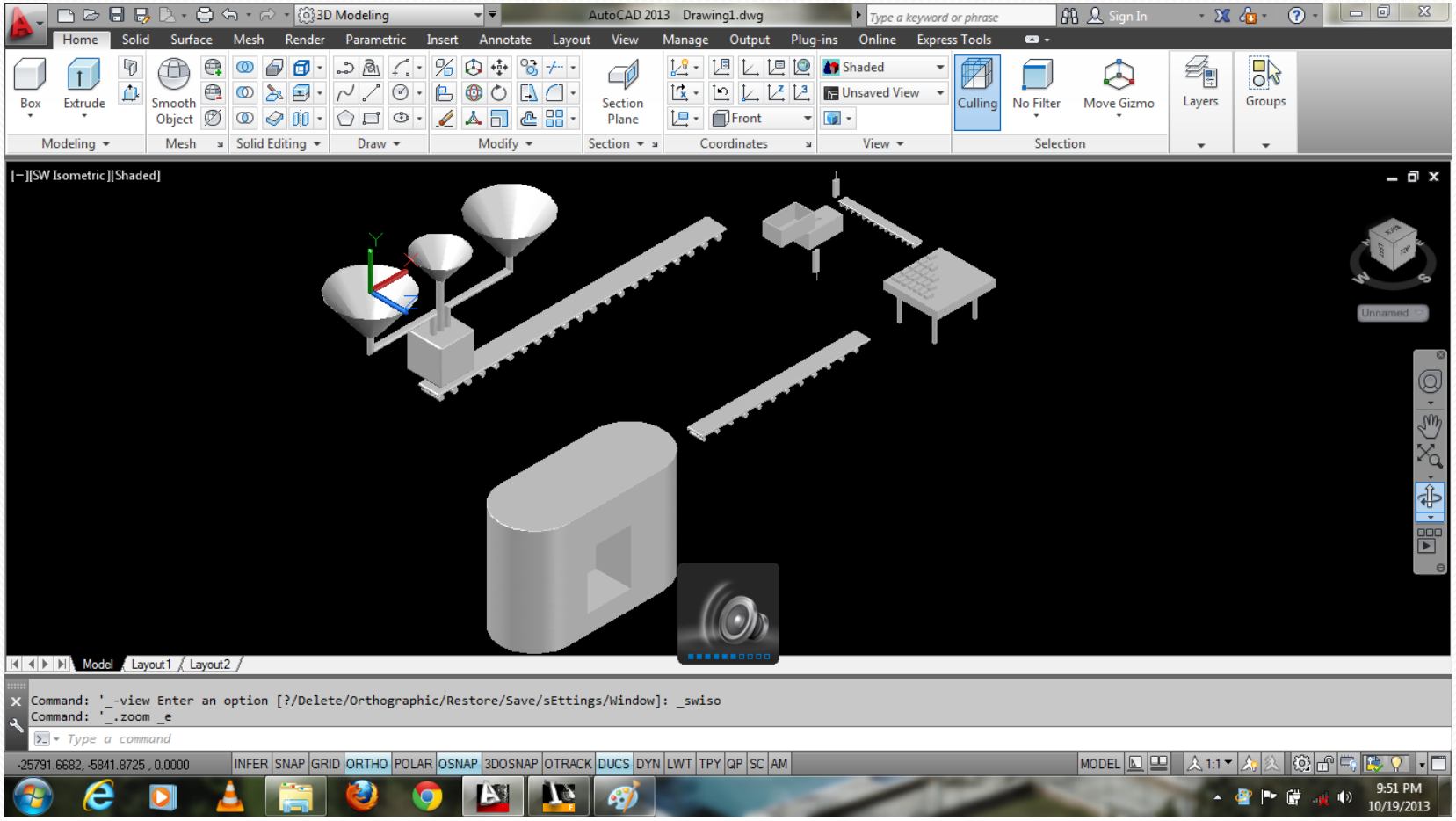
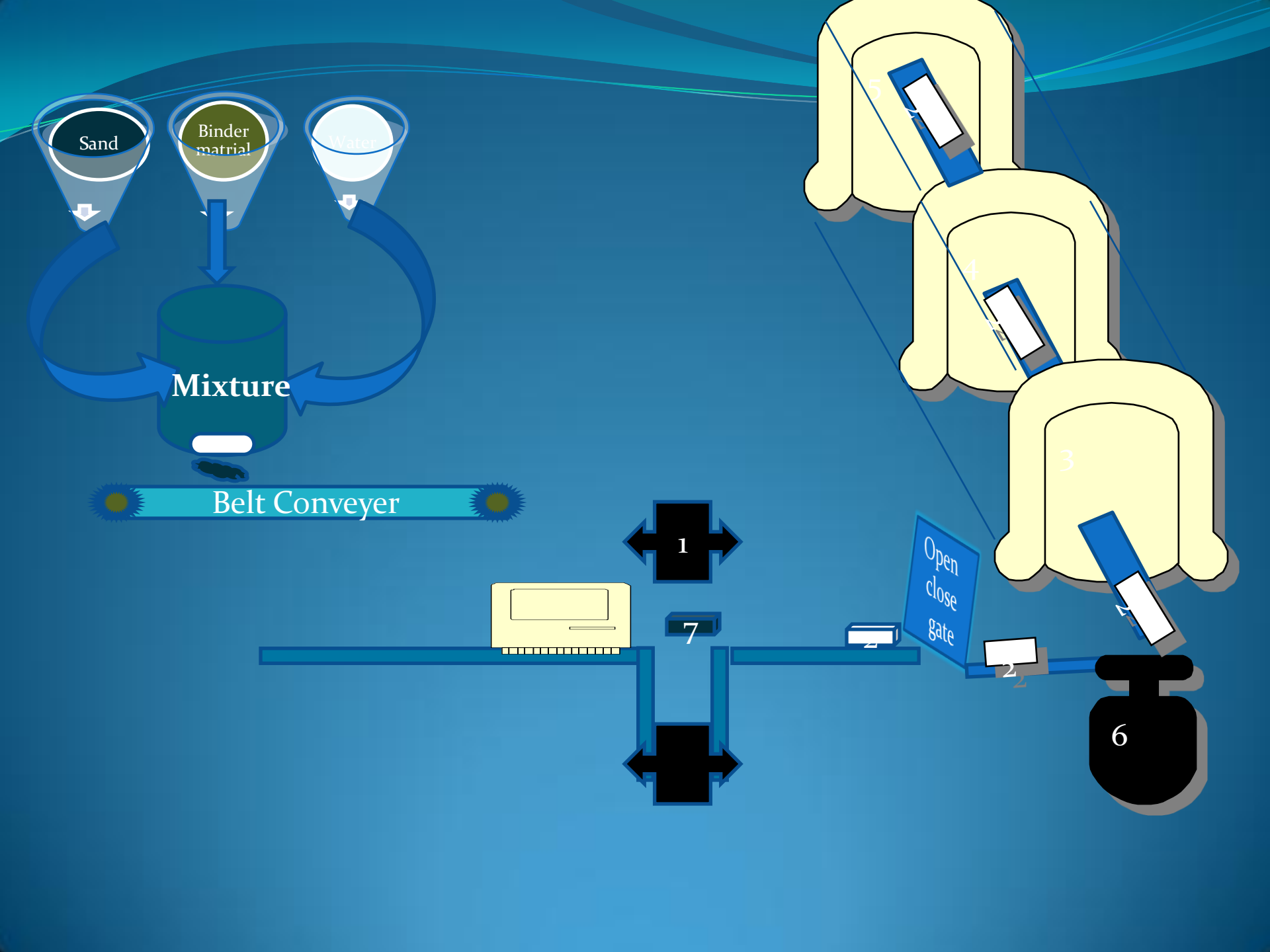
Punch and die mechanism



General layout of brick production with automation

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Belt Conveyer
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5
4
3

Cost Analysis

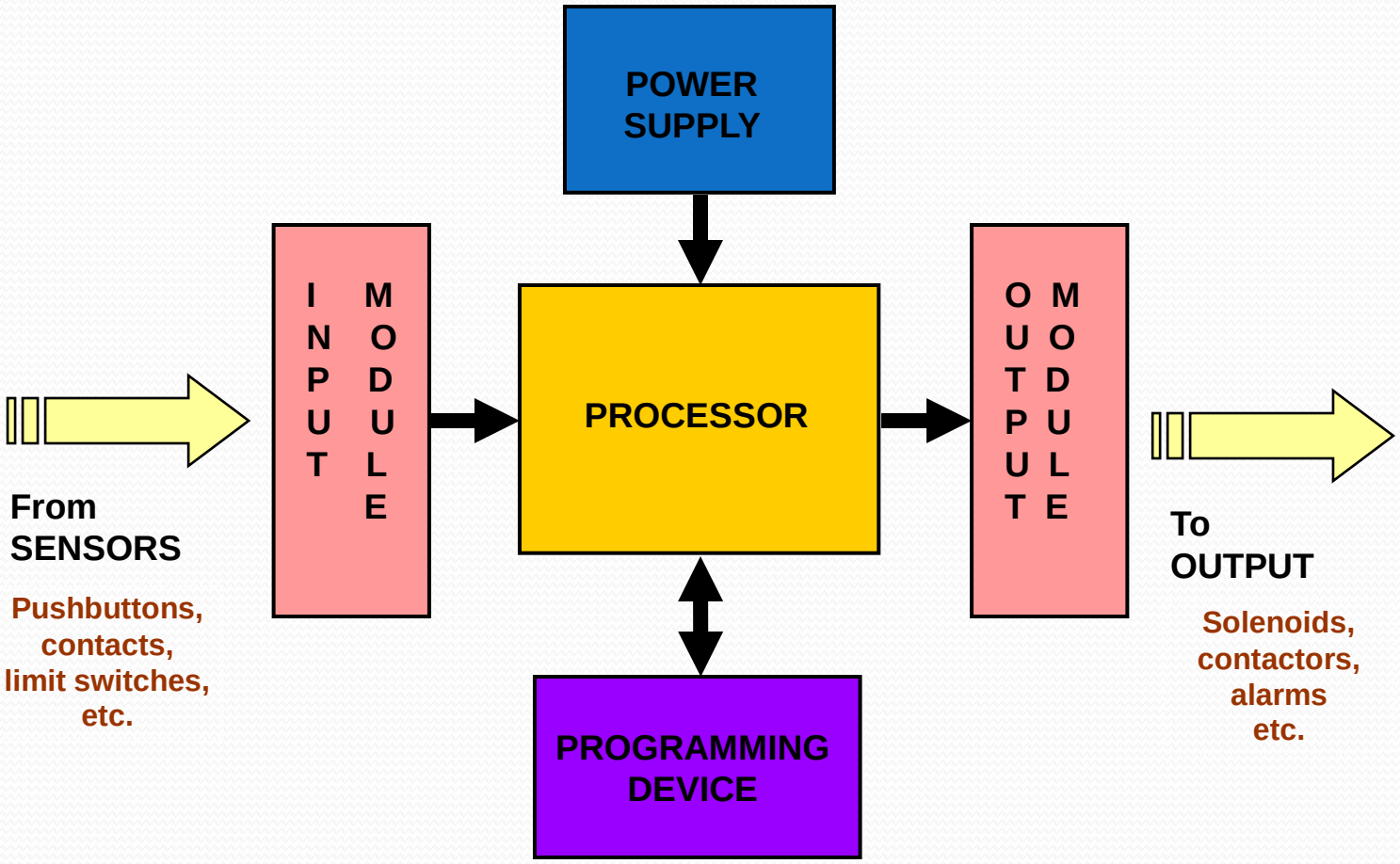
For 1000 bricks at the site	Material cost(sand) 3500kg	Arrangement of Bricks by 4 Labours	Combustion of Material	Total
Cost(Rs)	200	400	1500	**2100/-**

No of bricks	Cost(Rs)	
1000	2100	= **2.1** Rs per Brick
1	(?)	

Programmable Logic Controllers (Definition according to NEMA standard ICS3-1978)

- A digitally operating electronic apparatus which uses a programming memory for the internal storage of instructions for implementing specific functions such as logic, sequencing, timing, counting and arithmetic to control through digital or analog modules, various types of machines or process.

Major Components of a Common PLC



OUTPUTS

INPUTS

MOTOR

CONTACTOR

LAMP

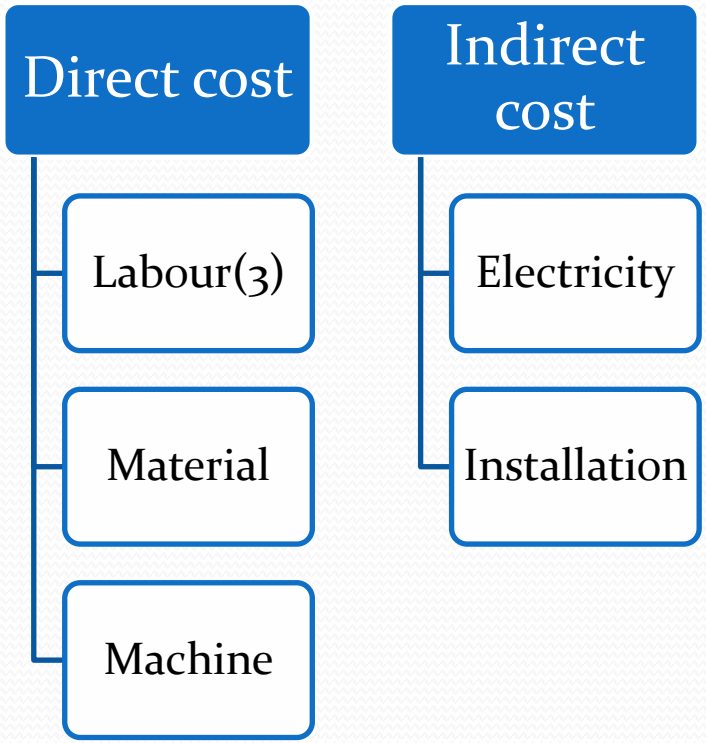
PUSHBUTTONS

PLC

Man & Machine	No of	Cost in Rs.
Plant and Machinery		Rs. 4,00,000.00
HOT - Crane 1 ton Capacity	1	Rs. 50,000.00
Hydraulic Palled truck (2 ton Cap	1	Rs. 1,50,000.00
Distribution transformer 300 KVA rating	1	Rs. 2,50,000.00
Machine Operator	1	Rs.4000.00
Semi skilled worker	1	Rs.3000.00

Future work

- Calculate cost analysis and timings according to our project and compare with conventional plant for brick production.



Project Survey	Project Definition		Literature Survey		Brick Production Process		Design layout for Brick production process		Design component for it	
Month	**Days**		**Days**		**Days**		**Days**		**Days**	
	15	15	15	15	15	15	15	15	15	15
Aug										
Sept										
Oct										

Work showing percentages with colour

25%	50%	75%	100%

Thank you