

Design Shape and Dimension of Threshing Station Model Palm Oil Mill in PT. Perkebunan Nusantara V - PKS Sei Galuh Using Autodesk AutoCAD 2014 Software

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ABSTRACT

Palm oil mills in PT. Perkebunan Nusantara V PKS - Sei Galuh is a producer of crude palm oil CPO (Crude Palm Oil), which consists of several stations the processing of palm oil, one of which is the threshing station. Threshing station is the station there is a separation palm kernel process with the cluster in a way slammed into a rotating drum. The purpose of this research is to design the shape and dimension of the station threshing model palm oil mill in PT. Perkebunan Nusantara V - PKS Sei Galuh with scale of 1: 8 using Autodesk Autocad 2014 Software. Design of shapes and dimension threshing station model is divided into three groups, namely the design shape and dimension of auto feeder, design shape and dimension of thresher and design shape and dimension of screw conveyor. The design shape and dimension of auto feeder are 2 units sprocket and 11 plate shaped profile L. The design shape and dimension of thresher is a diameter of 230 mm and a length 500 mm. The design shapes and dimension of screw conveyor are 3 screw with a diameter of 100 mm and a length of each screw is 156 mm, 160 mm and 156 mm. Cover on the design of the shape and dimension of screw conveyor U-shaped profile with a diameter of 120 mm and a length of 620 mm cover.

KEY WORDS: *Threshing Station Model, Screw Conveyor,*

Thresher, Auto Feeder, Autodesk Autocad 2014 Software.

1.0 INTRODUCTION

Palm oil mill in PT. Perkebunan Nusantara V PKS Sei Galuh consists of several stations the processing of palm oil, one of which is the threshing station. Threshing station is a station where there is a separation process palm kernel of empty bunches [1] consisting of auto feeder, thresher and screw conveyor.

Auto feeder is a device in the form of machine tool apron conveyor that can move and direct the fresh fruit bunches into the thresher to do separation process by way of fresh fruit bunches slammed into a rotating drum then palm kernel result of the thresher process fell to screw conveyor. Screw conveyor is a device machine tool that serves to move and direct palm kernel to bucket elevators for pulverized process by digester machine and further the process of suppression by the machine screw press to produce crude palm oil (CPO) [1].

Observation in the field at the time the authors do the practical work in palm oil mill PT. Perkebunan Nusantara V - PKS Sei. Galuh, auto feeder operation on threshing stations still use the operator to regulate incorporate fresh fruit bunches that have been boiled into a thresher by pressing the on-off push button. When the operator press the on button and auto feeder operation, the operator returned to the pressing station to do other work which is to reduce pulp palm kernel result of the emphasis by the press machine so that the dregs of the result of the emphasis does not accumulate and can optimize work process press machine. Palm kernel the threshed then brought by bucket elevator to be included in the digester and crushing process for optimize and to simplify the process of suppression by a press machine. The operator will observe palm kernel go inside digester

and look at the capacity level digister. Once the level has enough capacity on digister, then operator back to the threshing station and pressing the off button to turn off the auto feeder operation. Operator back to the pressing station to continue it is work reducing dregs of palm oil. When the operator see the dregs of palm oil result of the emphasis has been reduced, then operator back again to the threshing station and pressing the off button to turn off the auto feeder operation.

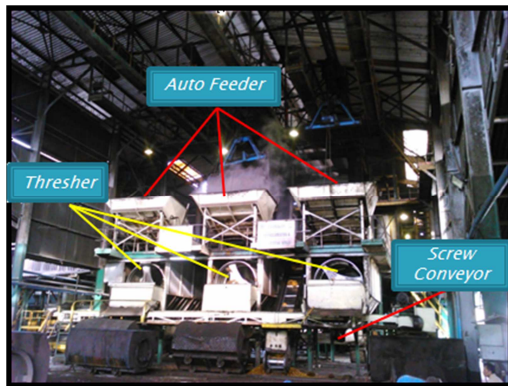


Figure 1: Threshing Station in PT. Perkebunan Nusantara V PKS - Sei Galuh

Observations in the field also in screw conveyor under thresher fractures/detachment shaft screw conveyor, which causes a buildup of palm kernel the screw conveyor is not spinning. To clean the screw conveyor from piling palm kernel takes quite a long time so that processing of oil palm should be dismissed and the impact on the company's losses due to the production of crude palm oil does not reach the target.

Based on the above problems, the authors designed the shape and dimension threshing station model using AutoCAD 2014 software and then, together with the planning of production processes and modeling threshing station in the laboratory of Mechanical Engineering University of Riau based threshing station PKS Sei. Galuh [2]. The author also designed the control system automatically on the threshing station model [3] based Programmable Logic Controller (PLC) in the auto feeder using a timer and designing a sensor system on a screw conveyor to detect the rotation screw conveyor, so that in case of breaking up/stop the screw conveyor, the sensor will send a signal to PLC for output is auto feeder, thresher and screw conveyor are dismissed then the author will apply the results to the automatic control system design threshing station model.

PLC is a computerized industrial control system that continuously monitors the input devices and make decisions based on a special program to control the output device. PLCs are usually small, have little memory, and the number of inputs and outputs is limited. CPU, power supply, and system I/O are all designed into a single unit. [4].

2.0 METHODOLOGY

Flow chart of a case study at a palm oil mill PT. Perkebunan Nusantara V Sei Galuh can be seen in Figure 1.

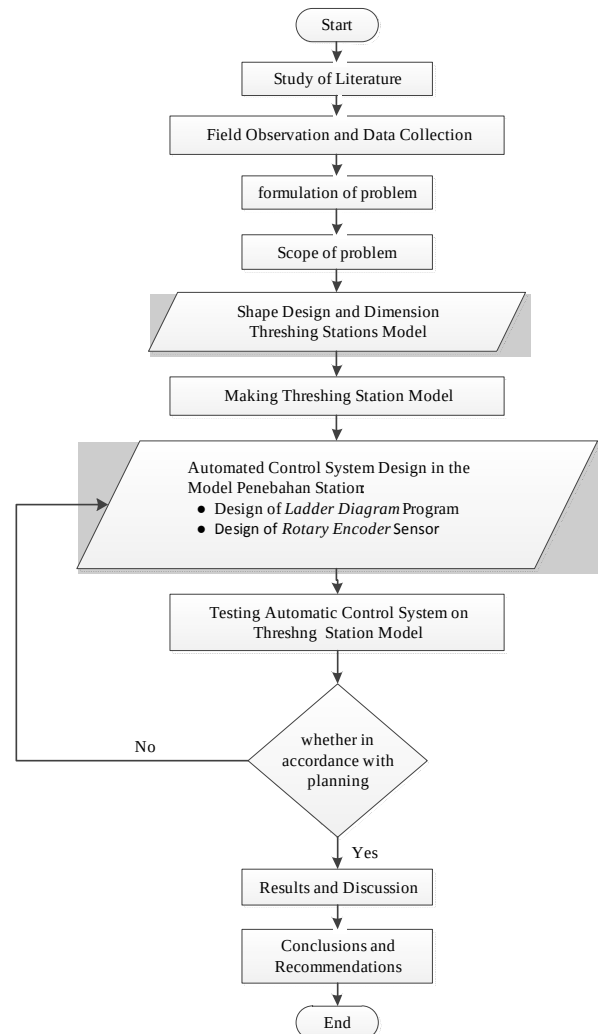


Figure 1: Flow Chart of Research

2.1 Block Diagram Tool

Block diagram are used to provide information about the overall system either in a manual or automatic in conditions in this study. Block diagram in the manual condition threshing station at PKS Sei. Galuh can be seen in Figure 2.

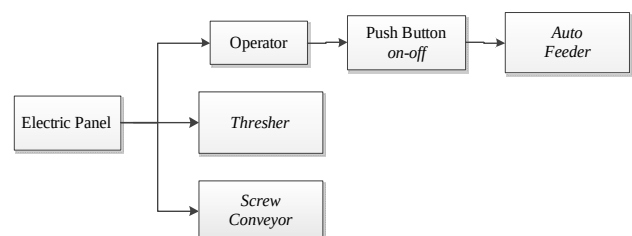


Figure 2: Block Diagram in The Manual Condition

Block diagram in Figure 2 shows a block diagram of the

threshing process in palm oil mills Sei. Galuh in manual condition. Screw conveyor and thresher operate concurrently when the switch on the electric panel is positioned on the operator. The operator will operate the auto feeder by applying pressure on the button on, operator will observe the level of capacity in the digister at the pressing station then the carrier will return to press the push button off to turn off the operation of the auto feeder when the level of capacity in the digister has been enough, the operator back press a button press on to operate auto feeder when the operator saw the dregs of the result of the emphasis has been reduced.

Based on the block diagram in the manual condition, made the block diagram in automatically based on the condition of the automatic control system design threshing station model to simplify the process view of a system. Block diagram of the automatic condition at threshing station model can be seen in Figure 3.

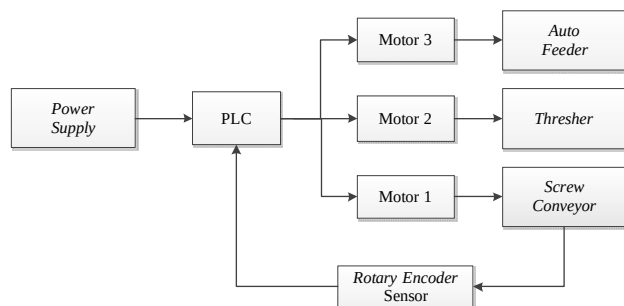


Figure 3: Block Diagram in The Automatic Condition

Block diagram in Figure 3 illustrates the block system of tools in general in the automatic condition, where the entire system is controlled by a Programmable Logic Controller (PLC). when the ON button is pressed the electric current from the power supply entrance to the PLC, the PLC work then turn on the thresher and screw conveyor motors simultaneously, while in the auto feeder motors still in the off/delay in the time interval that has been programmed in the PLC. Then the motors auto feeder will be on automatically with the time that has been programmed by the PLC, and continuously for the motor auto feeder, on and off automatically.

The rotary encoder sensors monitoring shaft rotation screw conveyor and will be active when the sensor detects the stop on the shaft screw conveyor, then rotary encoder sensor will send a signal to the PLC to be executed so that the third motors is switched off.

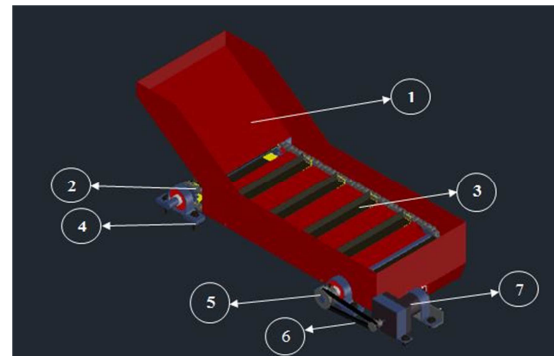
2.2 Design Shape and Dimension Threshing Station Model

Design shapes and dimension threshing station model using Autodesk AutoCAD 2014 Software to scale 1: 8 in accordance with the threshing station in palm oil mill Sei. Galuh. Design the shape and dimensions of this threshing station model are generally divided into three of them is the design of the shape and dimensions auto feeder, design the shape and dimension of thresher and design the shape and dimension of screw conveyor.

2.2.1 Design Shape and Dimension of Auto Feeder

Design shapes and dimension auto feeder consists of three namely

design shape and dimension of sprocket, design shape and dimensions of a conductor plate or carrier plate and design the shape and dimension of casing auto feeder. Here is a picture design shape of auto feeder as shown in Figure 4.



Caption :

- | | |
|-----------------------|-------------|
| 1. Casing auto feeder | 5. Pulley |
| 2. Sprocket | 6. Belting |
| 3. Carrier plate | 7. DC Motor |
| 4. Bearing | |

Figure 4: Design Shape of Auto Feeder

1) Design Shape and Dimension Sprocket

Sprocket is a toothed wheel paired with a chain that serves to forward power and the rotation of the prime mover is a motor. Design the shape and dimension of a sprocket auto feeder at threshing station model uses 2 units and 2 pieces sprocket shaft with each shaft length of 400 mm. Design shape of sprocket can be seen in Figure 5.

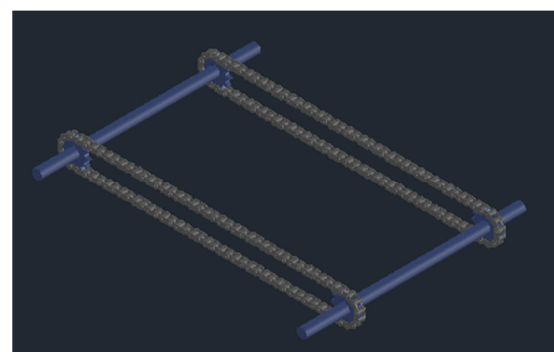


Figure 5: Design Shape of Sprocket

The distance between the sprocket to sprocket on the design of this auto feeder is 494 mm, can be seen in Figure 6.



Figure 6: Distance Between the Sprocket

Design shape of sprocket refers to the sprocket on the motorcycle Yamaha Jupiter Z with dimension of gears and shafts can be seen in Figure 7.

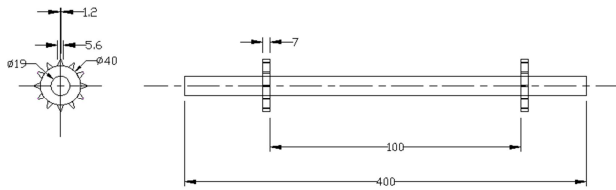


Figure 7: Dimension Shape Sprocket

- 2) Design shape and dimension of carrier plate
Carrier plate serves to deliver and direct palm kernel into the thresher. Design shape of plate an introduction to the chain using removable chain connection as shown in Figure 8. The number carrier plate to auto feeder used in this design a total of 11 plate introduction.

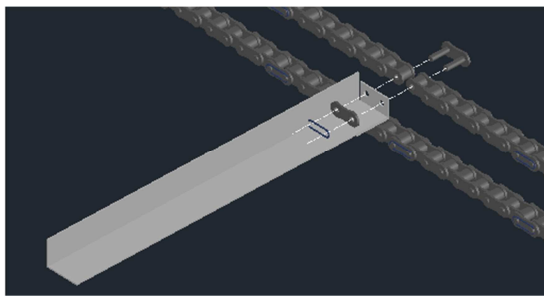


Figure 8: Design Shape of Carrier Plate

Figure 9 shows the dimension shape plate of instruction used in this design.

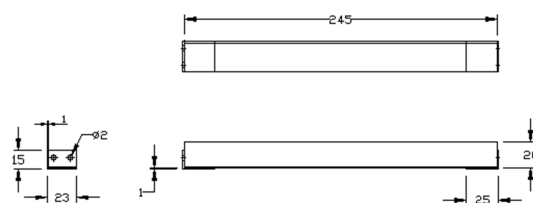


Figure 9: Dimension Shape of Carrier Plate

- 3) Design shape and dimension of Casing Auto Feeder
Casing auto feeder serves as a place to accommodate the fall of fresh fruit bunches which have been boiled in threshing station at PKS Sei. Galuh. Design the shape and dimension of the casing auto feeder can be seen in Figure 10.

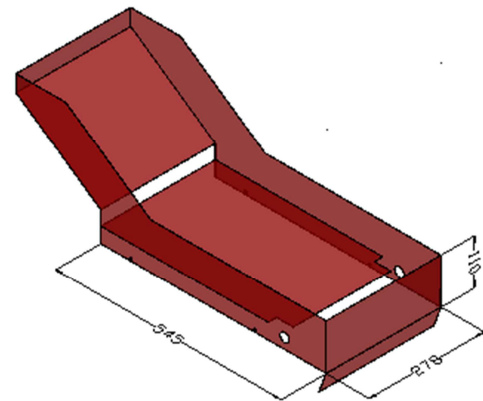


Figure 10: Design Shape and Dimension of Casing Auto Feeder

Figure 11 shows the dimension of the base auto feeder used in this design with a plate thickness of 1 mm.

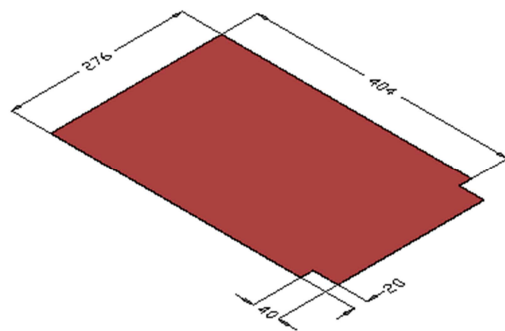
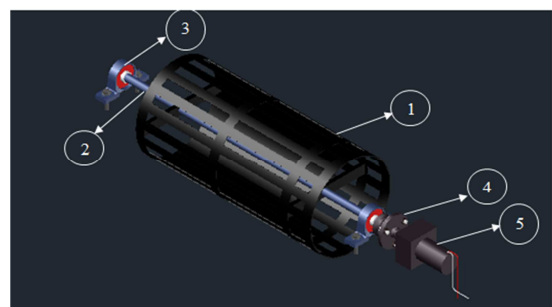


Figure 11: Dimension Base of Auto Feeder

2.2.2 Design Shape and Dimension of Thresher

Thresher consists of several other supporting components such as the thresher drum design, and the design of the shaft thresher. Figure 12 shows the result of the design shape of thresher.



Caption:

- | | |
|-------------|-------------|
| 1. Thresher | 4. Clutch |
| 2. Shaft | 5. DC Motor |
| 3. Bearing | |

Figure 12: Design Shape of Thresher

- 1) Design Shape and Dimension of Drum Thresher
Drum thresher is a palm kernel fall of auto feeder that spins at 22 rpm rotation. Design on thresher drum using 18 plates with dimension of 500 mm x 20 mm x 1 mm in shape like a drum with a slit width of 25 mm in order palm kernel can fall into a screw conveyor. Figure 13 shows dimension shape thresher drum used in this design.

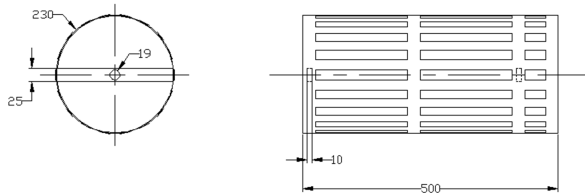


Figure 13: Design Shape of Drum Thresher

- 2) Design Shape and Dimension of Thresher Shaft
Shaft design used on thresher is diameter 19 mm with a shaft length of 788 mm as shown in Figure 14.

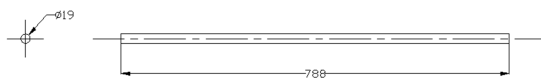
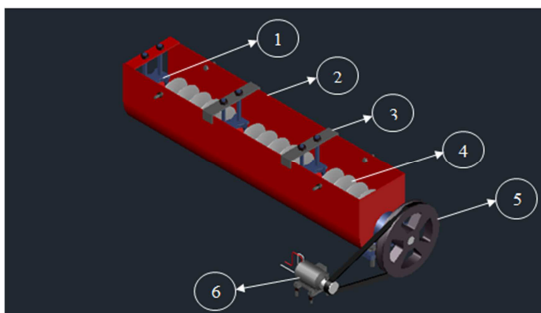


Figure 14: Dimension Shape of Thresher Shaft

2.2.3 Design Shape and Dimension of Screw Conveyor

Screw conveyor consists of several other supporting components such as screw, shaft, bearing hanging, screw conveyor casing and bearing anchoring plate hanging. Figure 15 shows the result of the conveyor screw shape design on this design.



Caption :

- | | |
|--------------------------|-------------------|
| 1. Hanging bearing | 4. Screw conveyor |
| 2. Casing screw conveyor | 5. Pulley |
| 3. Plat penahan bearing | 6. DC Motor |

Figure 15: Design Shape and Dimension of Screw Conveyor

- 1) Design Shape of Screw

There are three screw on this design with a pitch distance is 30 mm and a length of each screw shaft different from one another as seen in Figure 16. The tip of the screw shaft in pegs design that aims to facilitate the release of the screw shaft when the rotary encoder sensor testing.

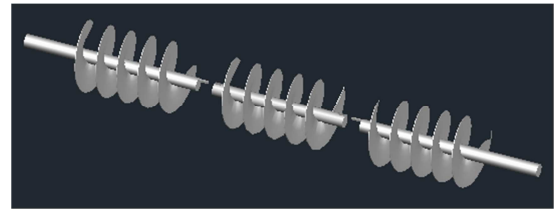


Figure 16: Design Shape of Screw

Figure 17 shows dimension shape of screw conveyor used in this design.

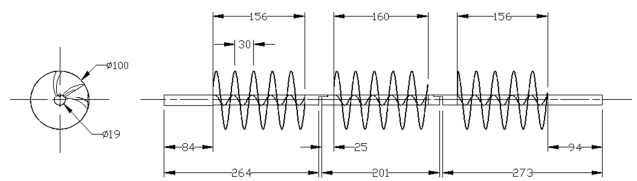


Figure 17: Dimension Shape of Screw Conveyor

- 2) Design Shape of Cover Screw Conveyor and Hanging Bearing

Design cover screw conveyor U-shaped profile which has a thickness of 1 mm with the dimension shown in Figure 18. Cover screw conveyor serves as a container palm kernel that fell from the thresher which is then driven by a screw conveyor. Cover design and bearing hanging screw conveyor can be seen in Figure 18.

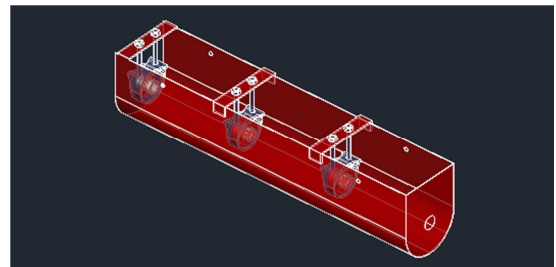


Figure 18: Design Shape of Cover Screw Conveyor and Hanging Bearing

Figure 19 shows dimension shape of screw conveyor used in this design.

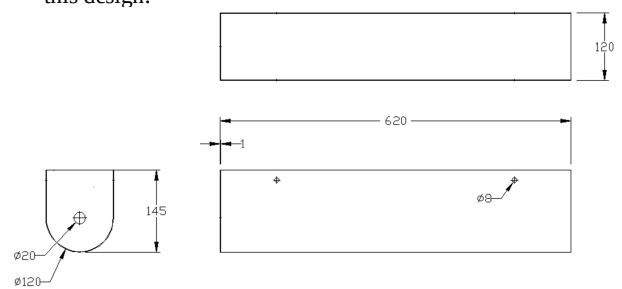
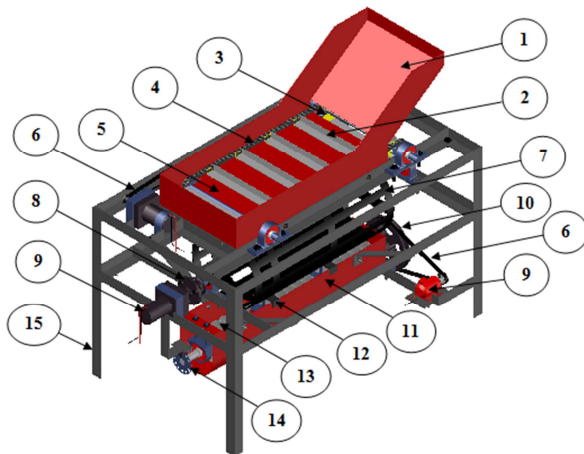


Figure 19: Dimension Shape of Screw Conveyor

3.0 RESULT AND DISCUSSION

The result on the design of the shape and dimension threshing station model can be seen in Figure 20.



Caption :

1. Casing Auto feeder
2. Carrier Plate
3. Buffer Plate
4. Chain
5. Base Auto Feeder
6. Belting
7. Thresher
8. Clutch
9. DC Motor
10. Pulley
11. Casing Screw Conveyor
12. Hanging Bearing Plate
13. Screw Conveyor
14. Rotary Encoder Sensor
15. Chassis

Figure 20: Design Threshing Stasiun Model

The results of the design threshing station model using autodesk autocad 2014 software can then be modeled threshing station based on the design that has been done. The result of the modeling threshing station can be seen in Figure 20.

The purpose of this threshing station model is to apply the result of the automatic control system design in the auto feeder and apply a sensor system to detect the rotation on the screw conveyor. Threshing station model can be seen in Figure 21.

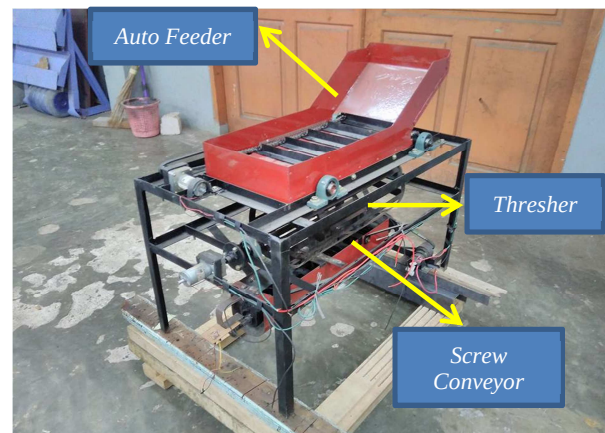


Figure 21: Threshing Station Model

4.0 CONCLUSION

- 1) Design threshing station model using autodesk autocad 2014 software with the scaled 1 : 8.
- 2) It has been created threshing station model based on the design using Autodesk AutoCAD 2014 software.

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