

## RESEARCH, DESIGN, AND MANUFACTURE PELLET MACHINES

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### ABSTRACT

High-quality livestock feeds are of great importance in livestock nutrition. The topic has researched, designed, and successfully manufactured small and medium-sized pellet machines used in households. The machine, which has a diameter of 3mm and a length of 10mm, can grind and squeeze food rapidly and efficiently. The product is not too bulky, and it can be easily moved, disassembled, and repaired. The product price is reasonable so that farmers can own, mix and press feed themselves, saving farmers time and money.

**Keywords:** Livestock Feeds, Pellet Machines, Livestock Nutrition.

### I. INTRODUCTION

Compound feed is a homogenous mixture of many different foods, which are combined together according to a formula established from scientific research to ensure nutrition for livestock [1], [2]. The introduction of compound feed allowed the industrialization of the livestock industry [3]. The introduction of compound feed has overcome the situation of seasonal feed supply and gives a more uniform product quality [4].

In addition, compound feeds enable rapid adoption of the latest achievements in nutrition, allowing widespread mechanization and automation in feeding [5], saving labor and food preparation time. Therefore, compound feed is of great significance. Developing the livestock feed that can utilize all sources of animal feed, including by-products of the agro-food processing industry [6], allows the development of livestock in the necessary directions.

Recently, following the general trend, our country's animal feed industry has paid attention to the processing of mixed feed into pellets [7], [8], [9]. In pellet form, it will be easier to use, as well as better to pack, transport, and preserve.

### II. METHODOLOGY

#### 2.1. Steps to proceed

- Actual survey through a number of stores that use pellet machines [10], [11].
- Find out some research topics related to the author's topic.
- Refer to documents on the web and some related books.

#### 2.2. Means of research

- Using Solidworks 2018 software [12], [13] for mechanical design for the project.
- Using Autocad 2018 software [14] to draw drawings.

### III. CALCULATION OF SPECIFICATIONS AND STRUCTURE OF THE MACHINE

#### 3.1. Calculation of specifications

Roller:

Notation	D(mm)	L(mm)	Quantity (pcs)	Weight (kg)
Specifications	73	38	2	4,147

Sieve surface:

Notation	D(mm)	D(mm)	B(mm)	(mm)
Specifications	124	24	20	3

Small latch:

b(mm)	h(mm)	t(mm)	(mm)	k(mm)	r(mm)
6	6	3,5	2,6	2,9	0,3

Big latch:

b(mm)	h(mm)	t(mm)	(mm)	k(mm)	r(mm)
8	7	4,0	3,1	3,5	0,4

The shaft length is 283mm:

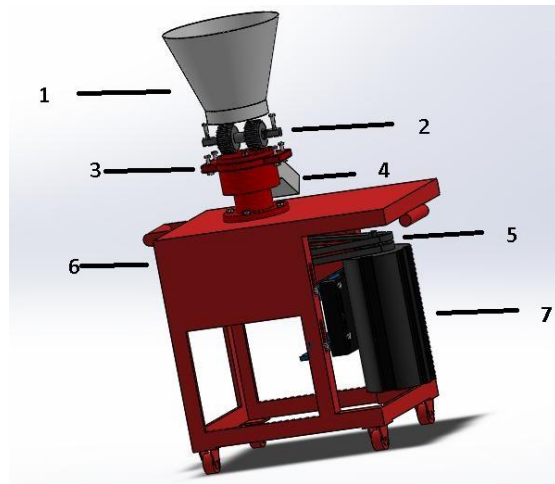
Materials	(Mpa)	(Mpa)		HRC
C45 heat treatment	610	360	16	23

Specification calculation results:

Notation	D(mm)	L(mm)	(m/s)
Specifications	3	10	0,02

### 3.2. Structure of the pellet machine

After calculating and designing, we have the basic structure diagram of the pellet machine as follows:



**Figure 1:** Pellet machine designed on Solidworks software

1. Feed hopper
2. Rulo
3. Pressing equipment set
4. Product outlet (trough)
5. Straps
6. Machine body
7. Motors



**Figure 2:** The actual product

#### IV. EXPERIMENTAL RESULTS

Materials for pressing bran pellets include: rice bran, corn bran, water, green vegetables.



Figure 3: Mixture of rice bran, corn bran, and vegetables



Figure 4: Aligning the pressing part



Figure 5: Machine in operation

#### 4.1. Experiment 1

- Mix in a ratio of 2 rice bran to 2 corn bran.
- The product is made into pellets but easily crushed without adhesion.



Figure 6: Experiment 1

#### 4.2. Experiment 2

- Mix in the ratio of 3 rice bran to 3 corn bran, 100 ml water, and some vegetables to increase the moisture content of the product.
- The product is in the form of pellets, the moisture is moderate, and the color is beautiful.



Figure 7: Experiment 2

#### 4.3. Experiment 3

- Mix in the ratio of 3 rice bran to 1 corn bran, 100 ml water.
- The product is in the form of pellets with the desired length and high adhesion.



**Figure 8:** Experiment 3

## V. CONCLUSION

### 5.1. Machine's specifications

- Pressing roller type machine
- Productivity 200 kg/hour
- Electric motor DK 51 - 6
- Power of 2.8 KW, number of revolutions 950 (rpm)
- Starting torque factor 1.8
- Number of spindle revolutions 8 (rpm)
- Number of rollers: 4
- Area occupied  $d \times r \times h = 565 \times 680 \times 860$

### 5.2. Special features of the machine

- Operating the machine is easy, safe, and high efficient.
- Less material stuck in the press.
- The machine can create different kinds of pellet shape because we only need to change the size and shape of the press.
- The design of the machine is sealed to prevent the bearings from getting wet
- Fabrication materials are made of materials suitable for chemical and high humidity environments.
- The lid is designed with a quick disassembly system to help workers reduce cleaning time.
- Easy-to-find fabrication materials.
- Manufacturing technology is not too demanding.
- The machine is mainly used in the feed-making system by the high-productivity line.

### 5.3. Some disadvantages of the machine

- Due to the drive system by screw and worm gear, the machine can make a lot of loud noise.
- The local loss of the machine is large.

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