# Product Development And Design- Ragi Thresher Cum Pearler Machine

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***Abstract****- This article has been done to design a ragi thresher cum pearling machine by computer aided designing, and then, using a stimulation software, the machine would be redesigned for a desirable efficiency. Ragi or finger millets are crops of great value but of less use. Due to various constraints, these crops are not harvested even though the harvesting of ragi can be done during any season and most type of soils in India. Also, there is a need of efficient machines for threshing such that more amounts of clean crops as a final product are obtained and less manual labor is required*

***Keywords***- Ragi crop, Thresher machine, Computer aided designing,

## I. INTRODUCTION

Ragi is one of the ancient human foods and it was believed to be first cultivated cereal grain. It is the staple food for especially for millions of people in drier parts of tropical Africa. Prasannakumar et. al. [6] conducted on evaluation and testing. It has been reported that the air-dried grain of millet contains approximately 12.4% water, 11.6% protein, 5% fat, 67.1% carbohydrate, 1.2% fibre(referred from the research conducted by G.B Adebayo, G.A Otunola and T.A Ajao on Relationship between Nutritional Qualities of Millets and Temperature, Advance Journal of Food Science and Technology et. al. [3]. The major Finger millet growing states are Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Jharkhand, Maharashtra an Uttaranchal.

Though it is not a popular crop like that of paddy or wheat, ragi is a staple crop for many people in many parts of India. Hence, there is less wastage. This crop is rich in polyphenols, fibres, phytochemicals and various minerals, mainly calcium as mentioned by Srivastava K., et al [1] in 2012. This millet has not been given due importance because of limited awareness among the common population and hence, its versatility and nutritional abilities have remained an unknown news.

## II. METHODOLOGY

The cylinder is driven by the pulley which is in turn powered by an electric motor or a pair of bullocks. A bullock can supply as much as 1 H.P. power. There is another pulley attached in the whole pulley-motor/bullock power system which follows eccentric mechanism. In eccentric mechanism, the axle is offset from the centre. This causes the oscillation in sieve.

As the cylinder rotates, the alternatively placed studs and canvas causes impact force and shearing force respectively on the ear head of the grain. This separates the straws from the ear head. The remaining parts, i.e., the broken straws, chaff and grain, land on the upper sieve. This sieve holds the chaff and straws and disposes them off by the blower. Then the glume covered grain lands on the lower sieve after which it is led to the adjustable aspirator. The clean grain is then led out.

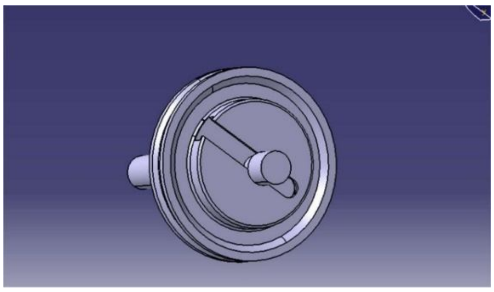

Fig. 1 Eccentric pulley 3D

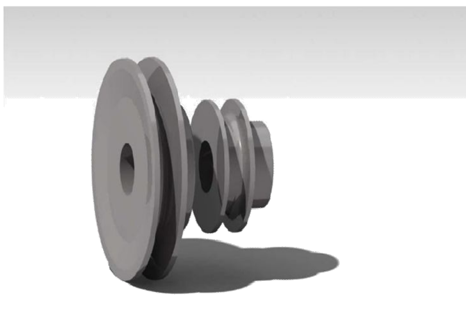

Fig. 2 Pulley 3D

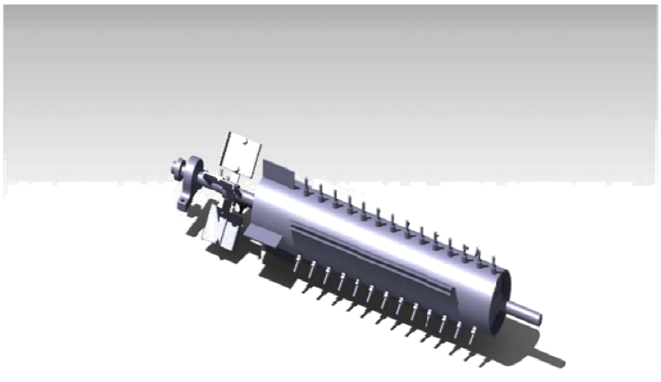

Fig. 3 Threshing cylinder 3D

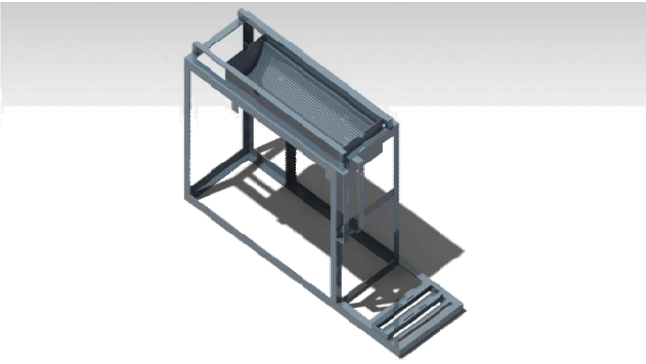

Fig. 4 Frame 3D

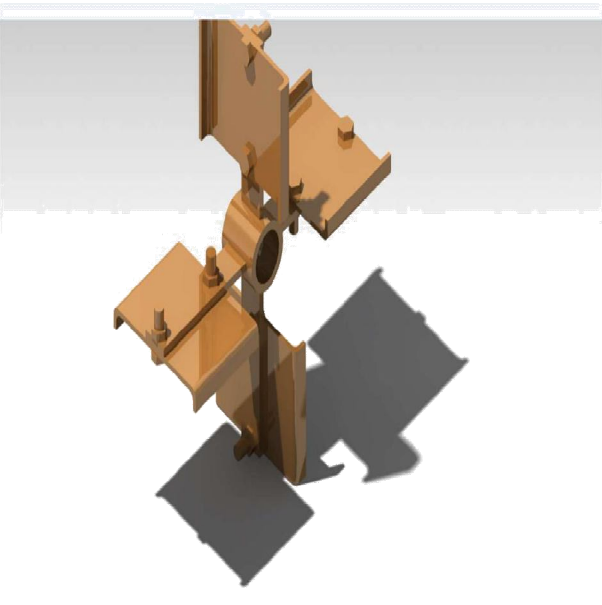

Fig. 5 Propeller 3D

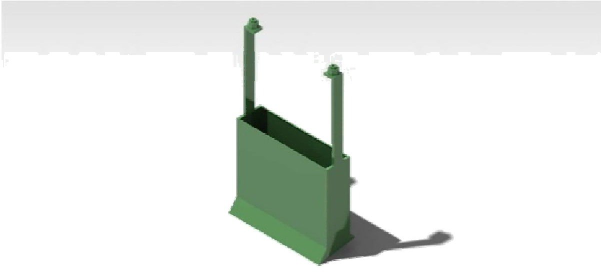

Fig. 6 Blower 3D

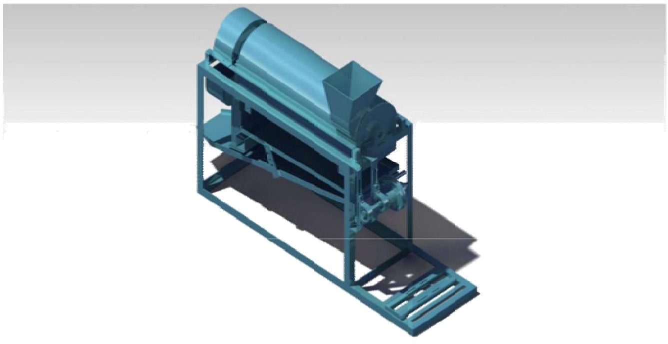

Fig. 7 Assembly

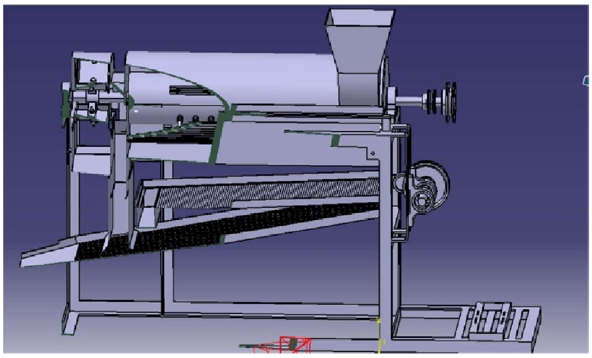

Fig. 8 Sectional view assembly

**A. Structural Analysis is ANSYS**

This facility in ANSYS enables users to create better designs and solve complex structural engineering problems. The FEA or Finite Element Analysis helps us parameterize various instances in mechanical engineering designs. The meshing technology is highly intelligent out here with various controls on the meshing. Advanced technologies, such as, modelling crack growth in cases where fracture is a concern, is available. The taming of complex additive metal manufacturing can also be done.

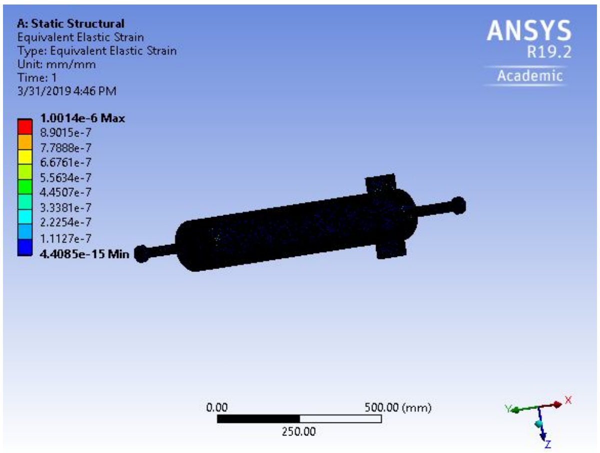


Fig.9 Equivalent Elastic Strain

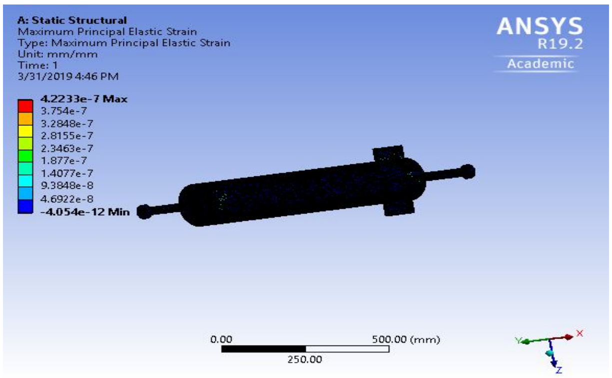


Fig.10 Maximum Principal Elastic Strain

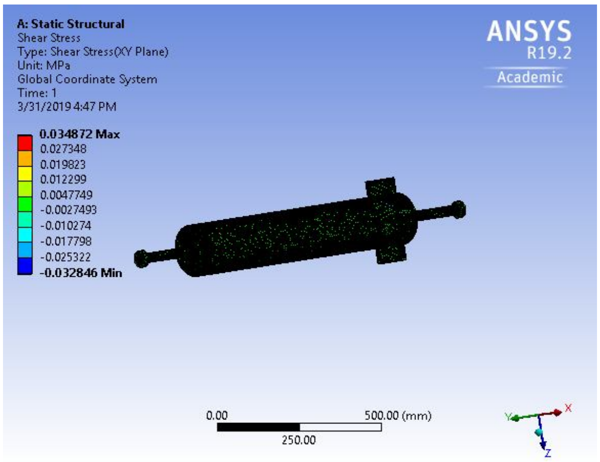


Fig.11 Shear Stress XY Plane

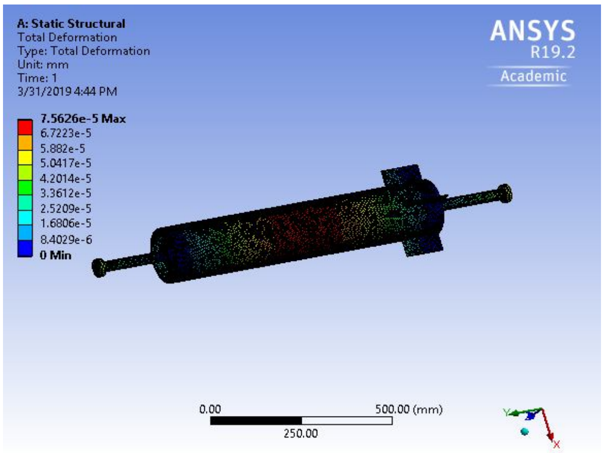


Fig. 12 Total deformation

## III. RESULTS AND DISCUSSION

### A. Working Principle

The machine works on eccentric mechanism which creates linear reciprocatory action from rotary motion.

### B. Machine parts

The ragi thresher cum pearler has the following parts:

1. Hopper: This is the part where the ragi, after removing from the ground, i.e., after harvesting, is put. That part of the crop is known as earhead. It is an extruded opening on the cylinder cover.
2. Threshing cylinder and threshing elements: The cylinder is a mild steel cylinder.

   i. Studs: These are fixed to it in such an arrangement that the studs, when observed from a side, creates a helical arrangement which continues till the other end. The helix is for leading the grains from one end to another along with an impact force with the rotary movement of the cylinder created by the pulley. This is a threshing action.

   ii. Canvas strips and louvre: There are canvas strips in both the cylinder cover (here, it is called louvre) and the cylinder, known as upper canvas and lower canvas respectively. As the cylinder rotates due to action of the pulley, the canvas creates a shearing force on the earhead as it moves from one end to another. This action is known as pearling.

3. Blower: The blower is a fan with clears the machine of the parts removed from the crop earhead, i.e., the straws, by the threshing and pearling action.

4. Upper sieve: The upper sieve receives the chaff, grain and broken straws after the action on the cylinder. It holds the chaff and separates it from the other materials. The sieve is subjected to oscillating forces.

5. Lower sieve: The grain has alight outer covering known as glume which is needed to be removed before consuming. This lower sieve leads the glume covered grain along to the aspirator. The transport to the aspirator is due to oscillating action and also, sliding action with is created by the slanting placement of the lower sieve..

6. Pulley: The pulley is driven by the input power source and in turn drives the cylinder.

7. Power source: The input power source is created either by electric motor or bullocks

## IV. CONCLUSION

The fabrication of the designed model by using CATIA and analyzing of the performance of the machine to some extent with the help of engineering stimulation software, ANSYS, was done.

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