

# A Review on Ultrasonic based Security System

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## Abstract

We already know India is one of the most agriculture dependent country and our economy is largely based on agriculture. Also the ever increasing demand for food with an increase in population is of prime importance. But the rate of production is comparatively low due to shortage of labour and high wages. So it is essential to achieve maximum efficiency in production in the limited area available nowadays. Also the shortage of labour has affected agriculture very badly. More and more people are turning away from agriculture. People are mostly migrating to cities and towns. The application of industrial equipments are endless starting from trivial milling machines, irrigation equipment, harvesting equipment and extending to specialized application such as combined harvesters and self-propelled machines, manure spraying machines. So an effective machinery for soil scooping machine has wide applications in house hold and farming purposes. The troubles associated with an agricultural machinery is its bulkiness, weight and reduced mobility and manoeuvrability. These problems are addressed with our project making it compact, lightweight and mobile. Thus, our soil scooping machine is an appropriate project in helping more people to deal with agricultural issues easily.

**Keywords: Combined Harvesters, Equipments, Machinery, Manoeuvrability, Self-Propelled Machines, Soil Scooping Machine**

## I. INTRODUCTION

India is a growing superpower with its solid economy which is backed by the agricultural sector. Agricultural sector contributes mostly to India's economy. India is one of the most agriculture dependent country and our economy is largely based on agriculture. But recently agriculture sector has faced many setbacks.

Also the ever increasing demand for food with an increase in population is of prime importance. But the rate of production is comparatively low due to shortage of labour and high wages. So it is essential to achieve maximum efficiency in production in the limited area available nowadays. Also the shortage of labour has affected agriculture very badly. More and more people are turning away from agriculture. People are mostly migrating to cities and towns.

With modernisation in every field that we know of, people are more involved in sectors other than agriculture. It is because the rate of technological advancements in other fields has not contributed to the rate of development of the agricultural sector. More and more people are interested in white collar jobs and also people are lured by the luxuries and amenities that a city provides leaving farmlands barren.

The application of industrial equipments are endless starting from trivial milling machines, irrigation equipment, harvesting equipment and extending to specialized application such as combined harvesters and self-propelled machines, manure spraying machines. So an effective machinery for soil scooping machine has wide applications in house hold and farming purposes. Conventional methods of farming are to be replaced with newer sophisticated technology to meet the increased demands. This brings about improved efficiency and saves time with reduction in labour costs. This is the key to the design ideology of this project.

## II. RELEVANCE

As we already know India is one of the most agriculture dependent country and our economy is largely based on agriculture. But the rate of production is comparatively low due to shortage of labour and high wages. So it is essential to achieve maximum efficiency in production in the limited area available nowadays. To overcome the shortage of labour, and also to provide a cost effective and time saving method for soil scooping in agriculture sector.

The troubles associated with an agricultural machinery is its bulkiness, weight and reduced mobility and manoeuvrability. These problems are addressed with our project making it compact, lightweight and mobile. Also conventional methods of farming are to be replaced with newer sophisticated technology to meet the increased demands. This brings about improved efficiency and saves time with reduction in labour costs.

The application of industrial equipments are endless starting from trivial milling machines, irrigation equipment, harvesting equipment and extending to specialized application such as combined harvesters and self-propelled machines, manure spraying machines. So an effective machinery for soil scooping machine has wide applications in house hold and farming purposes.

### III. ENGINEERING DESIGN

This soil scooping machine consist of long blades made by tempered alloy steels having greater toughness by decreasing the hardness of the alloy. The reduction in hardness is usually accompanied by an increase in ductility, thereby decreasing the brittleness of the metal. A handle which is used for forward and backward movement of the machine. A driving mechanism powered by a small engine and a mounting platform which mount the engine and other accessories. The mounting platform of triangular section which is most suitable for withstanding loads. A transmission system to transmit power from engine to blades, frame and vibration isolators to avoid jerking. A wheel system is used for mobilizing the unit. The major difference for this machine when compared to soil tillers are that we can provide sufficient height adjusting mechanism for increasing the depth of soil scooping.

The proposed model of our machine is shown in figure below.



Fig. 3.1: Design model of soil scooping machine

Soil scooping machine has wide applications in house hold and farming purposes. Conventional methods of farming are to be replaced with newer sophisticated technology to meet the increased demands. This brings about improved efficiency and saves time with reduction in labour costs.

### IV. ANALYTICAL PROCEDURES

#### A. Methodology

Methodology adopted for the completion of the project is given below:

- 1) Step 1: Conducted study based on needs and modification in soil scooping.
- 2) Step 2: Design and Analysis using Solidworks and ANSYS.
- 3) Step 3: Synthesis and force calculations.
- 4) Step 4: Materials selection and purchasing.
- 5) Step 5: Fabrication and testing.

#### B. Engine

Model: Greaves

Engine: 4 stroke

Displacement: 422 cc

Power: 7.5 hp

Rated speed: 3600 rpm

Bore (mm): 83mm

Stroke (mm): 78.8 mm

Compression ratio: 23+0.5 or 23-0.5

Valves: 2

Electric system: 12v with 12v, 330W flywheel magneto alternator  
Transmission gear: 4 gears plus reverse gear (steering wheel model) Torque

### C. Gear Ratios

First gear: 9/48  
Second gear: 15/43  
Third gear: 22/36  
Fourth gear: 28/30  
Reverse gear: 9/48

$$\text{Torque@ 3600 rpm} = \frac{5 \times 745.25 \times 60}{2 \times \pi \times 3600} = 14.831 \text{ N}$$

Maximum torque 2800 rpm: 18.2 Nm @ 2800 rpm

Soil cutting resistance can be formulated as:

$$R_1 = \frac{1}{4} \times k_1 \times L \times H \times 0.5 \quad \text{N}$$

Average values of specific resistance:

- 1)  $k_1 = 25 \text{ kN/m}^2$  sandy clay, gravel
- 2)  $k_1 = 95 \text{ kN/m}^2$  compact sandy clay, medium clay, soft coal
- 3)  $k_1 = 175 \text{ kN/m}^2$  hard sandy clay with gravel, hard clay, conglomerate
- 4)  $k_1 = 320 \text{ kN/m}^2$  medium slate, hard dry clay, chalk and soft plaster stone, marl here WE consider the case of gravel soil of specific resistance  $25 \text{ kN/m}^2$

To operate in hard soil category, teeth are mounted on toll blade, which loosen the soil and decrease cutting resistance for 25 %. It is important to properly set up digging depth and adequate distance between teeth in order to achieve less resistance. Cutting resistance is dominant in relation to machine movement resistance (90 % of machine power is used for digging resistance). Cutting resistance increases more due to increase of cutting depth (h), then with increase of cutting width (L). In order to achieve required efficiency on certain soil category, machine operator should adjust cutting depth ‘h’ and regularly inspect tool blades.

### V. SOLID WORKS ANALYSIS

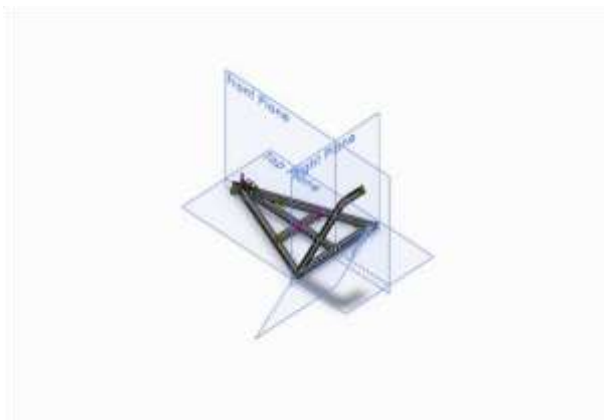


Fig 5.1: Design diagram of frame

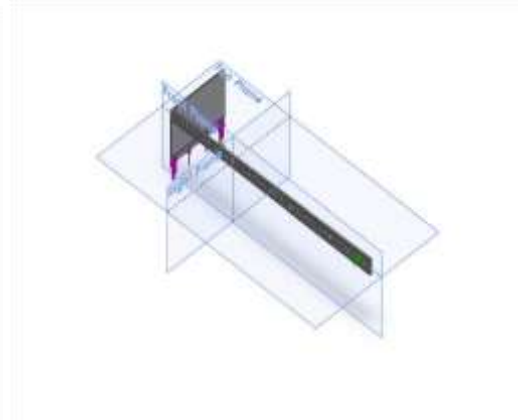


Fig 5.2: Design diagram of spade

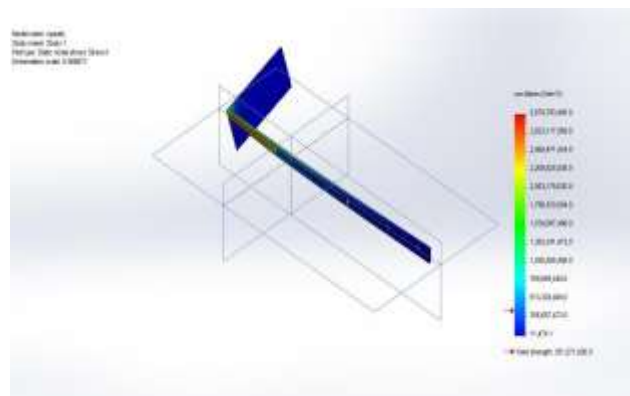


Fig 5.3: Equivalent stress distribution for spade

## VI. RESULTS AND DISCUSSIONS

The application of industrial equipments are endless starting from trivial milling machines, irrigation equipment, harvesting equipment and extending to specialized application such as combined harvesters and self-propelled machines, manure spraying machines. So an effective machinery for soil scooping machine has wide applications in house hold and farming purposes.

Since our fabricated model is a scaled up model of our proposed machine. This is done for analysing and checking our various mechanisms used for scooping by achieving the crank pedal mechanism given to blade frame. For single production the cost of our proposed model is very high due to high expensive for raw materials and torque convertor.

While in mass production the overall cost of material will be less. Conventional methods of farming are to be replaced with newer technology to meet the increased demands. This brings about improved efficiency and saves time with reduction in labour costs. Also the troubles associated with an agricultural machinery is its bulkiness, weight and reduced mobility and manoeuvrability. These problems are addressed with our project making it compact, lightweight and mobile. Thus, our soil scooping machine is an appropriate project in helping more people to deal with agricultural issues easily.



## VII. CONCLUSION

A mechanical device for soil scooping is designed and it has reduced the human effort involved in soil scooping and has saved lots of labour costs and the time associated in completing a certain work in a certain time period.

This device offers better advantages and meets the day to day needs of majority of the people in their households. It's an ideal equipment to meet the small scale needs of individual households. If this machine is adopted by many households, it will lead to an overall increase in productivity of that community and it would be beneficial to a large number of people.

With modernization in every field that we know of, people are more involved in sectors other than agriculture. It is because the rate of technological advancements in other fields has not contributed to the rate of development of the agricultural sector. More and more people are interested in white collar jobs and also people are lured by the luxuries and amenities that a city provides leaving farmlands barren.

Conventional methods of farming are to be replaced with newer sophisticated technology to meet the increased demands. This brings about improved efficiency and saves time with reduction in labour costs.

## REFERENCES

### *Journals*

- [1] Smoljan, B. The calibration of the heat conductivity coefficient in mathematical model of steel quenching, "Proceedings of Micro CAD '99 Miskole", Vol 1, 1999 pp.110.
- [2] Ritchie, R.O. Near-threshold fatigue crack propagation in steels, "International Metals Reviews", vol. 24, 1979, pp. 205-230.
- [3] Mikulic D, Marusic' Z, Stojkovic V Evaluation of terrain vehicle mobility, "Journal for Theory and Application in Mechanical Engineering 48", Zagreb, VOL 3, 2006, PP.134-456.
- [4] Vinkovic N, Stojkovic V, Mikulic D ( Design of Flail for Soil Treatment, 5th DAAAM International Conference on Advanced Technologies for Developing Countries, University of Rijeka, Rijeka.2006