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A Product Development Case Study of a Solar Operated Grass Cutter

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***Abstract*- This paper deals with the Grass cutter using solar operator, the sun has been the major source of energy for life on earth. Solar energy is almost unbounded. The total energy we obtain from the sun far exceeds our energy demands. Ever since the industrial revolutions human have been dependent on fuels, electricity and wind energy. For human enlargement in many countries there is study and trials are going on the Solar energy and the wind energy, So we make our new concept solar in these concept we cut grass with Grass cutter using solar operator system on the agricultural products or on small plants in lawns and gardens. Grass cutter using solar operator can be described as the application of Radio frequency to power a machine on which electric motor rotate which in turn rotates a blade which does the mowing of the grass.**
***Index Terms*- Productivity, Lean, Performance**

I. INTRODUCTION

Nowadays, pollution is the major issue in the universe. In case gas powered lawn mowers due to the emission of gases it is responsible for pollution. Also, the cost of fuel is increasing hence it is not efficient. Traditionally, lawn mowers are often clunky pieces of machinery that involve a lot of strength and energy to use. These present and high-tech grass cutters, however, have been creatively designed to make the whole landscaping process much simpler and easier for the user. From lawn mowers that can incredibly cut the grass for you to those that are cleverly powered by solar energy, these convenient and easy-to-use grass-cutting devices make straightening up your lawn more pleasing. The grass-cutters use cordless electric mowers, trimmers, and blowers powered by clean renewable energy generated by solar panels mounted on our trucks and trailers. We also use reel push mowers for smaller hard to access areas like pathways and parks. There's no oil, and no pollution. Just clean air, less noise, and green grass. The other objective is that the automatic lawn cutter has to differentiate between grass and concrete while monitoring its surroundings continuously.

Safety is the main concern while designing the lawn cutter. As it has blades we wanted our lawn cutter not to be in operating mode if it was being held in the air by the user.

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The accelerometer was hence used in lawn cutter so that it will not operate when user holds it. An automatic lawn cutter will relieve the consumer from mowing their own lawns and will reduce both environmental and noise pollution.

II. HISTORY

The first lawn mower was invented by Edwin Budding in 1830 in Thrupp, just outside Stroud, in Gloucestershire, England. Budding's mower was designed primarily to cut the grass on sports grounds and extensive gardens, as a superior alternative to the scythe, and was granted a British patent on August 31, 1830, Budding's first machine was 19 inches (480 mm) wide with a frame made of wrought iron. The mower was pushed from behind. Cast irongear wheels transmitted power from the rear roller to the cutting cylinder, allowing the rear roller to drive the knives on the cutting cylinder; the ratio was 16:1. Another roller placed between the cutting cylinder and the main or land roller could be raised or lowered to alter the height of cut. The grass clippings were hurled forward into a tray-like box. It was soon realized, however, that an extra handle was needed in front to help pull the machine along. Overall, these machines were remarkably like modern mowers.

Two of the earliest budding machines sold went to Regent's Park Zoological Gardens in London and the Oxford Colleges. In an agreement between John Ferrabee and Edwin Budding dated May 18, 1830, Ferrabee paid the costs of enlarging the small blades, obtained letters of patent and acquired rights to manufacture, sell and license other manufacturers in the production of lawn mowers. Without patent, Budding and Ferrabee were shrewd enough to allow other companies to build copies of their mower under license, the most successful of these being Ransoms of Ipswich, which began making mowers as early as 1832.

His machine was the catalyst for the preparation of modern-style sporting ovals, playing fields, grass courts, etc. This led to the codification of modern rules for many sports, including for football, lawn bowls, lawn tennis and others.

III. LIST OF PARTS

In this paper I have prepared Grass cutter using solar operator device which is capable to cut the grass. This device consists of linear blades, and it does not affect by climatic conditions. They have used following components for cutting grass.

Table 1: List pf Parts and components used to develop

Sr. No	Item	Quantity	Remark
1	DC Motor 2 Rotating the wheel	2	Rotating the wheel

2	DC Motor	1	Rotating the blade
3	Wheel	3	Moving wheel
4	Battery	1	Power supply for motor
5	Solar Panel	1	Power supply for batteries
6	Collapsible blade	3	High carbon steel resist wear
7	Electric Wire	5 m	Copper
8	IR Sensor	1	Obstacle detection

The main objective of this paper is to move the grass cutter is different directions to prepare various designs as per requirements. By using link mechanism the height of the cut can be adjusted. The unskilled labor can easily operate this device. They have prepared grass cutter machine. They have used solar panel so it is not required to charge battery externally and a battery is continuously charged at the constant voltage when grass cutter is in working. The battery is charged in daytime by using the solar panel and it is stored so we can use grass cutter at night time also. Because of two DC motor, both forward and backward motion of grass cutter can simultaneously possible. In this paper author explained that solar plate which is placed above the grass cutter generates solar energy and uses this energy for working the grass cutter. Also, using driver circuit for controlling the speed of the motor as per the requirement. Solar panels, batteries, DC motor, solar charger, circuitry, and blades these components are used for preparing grass cutter. For preventing the battery from overcharging and the over-discharging regulator is placed into the system and it should be placed in series. They have provided LCD display unit which displays voltage generated during solar rays trapping. Due to seasonal conditions if the battery is not charged they can provide the power bank to charge the battery instantly. The battery can be charged by using solar panel as well as external power supply and DC motor which is controllable is used for changing the direction of grass cutter as per need are used. The most modern regulator is used for preventing overcharging and discharging of the battery which saves span of the battery. Due to industrialization, more electricity is required for various industrial applications and electrical gadgets so solar energy is the best alternative for electricity. Solar panel, battery, DC motor, solar charger these components are used for fabrication of grass cutter. They have used less number of moving components so there is less maintenance. This grass cutter will give much more physical exercise to the operator and it will easily handle. In this paper they have prepared manually operated grass cutter with spiral blades due to blades increases the efficiency of cutting. For adjusting the height reel cutter is component placed on grass cutter. This grass cutter used to cut the grass uniformly and also it can cut the different types grasses. The battery can be charged during working conditions and it also having AC charging. For the collection of cutting grass cutting box is placed over grass cutter so the cut grass put on the lawn. It is having light in weight and compact in design. In this paper author fabricated grass cutting machine with rotary blades by using solar energy. The solar energy is trapped in the photovoltaic cell to generate electricity. The cells may be grouped in the form of panels or arrays. Solar panel is placed such that to absorb high intensity from sun and it will incline at 450. The main function of solar charger is increased current during batteries are charging and also disconnect when they are fully charged. Circuit's breakers are used to start or stop the motor. By considering ground clearance they can adjust the height of grass. Author developed solar powered lawn mower. They found various results which are listed below.

Table 2: Capacity identification of prototype

Sample plot	Average height of grass before moving (mm)	Average height of grass after moving (mm)	Expected height of grass after moving (mm)
Elephant grass	224	90	100
Stubborn grass	234	92	100
Spare grass	111	70	80
Carpet grass	70.5	56.5	50

The average height of grasses after moving was lesser than the expected after the machine have been adjusted to a height for four species of grasses. Less time required for cutting the grass. The efficiency is also increases. In this paper they have fabricated solar powered grass cutting machine with tempered blades are attached to this grass cutter. This grass cutter is manually operated as well as automatic operated. The materials commonly used GI sheet, motor, wheel, Al sheet, switch, wire, square pipe and insulating material. The components used are comparator, rechargeable battery, relay, temperature sensor, DC motor. The voltage generated by using solar panel displayed on LCD display unit. They prepared solar powered vision based solar lawn mower which operated manually with less effort. Therefore it protects the equipment form damage and also reducing risk on human. The machine cut the grass in different direction for making different design patterns as specie by human. The writer fabricate solar grass cutter machine for reducing human work and also consume non renewable sources of energy on the earth surface. By using solar panel the energy is acquire from sun and store it into batteries and uses this energy as per the requirement. All this functions are proceeding according to prescribed time by proper monitoring. A specie mechanism provide for protection of batteries from extra charging which increases life span of batteries. It can also be used for small scale gardening.

IV. FUTURE ENHANCEMENTS

In the current state the bot is capable of completing its objective with 100% success. But with the changing trends in technology were features can be added with the increasing feasibility of the components Some of the proposed features are:-

i. Using Geo Fencing technology the bot can be made capable of tackling more complex boundary shapes with higher precision.

ii. Using a GSM module the bot can made capable of sending and receiving messages from the user's mobile phone through SMS.
iii. Boundary area calculations can be made more precise by more complex algorithm designs and estimates of time and energy required can be displayed.
iv. The bot can be designed to complete multiple lawns in the same session by travelling to the next lawn automatically using satellite tracking.
v. Automatic blade changing warning can be provided by the bot to the user.

V. CONCLUSION

It consumes non-renewable sources of energy so total energy received from sun far exceeds our energy demand. It meant to be an alternate green option to the popular and environment hazardous gas-powered lawn mower and reduces human effort. The no skilled person also handles it easily. By using simple switches or by predetermine programming it can be easily handled and control within less time span. We have made it automated by providing sensors, which will detect the obstacles which comes in front of it.Therefore,It is highly efficient and accurate because it detects the obstacle and changes the direction or stop functioning as per the instruction was given. Therefore equipment should be protected from damage and reduces risk on a human .In this paper, we presented how operation of Bascule Bridge takes place. And also designed a model which works automatically in opening and closing of bridge. The automated process efficiently reduces the man power required for the process and also increases the efficiency.

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