

Optimization of cutting blade used in solar power grass cutter.

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Abstract

Today, we realize that sun powered vitality is a sustainable wellspring of vitality. Furthermore, the fossils fuel may not be accessible later on and it likewise dirties to our condition. So, we need to utilize, one of the most encouraging wellsprings of vitality where everybody concentrating on the idea of sun-based force and its use. Furthermore, the cutting activity is performed by a solitary metallic plate shaper which is worked by DC motor. Robot batteries charged by a sun powered vitality Thus a roundabout plate shaper with focal opening, fixed at internal edge and free at external edge is picked and its dynamic reaction is created. The goal of venture work is to investigate the vibration qualities as normal recurrence, mode states of circle shaper in sun oriented grass shaper machine with free limit condition yet improved by mass decrease through shape change in circle shaper. FEM programming bundle is utilized for vibration examination of rotor circle with same limit condition for deciding various parameters like Natural recurrence, mode shapes.

Keywords— Solar Grass cutter, normal recurrence.

I. INTRODUCTION

Keen sun-based grass shaper robots have become mainstream today. Grass shaper robot is utilized for self-sufficient grass cutting. In a period where innovation with natural mindfulness, machines are searching for help of their carbon impression, in this way, we arranged a model of the programmed grass slicing robot works through sun-based vitality, (non-sustainable power source. This robot diminishes ecological contamination. Right now, driving a grass shaper by sun powered vitality as opposed to the fuel vitality is chiefly earth. The nursery worker utilized hand scissors to cut and keep up garden consistently which likewise takes additional time. It is exceptionally hard to look after consistency. Be that as it may, the untalented plant specialist can without much of a stretch work this sun based grass shaper. The Circular plates with various round openings are generally utilized in building structures, for example rockets, airplane, and so forth., either to lessen the heaviness of the structure, to expand the scope of examination or to fulfill other designing applications. These gaps in a structure for the most part summon common recurrence change and stacking limit decline.

II. PROBLEM STATEMENT

The investigation of the dynamic conduct of round cutters with free limit condition yet having various structures is significant, as utilized in a few machine parts, for example, flywheels roundabout saw plates and so on. The information on normal frequencies of segment is of incredible enthusiasm for the examination of reaction of structures to different excitations. Undesirable noise, vibration and inadvertent disappointment related with the cutting procedure has gotten a significant financial and innovative issue in grass shaper that can be settled by this task work. Also utilizing elective vitality fuel(solar) it will become conservative and quiet activity of grass cutting.

III. LITERATURE REVIEW

Prof. S.M. Patil, Bhandirge Prajakta, Kumbhar Snehal, Patil Dhanashri, “Smart Solar Grass Cutter with Lawn Coverage”.

According to the author, in today's world, automation in virtually everything plays a really vital role in work, the grass cutters before used were manually hand-held however currently they are enforced the grass cutters that are machine driven. The machine-driven grass cutter uses a solar panel for the battery energy and they used IR sensing element for obstacle detection. They enforced the advanced and automatic grass cutter with the high efficiency and correct because it's the ability to sense the objects.

G. Rahul, “Grass cutting machine by solar energy power”

According to the author a solar powered vision based mostly robotic garden tool that provides automatic garden tool that may help the user to the grass with less effort. in contrast to different robotic field mowers, this style needs no perimeter wires to keep up the robot within the field and additionally with less human effort within the manual mode operation. Through an array of sensors safety takes major thought within the device, this robot won't only stay on the field, it'll avoid and discover objects and humans. Here they used a 12v 310mA solar battery in their project. every contributory to zero.5v each. they might attach electric battery however because the lead acid rechargeable battery used is rated one2v 1.2Ah, it won't be overcharged because of the little output of solar battery. To discover the obstacles, they used IR sensors. There are 2 sensors, one on all sides. this is often as a result of just in case the obstacle is on the left then it'll move in right direction and if the correct sensing element detects the obstacle then it goes towards the left.[1] however disadvantage is that typically response of the system is just too slow thus in real time high finish DSP methods is usually recommended that may process a lot of quicker.

Tsuyoshi Inoue, Yukio Ishida, “Chaotic Vibration and Internal Resonance Phenomena in Rotor Systems”.

Consistent with the author studied rotating machinery has effects of gyroscopic moments, however most of them are tiny. Then, several varieties of rotor systems satisfy the relation of one to (-1) sort internal resonance roughly. during this paper, the dynamic characteristics of nonlinear phenomena, particularly chaotic vibration, because of the one to (-1) sort internal resonance at the key critical speed and double the key vital speed are developed.

IV. FEM EXAMINATION

Examination of vibration attributes of roundabout cutters with free limit condition however having diverse plan parameters is finished with the FEM investigation by drawing and cross section of various cutters accessible in showcase. FEM programming bundle is utilized for vibration investigation of cutters with same limit condition for deciding various parameters like common recurrence and mode shapes.

V. GOALS

- To discover characteristic recurrence and mode shape's by FEM: To imagine the dynamic properties utilizing the FEM examination programming (ANSYS) and conversation of mode shapes.
- To look at the impact on regular recurrence by the current and advanced state of cutters in ANSYS.

VI. APPROACH

- FEM programming bundle is utilized for vibration investigation of annular plates with same limit condition for deciding various parameters like common recurrence and mode shapes.
- Mode shapes are contrasted and existing and enhanced shaper.
- Drawing get together parts determination & Manufacture grass shaper machine.

VII. METHODOLOGY

- To measure the components of rotor disks chose from advertise.
- To draw and work the shaper.
- To analyze and to discover modes and characteristic recurrence of shaper utilizing ANSYS
- Comparison of existing and improved shaper results to finish up.

Streamlining Proposition Issue

Every now and again to produce lost cash and loss of substitution time and even unintentional perils to the administrator or else basic to administrator. Common recurrence can be reached out to expand the reverberation esteem which prompts disappointment of shaper or rising the commotion levels so that one of plan parameter is are advanced.

Finishing Up Remark

Natural recurrence increments as the no. of diametral breaks increases. 10% ascend in the no. of diametral splits offers 7% to 40% ascent in normal recurrence variable according to modes. As these are the modes with a low number of breadths, which are most promptly distinguished to focus our enthusiasm on those with 2, 3 or 4 nodal measurements. Correlations on the outcomes, concern the common frequencies and the mode shapes is done here.

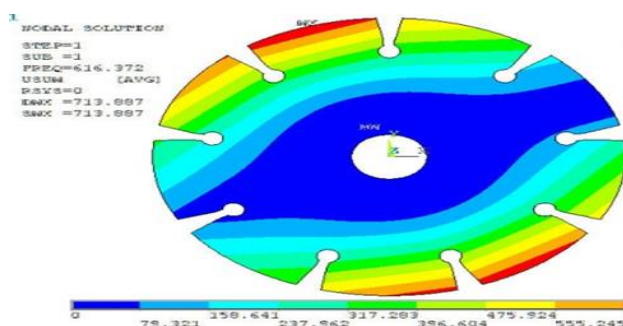


Fig No. [1] 9 slot blade

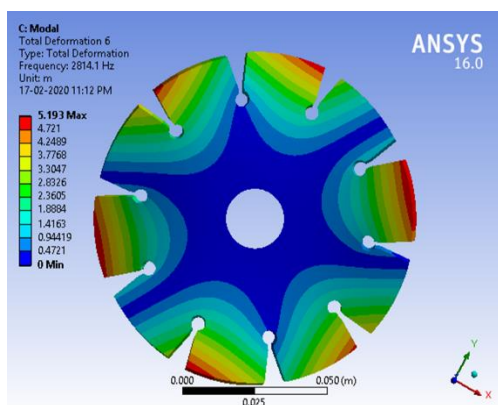


Fig No. [2] 10 slot blade

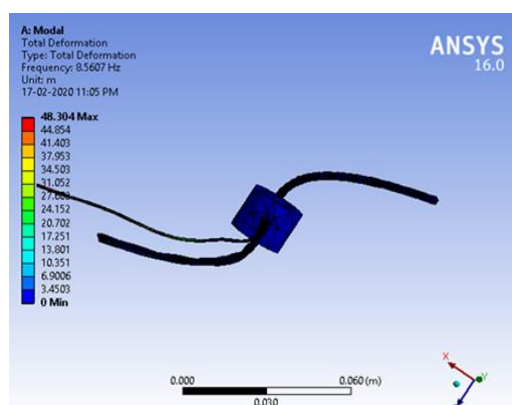


Fig No. [3] Wire rope cutter

Specimen	Aspect ratio b/a	Inner diameter in mm	Outer diameter in mm	Number of cracks of length 17.5 mm.	Crack end hole dia.mm
First Cutter optimized	0.182	20	110	<u>9</u>	5
Natural frequency by FEM	616	706	1030	1452	1802
Second Cutter optimized	0.182	20	110	<u>10</u>	5
Natural frequency by FEM	868	968	1270	1694	1935
Third cutter Wire rope optimized	0.005	20	-	-	-
Natural frequency by FEM	8.5607	8.5567	8.6621	8.6771	8.6883
% change	40	37	23	16	7

Table: - Comparison of Cutters, thickness = 1.5 mm

VIII. SOLAR GRASS CUTTER

A solar grass cutter is machine that uses sliding blades to cut a lawn at an even length. Even more sophisticated devices are there in every field. Power consumption becomes essential for future. The solar grass cutter consists of photovoltaic cell for the efficiency power from solar power panel. The DC to DC boost converter helps to step up DC voltage from the photovoltaic panel and stored the DC voltage in battery.

IX. COMPONENTS USED

1) Solar Panel

The solar panel are used to generate electric power. The photo-voltaic effect can be observed in nature in a variety of materials that have shown that the best performance in sunlight is the semiconductors. We have used a 12-volt 5-watt solar panel.

2) Battery

As the solar energy radiated in the form rays. Due to fluctuation in radiation causes the effect on operation, it cannot used on full capacity. The batteries are used as a storage device for solar energy which can be further converted into electric energy. We have used a sealed lead battery of 12 v-7.2 amp.

3) DC Motor

A DC motor depends on the actual fact that like magnet poles repels and in contrast to magnetic poles attach one another. A coil wire with a current running through it generates a magnetic force field aligned with center of the coil. An easy DC motor generally features a stationary set of magnets within the stator coil and a coil with a series of 2 or a lot of windings of wire wrapped in insulated stack slots

around iron poles items with finish of wires terminating on a switch. benefits of a brushed DC motor embody low initial value, high reliable and simple control of motor speed. Disadvantages are high maintenance and low life span for high intensity uses. we've used brushed DC motor of 12 v, 2000 rpm ,2kg-cm.



Fig No. [4] Solar grass cutter robot.

X. CONCLUSION

Conclusion of FEA of cutters: Natural frequency increases as the no of diametral cracks increase, 10% change in the no. of diametral cracks gives 7% to 40% change in natural frequency variable as per modes. We also compare the natural frequency associated with wire rope cutter, it also found lesser than previously analyze 10 slot cutters as per table mentioned above. So, we finally concluded our design of grass cutter blade as 10 slot blade which is comparatively efficient among others. Our Robot is human operated robot and modification in the charging the batteries by separate charging dock. Charging Dock is attached to the solar panel and charging controller. Charging of the batteries is completed into 1 hour in daylight. The robot is working continuously for 2 hours. The robot operates manually. The robot is using metallic thread cutter technology. It has a safety feature also. So, it provides a regular size trimming of grass by the automatic function without any human interference. It is a futuristic robot which works without taking off any nonrenewable energy source and human effort vibration analysis will be done to check high speed failure of blade.

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