ISSN (Online) 2456-1290
International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE)
Vol 2, Issue 5, May 2017

Design And Analysis of Quick Change Over for Starter Performance Test Bench

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Abstract: -- **Throughout the study, the main aim is to increase the productivity in the starter assembly line . In each workstation the processing time is different and the longest time consumption in workstation will be identified and observation is carried out . This related workstation is studied by time study techniques. The time is taken by stopwatch. The goal of the work is to seek in increase in the line efficiency and productivity rate hence proposed to the company. The major drawback is the setup change of performance test bench of the starter . These particular problems thus affect the productivity and the line efficiency as well. Thorough observation revealed the change over time for a workstation also an important aspect in the production time . It plays a major role in the company's overall income , as the result of that the major change should be taken so as to reduce the change over time . The setup change of performance test bench consumed more time and results in less production. So we should reduce the setup change time by removing the non-value added activities and bring in new techniques . This change has a better line efficiency and increase in rate of productivity**

I. INTRODUCTION & OVERVIEW

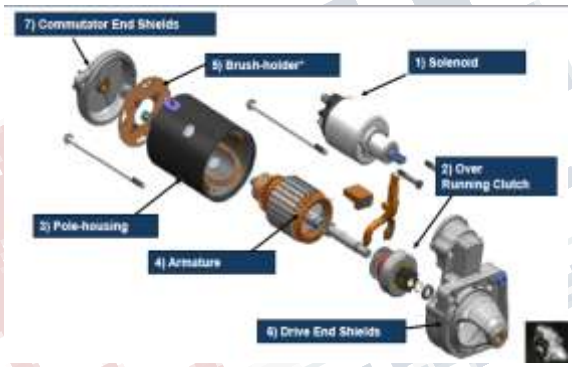

Figure 2.1- Starter Motor

Starter Motor division develops and produces innovative and technically advanced products that contribute towards noticeable reduction in fuel consumption and CO2 emissions. Bosch has an extensive range of high performance starter motors in its portfolio, suiting to the application requirements of Indian automotive market. In addition to conventional starter motors, Bosch also offers a broad range of Start/Stop Starter motors for economical and comfortable Start/Stop solutions, these systems help to reduce the emissions and save fuel by up to 8%.

The number of starting operations performed by the starter motor(lifetime) has been considerably increased for Start/Stop application. Greater design strength has enabled the Start/Stop Motor to survive more frequent starts throughout the lifetime of the vehicle without suffering damage.

The electric starter motor or starting motor is the most common type used on gasoline engines and small Diesel engines. The modern starter motor is both a permanent-magnet and a series-parallel wound direct current electric motor with a starter solenoid (similar to a relay) mounted on it and all the parts are shown as in the above figure 1.10. When current from the starting battery is applied to the solenoid, usually through a key-operated switch, the solenoid engages a lever that pushes out the drive pinion on the starter driveshaft and meshes the pinion with the starter ring gear on the flywheel of the engine.

The solenoid also closes high-current contacts for the starter motor, which begins to turn. Once the engine starts, the key-operated switch is opened a spring in the solenoid assembly pulls the pinion gear away from the ring gear, and the starter motor stops. The starter's pinion is clutched to its drive shaft through an Over Running spring Clutch (ORC) which permits the pinion to transmit drive in only one direction. In this manner, drive is transmitted through the pinion to the flywheel ring gear, but if the pinion remains engaged (as for example because the operator fails to release the key as soon as the engine starts, or if there is a short and the solenoid remains engaged), the pinion will spin independently of its drive shaft. This prevents the engine driving the starter, for such back drive would cause the starter to spin so fast as to fly apart.

However, this spring clutch arrangement would preclude the use of the starter as a generator if employed in hybrid scheme mentioned above, unless modifications were made. Also, a standard starter motor is only designed for intermittent use which would preclude its use as a generator; the electrical components are designed only to operate for typically under 30 seconds before overheating (by too-slow

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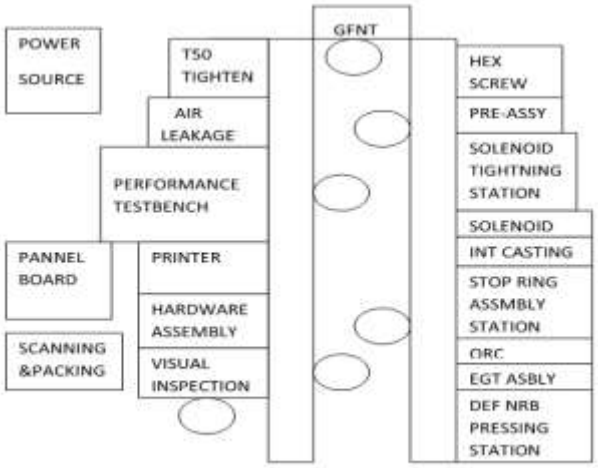
dissipation of heat from ohmic losses), to save weight and cost. This is the same reason why most automobile owner's manuals instruct the operator to pause for at least ten seconds after each ten or fifteen seconds of cranking the engine, when trying to start an engine that does not start immediately.

II. BLOCK DIAGRAM



Layout of Starter Assembly line

ADVANTAGES

- Increase in rate of production
- Increase in Efficiency of line

III. DESIGN AND ANALYSIS

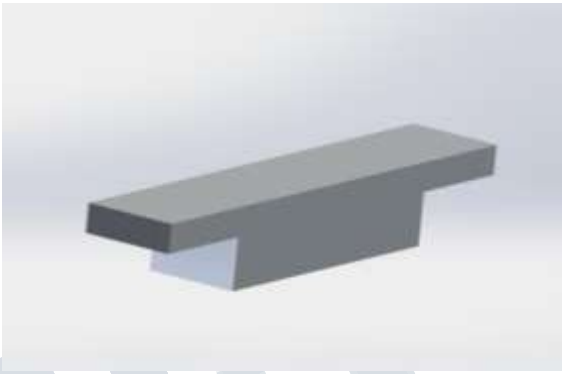
1. Tools used
   - Ansys workbench 16.2
   - Solidworks 2016

2. Type of analysis carried out
   - static structural analysis

3. Type of loading
   - static loading
   - fatigue loading

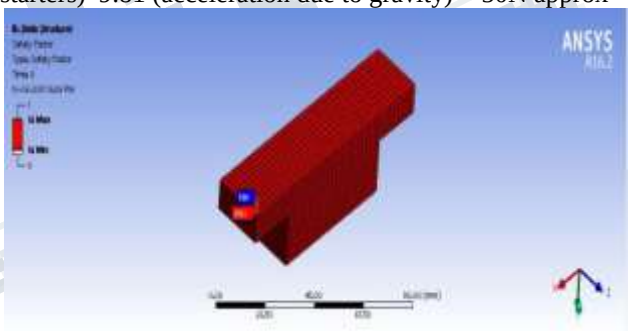
3.1.1 PRODUCT Design concepts and Detailed design

Stopper, CAD Model and Static Structural Analysis with calculations:



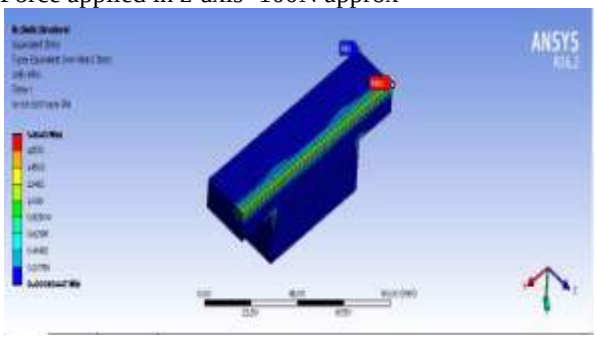
fig

Number of fixed surfaces =4 surfaces
Force is applied at edge of stopper
Force applied on y- axis = 5kg (average weight of starters)*9.81 (acceleration due to gravity) = 50N approx



Fig

Factor of safety
Force applied in z-axis=100N approx



Fig

Equivalent stress

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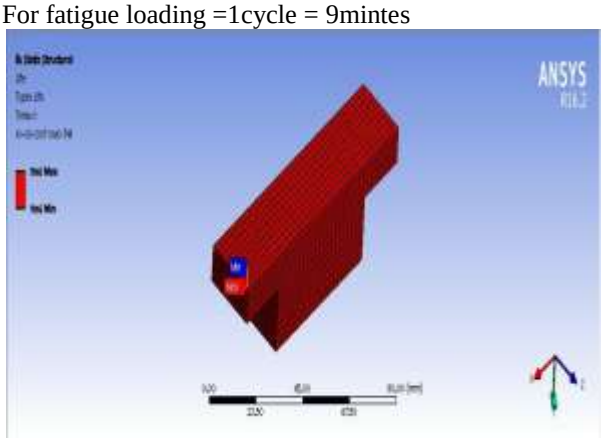
Maximum stress = 1.8643
Minimum stress = 0.00080447

For fatigue loading =1cycle = 9mintes



Fig

fatigue life

5. Twisting knob, CAD Model and Static Structural Analysis with calculations:

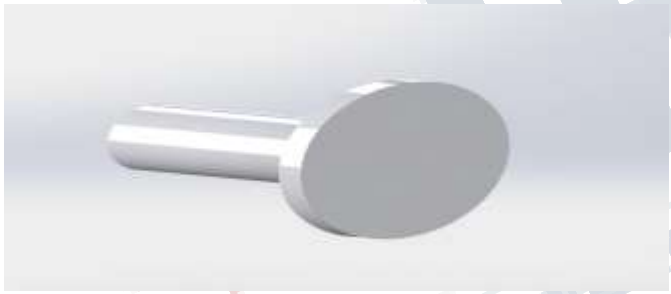


Fig Twisting knob

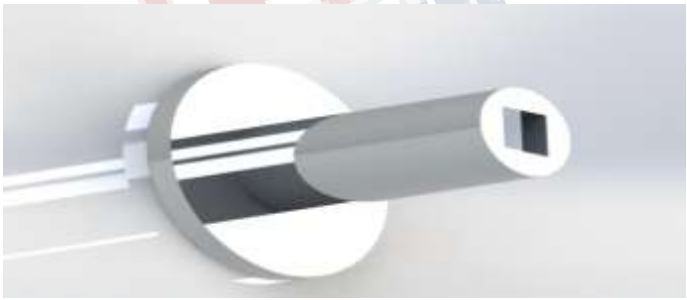


Fig Twisting knob

IV. CONCLUSION

- This project increases the profit of the company .
- It helps in time management during production
- It improves the overall time consumption .

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