DESIGN AND ANALYSIS OF CHAIN SPROCKET USING REVERSE ENGINEERING

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Abstract. The sprocket is an extremely imperative part in the transmission of energy and movement in most bike; they exist in different measurements, teeth number and are made of various materials. By and large sprockets are made of mellow steel. In this paper, existing sprocket cruiser is contrasted and the sprocket of AISI 1045 material. This examination includes the essentials of sprocket outline and assembling of a bike raise sprocket through figuring out approach. It talks about dimensioning, drafting, synthetic organization, material choice, decision of assembling process, warm treatment, surface complete and bundling as the eight stages that should be taken after consecutively in this figuring out approach.

Keywords: Essentials, Sprocket, Design, Reverse, Engineering.

1. Introduction

A sprocket is a profiled wheel with teeth, or machine gear-pieces, that work with a chain, track or other punctured or indented material. The name 'sprocket' applies for the most part to any wheel whereupon outspread projections connect with a chain disregarding it. It is sprockets have teeth and pulleys are smooth. Sprockets are utilized as a part of bikes, bikes, autos, followed vehicles, and other hardware either to transmit rotational movement between two shafts where gears are unsatisfactory or to bestow straight movement to a track, tape and so on. Maybe the most widely recognized type of sprocket might be found in the bike, in which the pedal shaft conveys a vast sprocket-wheel, which drives a chain, which, thus, drives a little sprocket on the pivot of the back wheel. Early recognized from a rigging in that sprockets are never fit together straightforwardly, and varies from a pulley in that vehicles were likewise to a great extent driven by sprocket and chain component, a training to a great extent replicated from bikes.
While exchanging power from heading to driven sprocket, chain applies high load on sprocket teeth. So, most extreme burdens following up on teeth are calculated. Stress prompted because of load ought to be not as much as the yield worry of the material. On the off chance that pressure turns out to be more than yield worry of material at that point there is a plausibility of disappointment. Henceforth static examination was performed to guarantee that the proposed configuration has factor of wellbeing more noteworthy than one. Additionally because of cyclic load following up on the sprocket from chain, it is critical to test the sprocket for weariness stacking. In exhaustion examination weariness life of sprocket is ascertained and it is guaranteed that the base weariness life is higher for safe utilization of sprocket for adequate era. After the base exhaustion life, break in the part started, which additionally increments with time and prompts disappointment of segment. Along these lines it is vital for any part to have adequate weariness life.

**Figure 1.** 3D scanning and reverse engineering

[3D scanning and reverse engineering diagram]

**Figure 2.** CHAIN SPROCKET

While exchanging power from heading to driven sprocket, chain applies high load on sprocket teeth. So, most extreme burdens following up on teeth are calculated. Stress prompted because of load ought to be not as much as the yield worry of the material. On the off chance that pressure turns out to be more than yield worry of material at that point there is a plausibility of disappointment. Henceforth static examination was performed to guarantee that the proposed configuration has factor of wellbeing more noteworthy than one. Additionally because of cyclic load following up on the sprocket from chain, it is critical to test the sprocket for weariness stacking. In exhaustion examination weariness life of sprocket is ascertained and it is guaranteed that the base weariness life is higher for safe utilization of sprocket for adequate era. After the base exhaustion life, break in the part started, which additionally increments with time and prompts disappointment of segment. Along these lines it is vital for any part to have adequate weariness life.
2. Reverse Engineering

Figuring out is modifying the current part with new thought so the general productivity of the framework is progressed? Numerous organizations which decline to contribute to build up another segment adjust figuring out where they simply execute new thought in existing part and spare enormous capital. Figuring out will regard certain degree and after that degree; new part configuration will be the way to progress

2.1. Cad through Reverse Engineering

Measurements are required for figuring of limit conditions. Subsequently it’s CAD (Computer-supported plan) show is vital. The regular sprocket model of Bajaj Pulsar 180 is utilized. Input for outline of sprocket are taken from raise wheel sprocket of Bajaj pulsar 180. Computer aided design demonstrate then is made by the charges in Catia V5 R19 of cushion, pocket, filet, and geometrical choices to a limited extent outline module. Parametric age of illustrations will get the measurements valuable in powers estimations in static stacking conditions on a part. Standard system for outlining and drawing the sprocket: This procedure gives a technique to producing strong models of any standard sprocket, given the pitch, number of teeth, sprocket thickness and so forth by first outlining the profile of the sprocket as given in fig 2.1.

Input → Bajaj Pulsar 180 rear wheel sprocket

Number of teeth = 42 Chain pitch = 12.7 mm
Sprocket diameter = 170 mm Roller diameter = 8.51 mm
Sprocket thickness = 7.2 mm

3. Modeling

CATIA (Computer Aided Three-dimensional Interactive Application) (in English ordinarily verbalized/) is a multi-arrange CAD/CAM/CAE business programming suite made by the French association Dassault Systems composed by Bernard Charles. Written in the C++ programming vernacular, CATIA is the establishment of the Dassault Systems programming suite.
4. ANALYSIS

ANSYS is universally useful limited component examination programming, which empowers architects to play out the accompanying undertakings:

1. Build PC models or exchange CAD model of structures, items, segments or frameworks
2. Apply working burdens or other plan execution conditions.
3. Study the physical reactions, for example, feelings of anxiety, temperatures conveyances or the effect of electromagnetic fields.
4. Optimize an outline ahead of schedule in the advancement procedure to lessen generation costs.
5. A common ANSYS investigation has three unmistakable advances.
6. Pre Processor (Build the Model).

5. Material Data

Mild steel

| Density      | Young’s Modulus Pa | Poisson’s Ratio | Bulk Modulus Pa | Shear Modulus Pa |
|--------------|--------------------|-----------------|-----------------|-----------------|
| 7850 kg m^3-3 | 2.1e+011           | 0.3             | 1.75e+011       | 8.0769e+010     |
Table 2. Final results of mild steel

| Object Name | Total Deformation | Directional Deformation | Equivalent Elastic Strain | Shear Elastic Strain | Equivalent Stress | Shear Stress | Structural Error | Strain Energy |
|-------------|-------------------|-------------------------|---------------------------|----------------------|------------------|--------------|-----------------|---------------|
| Minimum     | 0. m              | -2.2648e-007 m          | 1.3299e-009 m/m           | 1.2306e-005 m/m      | 131.03 Pa        | 9.9391e+005 Pa | 9.7266e-017 J    | 3.3965e-016 J |
| Maximum     | 7.846e-007 m      | 3.12e-007 m             | 9.8165e-006 m/m           | 1.2011e-005 m/m      | 1.9542e+006 Pa   | 9.7009e+005 Pa | 3.3589e-008 J    | 1.0768e-007 J |
Material Data

AISI 1065 carbon steel

Table 3. Material data of AISI 1065 carbon steel

| Property                  | Density | Young's Modulus Pa | Poisson's Ratio | Bulk Modulus Pa | Shear Modulus Pa |
|---------------------------|---------|--------------------|-----------------|-----------------|------------------|
|                           | 7850    | 1.4 e+011          | 0.3             | 1.1667 e+011    | 5.3846 e+010     |

Figure 9. Total Deformation

Figure 10. Equivalent Elastic Strain

Figure 11. Equivalent Stress

Table 4. Final results of AISI 1065 carbon steel

| Object Name | Total Deformation | Directional Deformation | Equivalent Elastic Strain | Shear Elastic Strain | Equivalent Stress | Shear Stress | Structural Error | Strain Energy |
|-------------|-------------------|-------------------------|---------------------------|----------------------|-------------------|--------------|------------------|---------------|
| Minimum     | 0. m              | -3.3972 e-007 m         | 1.9949 e-009 m/m          | 1.8458 e-005 m/m     | 131.03 Pa         | 9.9391 e+005 Pa | 1.459 e-016 J   | 5.0945 e-016 J |
| Maximum     | 1.1769 e-006 m    | 4.6801 e-007 m          | 1.4725 e-005 m/m          | 1.9542 e+006 m/m     | 9.7009 e+005 Pa   | 5.0384 e-008 J | 1.6152 e-007 J  |

Material Data
Carbon Fiber

Table 5. Material data of Carbon Fibre

| Property                  | Density | Young's Modulus Pa | Poisson's Ratio | Bulk Modulus Pa | Shear Modulus Pa |
|---------------------------|---------|--------------------|-----------------|-----------------|------------------|
|                           | 1.6 e-009 | 7. e+011          | 0.1             | 2.9167 e+011    | 3.1818 e+011     |
Figure 12. Total Deformation

Figure 13. Equivalent Elastic Strain

Figure 14. Equivalent Stress

Table 6. Final results of Carbon Fibre

| Object Name | Total Deformation | Directional Deformation | Equivalent Elastic Strain | Shear Elastic Strain | Equivalent Stress | Shear Stress | Structural Error | Strain Energy |
|-------------|-------------------|-------------------------|--------------------------|---------------------|------------------|--------------|-----------------|--------------|
| Minimum     | 0. m              | -6.6906e-008 m          | 1.4604e-010 m/m          | 3.0362e-008 m/m     | 21.982 Pa        | 9.6607e+005 Pa | 6.1202e-018 J   | 3.0105e-017 J |
| Maximum     | 2.3619e-007 m     | 9.611e-008 m            | 3.0839e-006 m/m          | 3.1369e-006 m/m     | 2.0025e+006 Pa   | 9.9809e+005 Pa | 1.2531e-008 J   | 3.2893e-008 J |

By watching the above outcomes looking at the three materials comes about playing out their qualities underneath plate beneath

- Total disfigurement valve is less in Carbone fiber material is 2.3619e-007 m contrasting alternate materials more in mellow steel 7.846e-007 m, twisting quality less implies that materials can't change the first shape with the goal that materials was better.

- Equivalent Elastic Strain less in AISI 1065 carbon steel 1.4725e-005 m/m. flexible strain. A type of strain in which the misshaped body comes back to its unique shape and size when the distorting power is expelled. More in mellow steel.

- Von Mises pressure is broadly utilized by creators to check whether their outline will withstand a given load condition. In this address we will comprehend Von Mises worry coherently. Von Mises
pressure is thought to be a place of refuge for outline engineers. Using this data an architect can state his plan will come up short, if the greatest estimation of Von Mises pressure actuated in the material is more than quality of the material. It functions admirably for most cases, particularly when the material is pliable in nature. Comparable Stress is more in Carbone fiber material 2.0025e+006 Pa less in gentle steel.

6. Conclusion

From consequences of examination it is watched that anxieties are most extreme at joint areas. It is likewise watched that both the materials have pressure esteems not as much as their particular admissible yield pressure esteems. So the plan is sheltered. From examination results and correlation of properties of the considerable number of materials, it is discovered that carbon fiber is the material which is having the slightest thickness; likewise it is effortlessly accessible and modest when contrasted with other interchange materials. Likewise machining cost for carbon fiber is less. Subsequently it is the most appropriate substitute material for sprocket and is relied upon to perform better with fulfilling measure of weight diminishment.

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