

Review Paper on Design of Chain Drive

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Abstract - In this paper we are going to present a review on design and manufacturing of chain drive. To design the chain drive we need to study the load on the machine and power of motor. Chain drive is one of the most critical components in mechanical power transmission system and in most industrial machinery. It involves modern design, specific material with consideration of forces and load and its mechanical properties. To design a chain drive we require input power, type of equipment to be carried, horse power to be transmitted, full load speed of the fastest shaft rotating in RPM. The conditions of chain drive are drives with more than two sprockets or unusual conditions, severely high or low temperature, widely fluctuating loads, frequent start and stop requires special attention.

sprocket or driven sprocket is generally on a theoretical circle described by the centre line of the chain as it passes over the sprocket.

C. Driven section

It transmits the power from the driver to the secondary shaft/transmission to increase the speed the driven should be smaller than the driver. To decrease the speed driven should be larger than the driver. Sometimes it is connected to a secondary transmitter such as a gear which the supplies energy to secondary shaft.

Below are the representation of parts in a chain drive and

Key Words: Chain drive, Sprocket, chain, transmission.

1. INTRODUCTION

Chain drive is one of the best for power transmission. They are used in transmission of mechanical energy from driving shaft to the driven. They have a high efficiency of transmission and require no initial tension. They can also transmit power over larger distances than gear drive. Chain drive are relatively easy to install and their assembly tolerance are not as restrictive as those for gear drive. Chain drive are easy to redesign and reconfigure. In compare to gears chains perform better under shock loading conditions. In compare to belt drive they do not require tension on slack side, thus bearing load is reduced. In chain drive operating load is spread over many teeth and careful alignment and proper lubrication are required.

2. DESIGN

1. Selection of chain type: Based on application roller chain is selected.

2. Calculation of transmission ratio:

$$I = z_1/z_2 = N_1/N_2$$

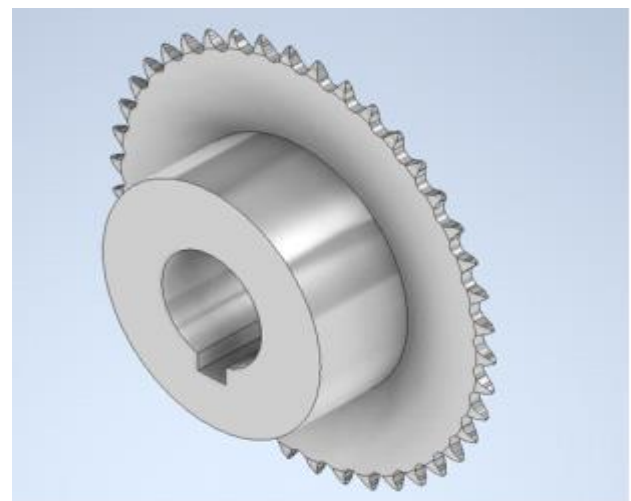
3. The design of chain drive consist of three sections

A. Chain section

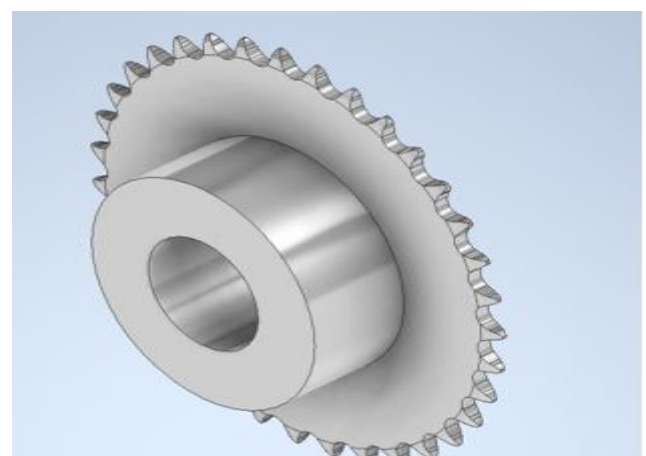
The power is transmitted by a roller chain it is also called as drive chain or transmission chain. The chain passes over a sprocket gear, meshing with teeth of sprocket in the holes of roller chain

B. Driver section

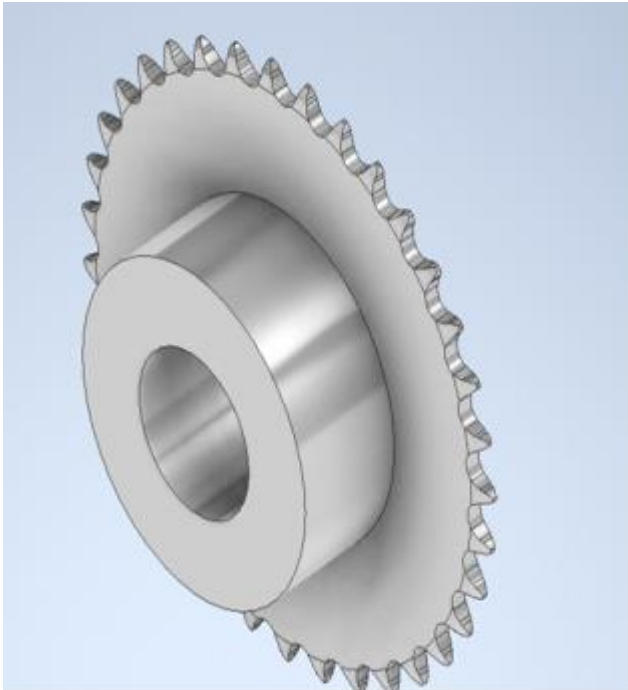
The driver section is usually the sprocket that is provided with the shaft input power. Pitch diameter of either the drive



Driver Section



Driven Section No.1



Driven Section No.2



Assembly



Chain Section

3. LITERATURE REVIEW

The latest trend in the automation industry is to obtain efficient & reliable systems in compact size. The most important system used in a machine the drive that is selected to transmit power. The belt drives are subjected to excessive elongation and wear, while gear drive are subjected to excess mass & inertia in the system. Hence chain drive are preferred widely, in various high performance engines. Chain drives are easily assembled & adjustable. They are high efficient, reliable, durable & capable to attain wide range of speed and power. Even after having so many advantages their dynamic behavior is not well researched. Chain drives are rapidly getting popular especially in the automotive industries, because of their advantages. Their advantages are as follows:

1. Long life expectancy due to friction contact and their surface being separated by an oil film.
2. Very negligible stretch, allowing them to carry heavy loads.
3. They have a very long shelf life because they do not degenerate with age and they are unaffected by sun, reasonable of heat, moisture and oils.
4. Operates in all types of environment including high temperatures, high moisture or oily areas.
5. No slippage.
6. Some can be replace without disturbing other components.

Drawbacks:

1. Noise is usually higher than other drives.
2. Can elongate due to wearing of sprocket and teeth contact surfaces.
3. Flexibility is limited to a single plane.

4. High wear of sprockets.

4. CALCULATIONS

To calculate sprocket teeth we have initial speed data

- N1=Driving Sprocket RPM
- N2=Driven Sprocket RPM
- N3=Driving Gear RPM
- N4=Driven Gear RPM
- T1=Teeth of Driving Sprocket
- T2=Teeth of Driven Sprocket
- T3=Teeth of Driving Gear
- T4=Teeth of Driven Gear

Using Formula

$$T1 \cdot N1 = T2 \cdot N2$$

$$T3 \cdot N3 = T4 \cdot N4$$

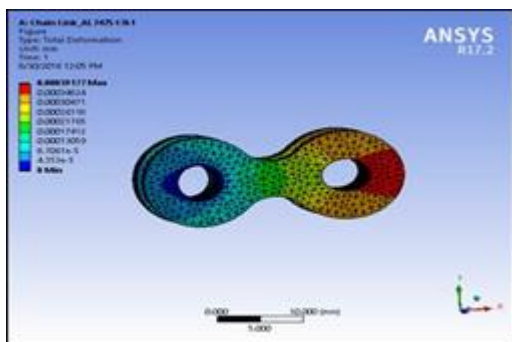
$$T2 < T1$$

Therefore number of teeth required for Driven Sprockets should be less than Driver sprocket to obtain more speed.

Analysis of deformation of chain with two different materials:

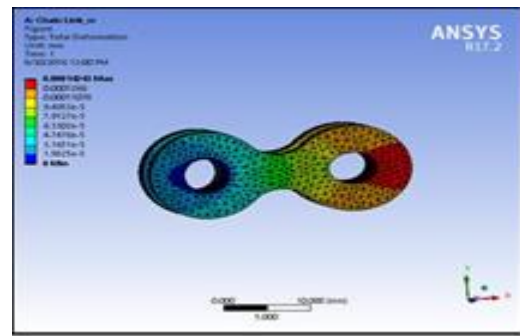
Aluminum Alloy:

1. Total deformation=0.000391766
2. Total yield strength=30
3. Total strength=165



Stainless Steel:

1. Total Deformation=0.00014241
2. Total yield strength=207
3. Ultimate strength=586



By comparison stainless steel is far superior in yield strength, Ultimate strength and deformation. Therefore stainless steel is better option.

5. CONCLUSION

The chain drives are mostly used for high torque transmission. From all chain roller has a positive drive. From the above calculations it can be seen that for the driven sprocket to achieve more speed than the main shaft the number of teeth should be less than Driver sprocket. For chain material stainless steel should be used for better yield strength and ultimate strength.

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