DOWNLOAD PDF SPUR GEAR ANALYSIS USING ANSYS

Chapter 1 : Stress Analysis Spur Gear Design By Using Ansys Workbench

In this paper using ansys work bench software, bending stress, contact stress and static load on the tooth of spur gear drive is found. Index Terms â€" Bending stress, Contact stress, Gear analysis using Ansys Work Bench, Static Load.

The bending stress of the gear tooth is considered to be one of the main contributors for the failure of the gear in the gear set. Thus, analysis of stresses has become popular as an area of research on gears to minimize the chances of failures and also for the optimal design of gears. This work investigates the characteristics of an involute helical gear system mainly focused on bending stresses using ANSYS. The analytical study is based on Lewis formula. Study is conducted by varying the face width to find its effect on the bending stress of helical gear. It is therefore observed that the maximum bending stress decreases with increasing face width. The study in this work shows that complex design problem of helical gear required superior software skills for modeling and analysis. A maximum deviation of 1. Two or more gears working in tandem are called a transmission and can produce a mechanical advantage through a gear ratio and thus may be considered a simple machine. Geared devices can change the speed, magnitude, and direction of a power source. Involute shaped gears found to be almost everywhere because of the contact forces act along a straight line. Helical gears currently being used increasingly as a power transmitting gear owing to their relatively smooth and silent operation, large load carrying capacity and higher operating speed. Designing highly loaded helical gear for power transmission systems that are good in strength and low level in noise necessitate suitable analysis methods that can easily be put into practice and also give useful information on contact and bending stress [1]. The finite element method is proficient to supply this information but the time required to generate proper model is large amount. Gear analysis can be performed using analytical methods which required a number of assumption and simplifications which aim at getting the maximum stress values only but gear analyses are multidisciplinary including calculations related to the tooth stresses. In this work, an attempt will been made to analyze bending stress to resist bending of helical gears, as both affect transmission error. Due to the progress of computer technology many researchers tended to use numerical Methods to develop theoretical models to calculate the effect of whatever is studied. However, the developed model and its solution method must e selected attentively to ensure that the results are more acceptable and its computational time is reasonable. The dimension of the model have been arrived at by theoretical methods. The stress generated of the tooth have been analyzed for materials. Finally the results obtained by theoretical analysis, AGMA calculations and finite element analysis are compared to check the correctness. Vijayaragan and Ganesan [2] presented a static analysis of composite helical gears system using three dimensional finite element methods to study the displacements and stresses at various points on a helical gear tooth. Huston et al [3] discussed a new approach to modeling gear tooth surfaces. A computer graphics solids modeling procedure is used to stimulate the tooth fabrication process. This procedure is based on the principle of differential geometry that pertains to envelopes of curves and surfaces. The procedure is illustrated with the modeling of spur, helical, bevel, spiral bevel and hypoid gear teeth. In the same year, a new approach was introduced by Zhang Et Al[4] to analyze the loading and stress distribution of spur and helical gear accounting for varying meshing stiffness, geometric modification and elastic deflection of engaged gears. Combining a discretized gear model with finite element analysis it has both good computational accuracy and efficiency. Zhang and Fang [5] presented an approach for the analysis of teeth contact and load distribution of helical gear with crossed axis. The approach was based on tooth contact model that accommodate the influence of tooth profile modifications, gear manufacturing errors and tooth surface deformation on gear mesh quality. Cheng and Tsay [1] investigate the contact and the bending stresses of helical gear set with localization contact by means of finite element analysis FEA The proposed helical gear set comprises an involute pinion and double crowned gear. Mathematical models of the complete teeth geometry of the pinion and the gear have been derived based on the theory of gearing. Accordingly, a mesh generation program was also developed for finite element stress analysis. The computerized design, methods for generation, simulation of meshing, And enhanced stress analysis of modified involute helical gears was considered by Litvin et al [6]. The approaches proposed for

modification of conventional involute helical gears were based on conjugation of double â€" crowned pinion with a conventional helical involute gear. Hedlund and Lehtovaara [7] presented a study focuses on the modeling of helical gear contact with tooth deflection. Their paper introduced a mathematical model for helical gear contact analysis. Helical gear surface profiles are constructed from gear tooth geometry by simulation the hobbing process. The three - dimensional finite element model for the calculation of tooth deflection including tooth bending, shearing and tooth foundation flexibility. The model combines contact analysis with structural analysis to avoid large meshes. A basis for solid modeling of gear teeth with application in design and manufacture was investigated by Huston et al [3]. They discussed a new approach to modeling of gear tooth surface. A computer graphics solid modeling is used to simulate the tooth fabrication processes. This procedure is based on the principles of differential geometry that pertain to envelopes of curves and surfaces. The procedure is illustrated with modeling of spur, helical bevel, spiral bevel and hypoid gear teeth. Applications in design and manufacturing are discussed. Extensions to nonstandard tooth forms, to cams and to rolling element bearings are proposed. Vera and Ivan [8] used the numerical method for modeling the contact of tooth flanks to analyzed and determine the shape of the function which defines the change of contact stresses on tooth flanks along the path of contact for a tooth pair. The results provided for the stress state of tooth flanks are also presented and discussed. The comparison of analytically and numerically obtained curves of change in the stress state on meshed tooth flanks, confirmed the accrual of the developed model. The necessary design modifications have also been made to rectify the problems being faced by the firm. Theoretical calculation for bending stress Figure 1. Results of maximum bending stress from lewis eq. The goal of these standards is to provide consistency among the manufacturers and to assist the purchaser in procuring the best product for the best price. Factor is also used to adjust the strength due to various environmental conditions. The AGMA has developed a number of factors to be used with the lewis equation that will lead to an acceptable design. It include the description of the geometry or model, the physical characteristics of the model. It includes the visualization and interpretation of the results of the solution. The load applied at the tooth of the helical gear. By varying the face width and keeping the other parameters constant various models of the helical gear are created. For determining at any stage during the design of the gear face width is an important parameter. The results of the variation in face width from 32 mm to 35 mm there is continuous decrement in the value of the stress of the tooth of the helical gear stress. As it is seen clearly from all tables and graphs the maximum bending stress values are increase with the decrease of face width. In theory of helical Gear, we are considering that the load is acting at one point and the stress is calculated. The calculation of maximum stresses in a helical gear at tooth root is three dimensional problems. The accurate evaluation of stress state is complex task. The contribution of this thesis work can be summarized as follows: In this work, it is shown that the effective method to estimate the root bending stress using three dimensional model of a helical gear and to verify the accuracy of this method the results with different face width of teeth are compared with theoretical and AGMA formulas. Box , Tampere, Finland. Pushpendra Kumar Mishra, Dr.

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Chapter 2 : Advanced Structural Analysis using ANSYS Workbench - Courses - Skill-Lync

I tried to simulate spur gear using Stuctural Analysis in ANSYS Student version. I already calculated contact stress between spur gear using AGMA equation and Hertz equation. The value is MPa and MPa respectively.

Gears are mainly type like spur gears, helical gears, double helical gears, bevel gears, crown gears, hypoid gears, worm gears, rack and pinion, epicyclic gears etc. The application of these gears fled from tiny wrist watches to huge machinery equipment gears from vital elements of mechanism in many machines such as automobile, aerospace industry, rolling mills, hoisting and transmitting machinery, marine engines, and the like. Parallel and co-planer shaft connected by gears are known as spur gear. Spur gear have straight tooth and are parallel to the axis of the wheel. Spur gears are most common type of gears. A pair of spur gear tooth in action is generally sub- jected to two types of cyclic stress: Both stress may not attain their maximum values at the same point of contact fatigue. These types of failure can be minimized by analysis of the problem during the design stage and creating proper tooth surface profile with proper manufacturing methods. In this paper using ansys work bench software, bending stress, contact stress and static load on the tooth of spur gear drive is found. It be- comes more and necessary to consider alternative technol- ogy of manufacturing materials used for gears. The mechanisms and the stress always come together and they have a strong relation between each other. Spur gear is the simplest type of gear having at tooth cut parallel to the axis of shaft on which the gear is mounted. Spur gears are used to transmit the power between parallel shafts. We have to consider all the possibilities, so that the gears are proportional to keep all the stresses with in design limit. Generally stresses calculated in gear design formula are not necessary true stress, can make it difficult to get correct answer on gear-tooth stresses, because it may not be known whether load is uniformly distributed across the face width and whether properly shared by the two or more pairs of teeth that are in mesh at the same time. So we have to make right assumption that will allow for things like stress concentration, residual stress, misalignment and tooth error. T, Go- rakhpur ,India,. The finite element method is capable of providing this information but it is time taken, the time need to create such a model is large. In order to reduce the modeling software can be used. One such model is provided by ansys work bench. An analytical solution is a mathematical expression that gives value of the desire unknown quantity an any location in the body, as consequence it is valid for infinite number of location in the body. For problem involving complex material properties and bounder condition, the engineer resource to numerical method that provide approximate that eatable solution 3. Apply material for spur gear structural steel. Element type solid10 node quadratic tetrahedral. Part Design of spur gear Fig. Mess of the gear Fig. Middle Principal Stress Fig. Minimum Principal Stress Fig.

Chapter 3 : How To Perform Spur Gear Anlysis In ANSYS. ~ MECHANICAL INFO

Dear All, While solving the Spur Gear (The Dimensions and loads are quoted from a research article), I The student community is a public forum for authorized ANSYS Academic product users to share ideas and ask questions.

Chapter 4 : Spur Gear Analysis

this paper using ansys work bench software, bending stress, contact stress and static load on the tooth of spur gear drive is found. Keywords: Bending stress, Contact stress, Gear analysis using, Ansys work bench, Static.

Chapter 5 : Spur gear analysis

Catia V5 Tutorials/How to create Parametric helical gear_15 deg helix angle\parameteric formulae - Duration: Abhishek Agrawal 45, views.