Junil FOR RESEARCE	Research Paper	Engineering		
International	Design Optimization of Diaphragm Spring With Various Load Condition			
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	rn automobiles employ diaphragm spring clutch, which	s advantageous in terms of less overall height and		

diaphragm spring can be exploited favorably in achieving smooth engagement process. The subject of this project is to show possible ways to optimize pressure force which act on diaphragm spring intended for use in motor vehicle clutch. During the exploitation of the clutch, because of friction linings wearing, pressure force which act on the diaphragm spring is changing. This means that the force in both cases has to be constant. Possible solution to achieve this condition is to have changes in diaphragm spring mechanical property and Increase the overall performance of the diaphragm spring.

weight, number of components, low release load and increased service life. The non-linear characteristics of the

KEYWORDS : Clutch, Diaphragm Spring, Creo 2.0, Ansys15.0

INTRODUCTION

Now a day's Diaphragm spring is the main important part of an automobile clutch system. A Clutch system is one of the main systems in a vehicle. Clutch is a mechanical device located between a vehicle engine and transmission, which provides mechanical coupling between the engine and transmission, input shaft. In Diaphragm, spring clutch has similar construction to that of the multi coil spring unit, but it uses a single dished diaphragm type spring to apply the clamping thrust. This spring also serves as part of the release mechanism. The diaphragm spring is placed between the pressure plate and the cover pressing. In this project, we are using different designs of diaphragm spring and we applied the various type of loads on the diaphragm spring design so that the different loads resists the diaphragm spring design and to obtain a high performance of an automobile clutch system thus improving the overall performance of an automobile. The diaphragm spring is a steel disc having a hole at the centre, and the inner portion of the disc is radially slotted so that a number of actuating fingers is formed. The outer edge of the dished spring bears against the pressure plate and two round sectioned wire rings are positioned from a short distance from its outer edge, one on each side of the dished spring.

LITERATURE REVIEW

The diaphragm spring clutch is the beginning of Luk (Lamellen und Kupplungsbau August Haussermann) success story. Beginning in the mid 1960, it increasingly replaces the coil spring clutch. For the last 80 years, we have been pursuing Research and Development in the hot forming of spring steels and the improvement of fatigue life. The 'Haussermann clutch' marketed under the brand name of "Luk" (Lamellen und Kupplungsbau August Haussermann), was the first diaphragm spring clutch to be made in Europe and is the basis for all dry clutches used in today's automotive engineering. This tradition forms the foundation of our production technology for high precision slotted diaphragm springs and for the precision waving of clutch plates and of our consulting competency [2]. LuK is an integral part of the Schaeffler Group. Over the last five decades, Luk has established itself within the Schaeffler Group as an expert and technology leader in the field of systems and components for vehicle drive trains. It all started in 1965 when the company developed a diaphragm spring clutch with a release system that to this day remains a groundbreaking innovation and just one of the many to have come from LuK [2].

Darko Danev, Milan Kjosevski and Simeon Simeonov [3] Obtainable in this research work, the diaphragm-spring fingers, stiffness

which can be achieved by changing of their cross-section. Also the fingers and the stiffness of the clutch cover will enable optimization of the total engagement or disengagement path of the clutch and directly influencing the factors that prolong its longevity. Kaustubh Shendkar and Prof. V.P. Mali [4] inside this research the Natural Frequency Increases with increase in nodal diameter or in aspect ratio of diaphragm spring in clutch. Whereas the Natural frequency decreases with increased slot end entire diameter in diaphragm spring of clutch. Natural frequency increases with increase in aspect ratio of diaphragm spring in clutch. Necmettin Kaya [1] has proposed optimized the diaphragm spring slots by using inherent algorithm in order to increase the fatigue resistance of the diaphragm spring. The slot forms at the diaphragm spring are important because of the height stress fatigue resistance at this region. N.Prasanth, M.Arun, R.Balagurubaran, D.Sabarish and Dr.R.Kirubashankar [5] in this project we studied to provided an alternative to the existing clutch applying system in heavy vehicles through semi automation with low cost system. although, the project provide the preferred output, the centre positioning of the cylinder is not achieve to bring the system in half clutch while starting and to coordinate with the gear rod. Ozansoy, T. Tevruz and A. Mugan [7] In this project, it is possible to calculate and design the components of a clutch system in an optimum way, which will help decrease the test and prototype costs significantly, or in our study we tried to reduce the axial vibrations of disengaged clutch, thus effects of these axial vibrations during half engaged clutch position. Trinoy Dutta and Lopamudra Baruah, [6] Presented In this study, we can be used to calculate the angular acceleration of clutch shaft, based upon the behavior of the non linear disc spring. To use this model complete simulation of the engagement dynamics of the clutch can be done for different diaphragm spring characteristic curve and clutch release curves.

AIM AND OBJECTIVES OF THE RESEARCH

In this project, consider a bus and design a diaphragm spring and stress analysis is done on this spring. The stress analysis is done on the upper part of the diaphragm spring. In this project, we have applied the 85N and 100N load on the design of diaphragm spring. Hence, it is important to precisely select the design limit and analyze them to acquire more reasonably of the diaphragm spring effect the overall performance of the automobile clutch system.

This Project objective is to design a diaphragm spring and to analyze the diaphragm spring clutch by using ANSYS software. The first objective can be achieve by using design of diaphragm spring using cre-o software and second objective can be achieved by using Ansys software. In this software, we optimize the design parameter of the basic structure and stress analysis for the model of the design of diaphragm spring. For these result the diaphragm spring changing its mechanical property and increase the performance of the diaphragm spring.

METHODOLOGY OF RESEARCH

The foremost discriminatory of this research is to develop an efficient and practical methodology for design optimization of diaphragm spring model. The proposed methodology consists of two main stages. In first stage, we are using cre-o software. With the help of cre-o, we draw the geometry of the diaphragm spring model. First, we draw a plan disc and then we cut the material of this disc and draw the design of the diaphragm spring and in the second stage, we are using ansys software. In this software, we import the different types of geometry of load on the upper part of the diaphragm spring model. Alternatively, we calculate the theoretical analysis of this diaphragm spring model in different criteria.



Fig.1 cad model of diaphragm spring

Table-1: Diaphragm Spring Data for Design

Diaphragm spring disc meas- urement	Diameter (mm)	Thickness (mm)	Mass (kg)	Nodes	Ele- ments
Diameter (mm)	450	20	3.2505	30481	13409



Fig.2 Meshed model of diaphragm spring Design



Fig.3 Application of load on diaphragm spring Design

In this research, we calculate the result for two loads 85N and 100N. In addition, describe the different types of elastic characteristics of diaphragm spring.



Fig.4 Total Deformation Design



Fig.5 Equivalent Elastic Strain Design

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Fig .6 Maximum principal stress Design



Fig .7 Strain energy Design

Result of 100N load for design from Ansys:



Fig. 8 Total Deformation Design

Result of 85 N load for design from Ansys:



Fig.9 Equivalent Elastic Strain Design



Fig.10 Maximum principal stress Design



Fig.11 Strain energy Design

RESULTS & DISCUSSION

The results of the four parameters are plotted for 85N(Blue Line) and 100N(Red Line) load. A comparison is shown in total deformation, equivalent elastic strain, and maximum principal stress and strain energy.

Graph.1 Total Deformation



Graph.2 Equivalent Elastic Strains



Graph.3 Maximum Principal Stress



Graph.4 Strain Energy



The following analysis specifies the variation of special parameters for different load conditions for a diaphragm spring. The analysis for the subsequent deformation existing in the diaphragm spring is analyzed and the design is safe and stable to work in the higher levels of loads without deformation. As the deformation and stress values obtain is lesser than the limiting values. And hence the design is secure and precise. Above the design results, this design is the best design for 85N or 100N load and improves the elastic characteristics of the diaphragm spring material.

CONCLUSIONS

The results are analyzed out of the four parameter above conclude that diaphragm spring design for two different load conditions are taken in account. A comparison is shown in variation in following results obtained at different load condition. Total Deformation, Equivalent Elastic Strain, Maximum Principal Stress and Strain Energy has been analyzed for the diaphragm spring design. Results are obtained from the analysis of diaphragm spring. And from the above results this type of diaphragm spring is the best spring to withstand the load of 85N and100N.and these diaphragm spring is more suitable for withstand 85N load. Design data of diaphragm spring had been collected from previous research papers. So the performance of overall automobile is improved.

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