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Failure Analysis of Yoke Joint Assembly of Transmission Drive Shaft: A Review

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Abstract-Universal Yoke Joint is very important component in transmission system from safety point of view. A Universal Yoke Joint is a positive, mechanical connection between rotating shafts, which are usually not parallel, but intersecting. They are used to transmit motion, power, or both. Since they subjected to large amount of variable stresses induced in Universal Yoke Joint and effect on different components of it. Numerical and Finite Element Analysis method are used. It consists of two yokes, one on each shaft connected by a cross-shaped intermediate member called the Spider. The angle between the two shafts is called the Operating Angle. For Analysis TATA MIDI-712 (YASHWANTI) model has been taken into consideration. It is observed that the failure of Yoke Joint has been occurred due to the various stresses induced which are taken into consideration for analysis of failure part (Yoke Joint). For Finite Element Analysis, CAD Model of Universal Yoke Joint is prepared using CREO PARAMETRIC and this model is imported in ANSYS where stresses analysis by Finite Element Analysis.
Key Word(s): Yoke Joint,Brinelling,Spalling, Burned U-Joint Cross Trunnions,U-Joint Fractures,CAD,FEM.

I. INTRODUCTION

An automobile engine produces power which is conveyed to the wheels so as to enable the vehicle to run. Universal Yoke joint and Propeller shaft play an important part to transfer power from engine to wheels. The purpose of universal Yoke Joint is to transmit power (torque). It is a specialized rotary joint used to allow a rotating split shaft to deflect along its axis in any direction. It is a positive mechanical connection between rotating shafts which are not parallel but intersecting. The flexibility is achieved by constructing the joint with two U-shaped yokes which is joined by a cross shaped hub. Once of the yoke is attached to the end of each portion of the split shaft and joined with the cross hub, with the U-sections oriented at 90 degree to each other. It allows the horizontal primary shaft to drive inclined shaft with no friction or loss of speed or drive output potential. It is one of the oldest of all flexible couplings. It is commonly known for its use on automobiles and Bus, trucks etc. During operation yoke should undergo for an infinite life with different loading. However, the highest stresses occur at the crack beginning location of the yoke. A possible surface fault leads to crack propagation at the highly stressed point. After a crack propagation period, the component undergoes fracture. A finite element stress analysis need to be carried out at the failure region to determine the stress distribution and possible design improvement. An FEA based software like ANSYS or any suitable software is utilized for the solving the given problem. An attempt to evolve an improved design resisting the failure and in turn enhancing the life would be the objective for this work.Fig. show 3D geometry model of Yoke Joint Assembly.

Fig-1.1:Universal Yoke Joint and Transmission Drive Shaft (Midi-712)

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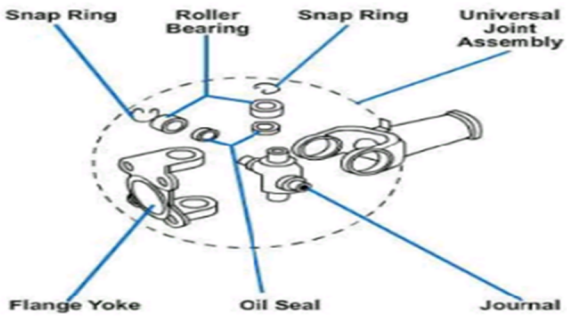

Fig-1.2: Cross and Roller Universal Yoke Joint

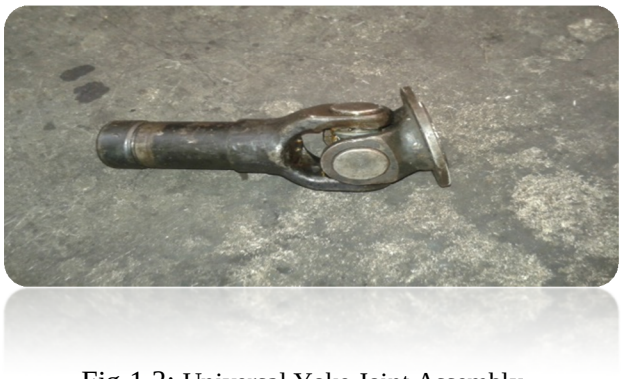

Fig-1.3: Universal Yoke Joint Assembly

II. LITERATURE REVIEW

Ritesh P. Neve (2015)analysed is being perform on universal joint certain modification are made in the existing geometry and analyses for the identical loading and boundary condition.

H. Bayrakceken, et.al. (2005) presented spectroscopic analyses, metallographic analyses and hardness measurements are carried out for universal joint yoke and a drive shaft of an automobile power transmission system. For the determination of stress conditions at the failed section, stress analyses are also carried out by the finite element method.

FarzadVesali, et.al. (2012) analyzed the loading behavior and the surface conditions of the defected bearings. By comparison with the known fatigue theories attempts are made in order to dig into the causes for the failures.

S. G. Solanke and A. S. Bharule (2014) investigated Stress Distribution for Optimization of Yoke in Universal Joint under Variable Torque Condition. Yoke is analyzed under torque load from steering rod observing hot spot Stress concentration region, hot area potentially carrying load. Scope to optimize part by eliminating density in order to maximize area of hot region with reducing in dead region.

S. K. Chandole, et.al. (2014) analysed of the component is carried out to find the stress and displacement of the final product. Using FEA analysis identified the nature and characteristics of stresses acting on the yoke and also evaluates the influence of the loads/ mass/ geometry/ boundary conditions over the yoke.

Naik Shashank, et.al. (2013) analysed for the identical loading and boundary conditions as in the reference paper from which the problem has been taken. In case of propeller shaft a comparative study has been made between two shafts differing in their material, keeping in view the possible weight reduction that can be obtained without affecting the functionality of the shaft. Both the components are analysed in ANSYS and the results are compared.

S. Kinme, et.al. (2004) analysed was effectively utilized for repeatedly reviewing the design. As a result, high rigidity and low cost stamped yoke was developed.

Kamal Kashyap and D. G. Mahto, (2014) Presented a finite element analysis predicting the behaviour of hooks joint under different

loads on different parts. The software package ANSYS is used to model the joint. This paper may help to improve the quality of hooks joint.

Swapnil S. Kulkarni, et.al. (2014) analysed and weight optimization of a universal joint yoke of an automobile power transmission system are carried out. The universal joint consists of two forged-steel yokes flange & tube Yoke cross turn-on hold two Yoke together at right angles to each other.

III. IDENTIFICATION OF PROBLEMS

Four Problems were Identified Related to Failure of Yoke Joint:

A. Brinelling

Brinelling is when needle marks appear on the surface of the U-joint cross, which is usually caused by excessive torque, driveline angle.

B. Spalling

Spalling looks like the bearing surface of the U-joint has been "scraped'' away. Spalling is usually caused by water or dirt contamination.

C. Burned U-Joint Cross Trunnions

Burned U-joint cross Trunnions are improper lube procedures.

D. U-Joint Fractures

U-Joint fractures are usually an improper application of shock load and torque load.

(Table-1)Fig-3.1: Yoke Joint Failure Part

	U-joint Fractures
	Brinelling,Spalling, Burned U-joint cross Trunnions
	U-joint Fractures

IV. SCOPE OF PROBLEMS

When a ST-BUS moves on the road, the stresses will be developed in the Transmission Drive Assembly due to road conditions, due to proper servicing and maintenance, due to proper lubrication which causes failure of YOKE JOINT, which is a frequent problem faced by ST-BUS. Due to the failure of YOKE JOINT the BUS will stops which are a great inconvenience to Passengers, ST-BUS Employee and Worker. Hence YOKE JOINT failure is genuine problem. This study helps to highlight the causes of YOKE JOINT

failure and suggest the design modification to reduce failure of YOKE JOINT, this study will help to minimize the inconvenience to Passengers, ST-BUS Employee and Worker.

V. CONCLUSION

The aim is to solve MSRTC workshop problem of YOKE JOINT failure of Passenger Bus; keeping this in mind we have started the project work. We have planned to Design and reduced the existing problems by using CAD and FEM.

REFERENCES

[1] Ritesh P. Neve, "Material Optimization and Weight Reduction of Universal Joint Yoke Using Composite Material", IOSR Journal of Mechanical (IOSR-JMCE)ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, May - Jun. (2015).
[2] H. Bayrakceken, S. Tasgetiren, I. Yavuz, "Two cases of failure in the power transmission system on vehicles: A universal joint yoke and a drive shaft." Afyon 03200, Turkey 16 November (2005).
[3] Farzad Vesali, Mohammad Ali Rezvani and Mohammad Kashfi, "Dynamics of universal joints, its failures and some propositions for practically improving its performance and life expectancy." August (2012), Volume 26, Issue 8, pp 2439-2449.
[4] S. G. Solanke and A. S. Bharule, "An Investigation On Stress Distribution For Optimization of Yoke In Universal Joint Under Variable Torque Condition" International Journal of Mechanical Engineering and Robotics Research Vol.3, No.2, April (2014) ISSN 2278 – 0149.
[5] S. K. Chandole, M. D. Shende, M.K. Bhavsar " Structural Analysis Of Steering Yoke Of An Automobile For Withstanding Torsion/ Shear Loads", International Journal of Research in Engineering and Technology (IJRET) : Volume: 03 Issue: 03- Mar-(2014).
[6] NaikShashankGiridhar, SnehHetawal and P. Baskar, " Finite Element Analysis of Universal Joint and Propeller Shaft Assembly.", International Journal of Engineering Trends and Technology (IJETT) - Nov(2013) – Volume Number 5.
[7] S. Kinme, T. Kamikawa, A. Nishino, K. Ikeda and S. Inoue, "Development of Stamped Yoke for High Rigidity Intermediate Shaft" Koyo Engineering Journal English Edition 165 (2004).
[8] Kamal Kashyap and D. G. Mahto, "Analysis of Hooks Joint Using Ansys by Von-Mises Method" International Journal of Engineering and Advanced Technology (IJEAT)ISSN: 2249 – 8958, Volume-3, Issue-3, February (2014).
[9] Swapnil S. Kulkarni, P.G. Tathe and Prof. D.S. Bajaj, "Failure Analysis And Optimization In Yoke Assembly Subjected By Torsion And Shear", International Journal of Advanced Engineering Research and Studies E-ISSN2249–8974. July-Sept (2014)

BIOGRAPHIES

Mr. Anuj A. Muleywas born in India, in 1991. He received his B.E. (Mechanical) from A.C.E. College, Wardha, Affiliated from RTMNU, in 2014. Present he is doing M-Tech (CAD/CAM)from BDCOE College, Affiliated from RTMNU, Sevagram, Wardha(Maharashtra).

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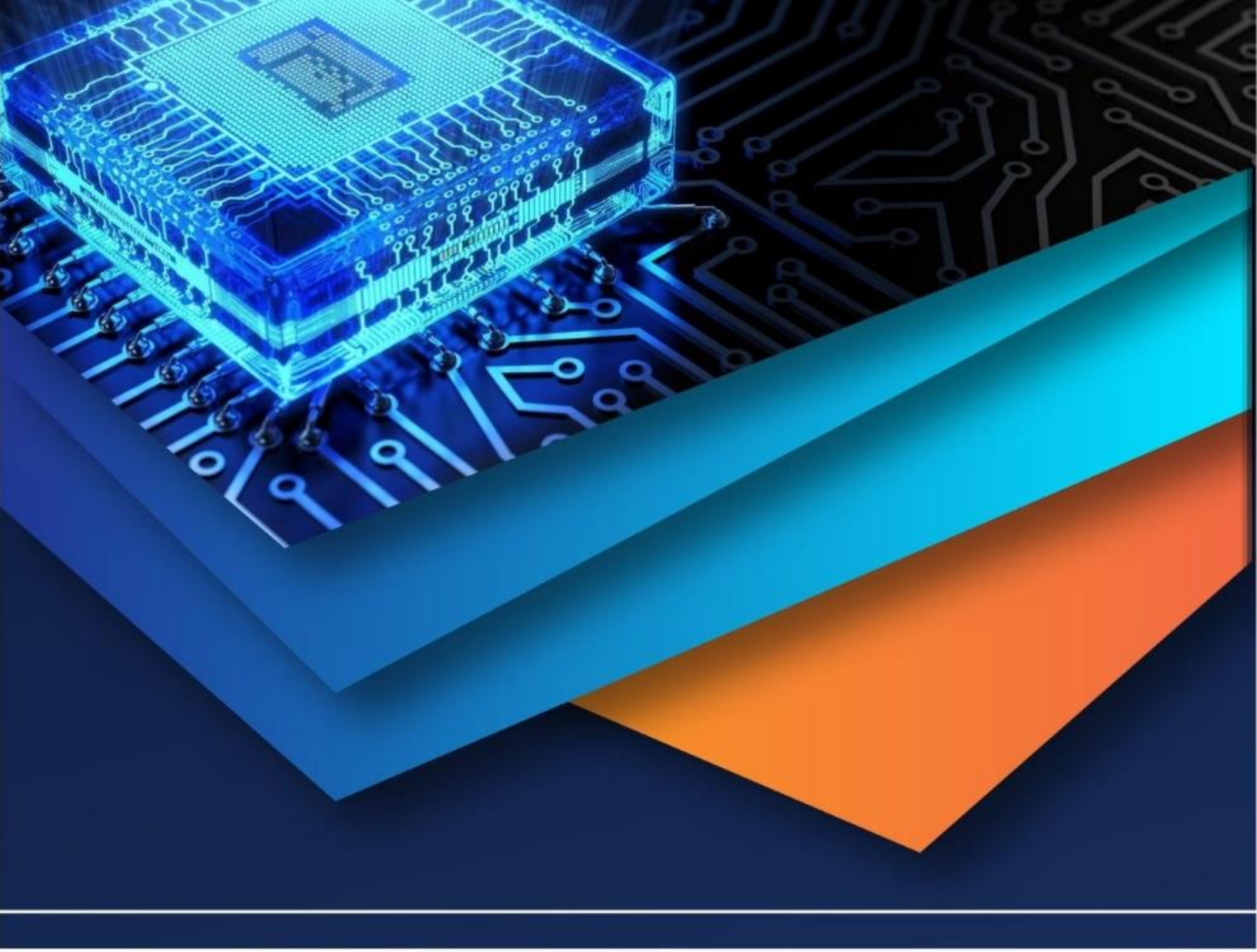

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