International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 05 Issue-01
January 2018

A Diverse Methodology for main bearing bolt and Cap loosening Machine for Automobile Crankshaft

B. Nagamma & K.Satish

Abstract:*As the time ate up for the loosening of the bolt manually requires greater time and reduces thecharge of production. The Automation is finished. It saves a whole lot of time and additionally will increase the rate ofproduction. The manual loosening of fundamental bearing bolt and cap isn't always most effective a time-eatingthe technique, however, it's also quite tedious and susceptible to human errors.Hence automation is completed to reducethe errors. The Automation of Main Bearing Bolt and Cap loosening reduces the component harm andwill increase the efficiency of the product. The thread chip-off and operator mistakes also are decreased.And also the requirement of skilled technician is reduced, which mechanically reduces the timeate up for various allowances.*

Keywords-Automobile crankshaft assembly, automobile bolt design, crankshaft assembly

I. INTRODUCTION

Like pistons and piston rings, connectingrods, bearings, and valves are used in areas of theengine that demand close fits. Due to high temperatures,however, some clearance must be allowedfor part expansion. While there are differencesbetween makes of engines, maintenance of therods, bearings, and valves is much the same for all.Special attention must be given to four-cycleengines because they contain more parts thatrequire service. Rod and bearing service is thesame for both two-cycle and four-cycle types.

The connecting rod attaches the piston to thecrankshaft. The upper end of the connecting rodhas a hole through which the piston pin is passed.The lower end contains a large bearing that fitsaround the crankshaft journal.The lower end of the connecting rod isusually split when friction bearings are used.Friction bearings use smooth, sliding surfaces toreduce friction between moving parts. The place atwhich the halves separate is called the parting line.

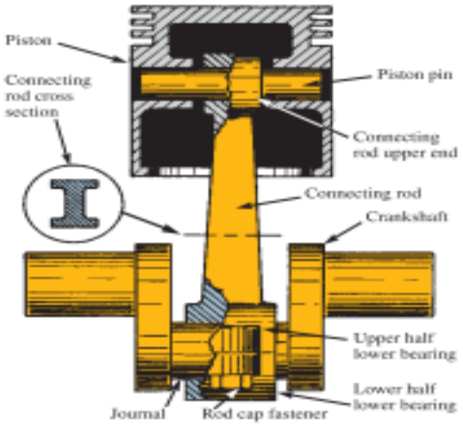

Figure.1. Connecting rod attaches piston tocrankshaft. Bearings are used at both ends of rod toreduce friction

The crankshaft converts the reciprocating(back and forth) motion of the piston into rotary(circular) motion. It transmits engine torque to apulley or gear, so that some object may be drivenby the engine. The crankshaft also drives thecamshaft (on four-cycle engines), supports the flywheel, and, in many engines, operates the ignitionsystem.Crankshafts can be made of cast or dropforged steel. One-piece and multi-piece crankshafts are used. Figure.2 shows a typicalone-piece small engine crankshaft.

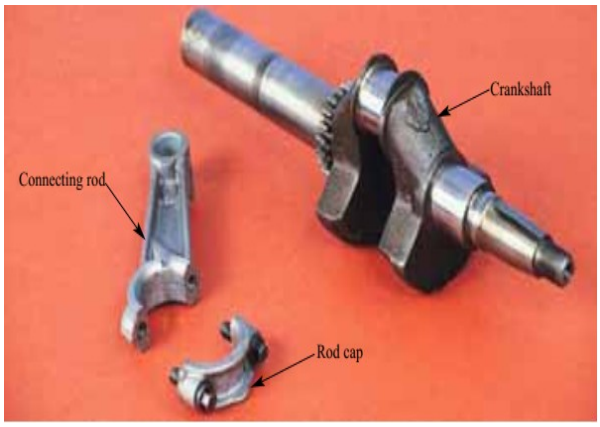

Figure.2 Single-piece crankshafts are most popular in small gasoline engine applications

International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 05 Issue-01
January 2018

With friction bearings, a thrust surface on theshaft rubs against a similar surface on thecrankcase. A precision insert main bearing mayhave a thrust flange for the crank to rub against. Insome applications, a bronze thrust washer is used.Clearances will vary with engine type,design, and use. Bearing and thrust surface clearances are critical. They must be held to exact tolerances as recommended by the manufacturer.Figure.3 illustrates the method of measuring the bearing surfaces on a crankshaft with amicrometer. A measurement must be taken in atleast two positions 90° to each other. If any of thedimensions are smaller than specified, or if thereare any score marks, the bearing surfaces shouldbe reground. Basically, wear and taper should notexceed .001″

Figure.3A micrometer is required to accuratelymeasure bearing surface diameter on a crankshaft

II. PROPOSED CONTROL SCHEME

In Engine plant all operations are done by Automation Process. But the Main Bearing Bolt and Caploosening is done manually. As it (The Bolt and Cap loosening) is done manually as shown in the figure1.There are various problems that occurs, moreover it is not completely reliable as there are chances ofhuman errors due to fatigue and other factors and also the time consumed on the process is more[4]. HenceAutomation is done.

Quality: The manual operation affects the quality in the form of part damage and thread chip-off in bolt. This is dueto the loosening of the bolt in main bearing cap.

Ergonomics: Ergonomics is said to be relationship between men and machine during manual operation. The ergonomicsis affected due to human fatigue, operational errors and the time consumed for various allowances.

Scrap: Scrap is also increased during manual operation and it causes Bolt damage and thread chip off and it leadsto increase in burr.

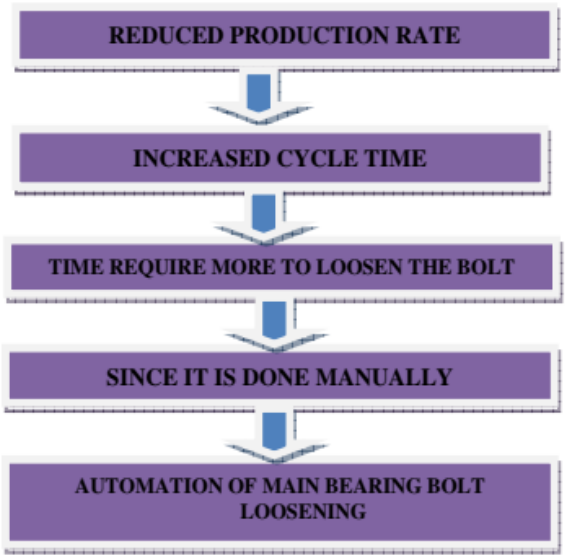

Figure.4 Methodology[12]

It works under Hydro-Pneumatic stress.The block is input to the conveyor by means of the choose and place roboticand the block moves to the diverse sections via the conveyor. In the main bearing bolt and caploosening consultation, the block is raised and the bolt and cap are loosened via the hydro-pneumatic gadget[7].Itroutinely loosens the principle bearing nut and cap inside the cylinder block and additionally, it's far sensed routinely by way ofthe sensor. And it's miles include 10 spindles and every spindle operates simultaneously for bolt loosening [9].And it's miles inclusive of five clamps for loosening the main bearing cap. It takes best much less time for the operation.When in comparison to manual operation time.

It works under Hydro-Pneumatic stress.The block is entered to the conveyor by way of the choose and location robotand the block moves to the numerous sections thru the conveyor. In the primary bearing bolt and caploosening session the block is raised and the bolt and cap are loosened by using the hydro-pneumatic machine[7].

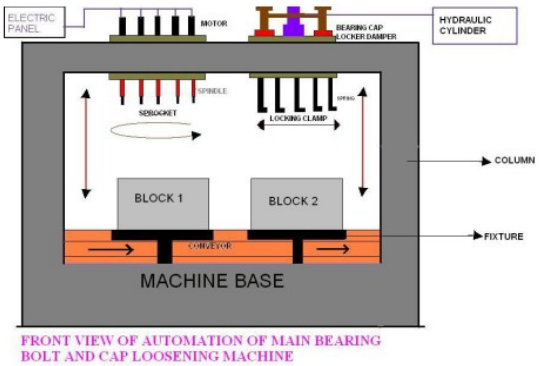

Figure.5 front view of automation of main bearing bolt and cap loosening machine[12]

Itroutinely loosens the main bearing nut and cap within the cylinder block and also it is sensed routinely by means ofthe sensor. And it far encompasses 10 spindles and every spindle operates concurrently for bolt loosening [9].And it's miles which include 5clamps for loosening the principle bearing cap. It takes most effective less time for the operation.When compared to guide operation time.

III. SIMULATION RESULTS

Assuming the top frame as a Fixed Beam which has uniform distributed load about 2500kg and the loadgets equally distributed.

i) To find self weightSelf weight = density* volumeVolume=1350*(140*95-120*95) =5805cm³
Density = 7.85 gm/cc for A36 Steel bar
Therefore, self weight = 5805*7.85=45.56*10³ gm
ii) To find Maximum Deflection Y max:
Ymax = WL³/384EI
= (1250+45.56)*9.81*1070³/(384*2*10³*578.4*10³)= 0.09 mm
iii) To find maximum bending momentM max= WL/24
= ((1250+4556)*9.81*1070)/24
= 506.63 Nm

Force=Torque/distanceTorque required for loosening the Bolt in main bearing cap so, torque about 5 to 6 kgfmIn this torque formula we find the force value: We considered the torque value is 5.5 kgfmForce =5.5/ (0.01) = 5393.66 N

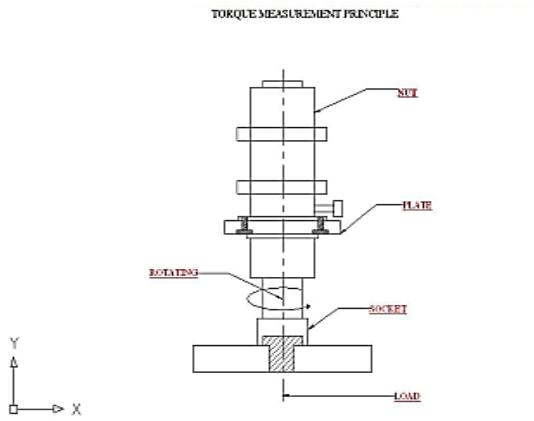

Figure.6 Bolt loosening Machine view[12]

IV. CONCLUSION

Success complete implementation of Main Bearing Bolt and Cap loosening gadget ended in transformationfrom manual processing to automatic processing, hence doing away with the workmen's fatigue. Theachievements at the implementation of the principle bearing bolt and cap loosening system can improves typical efficiency,avoid scrap and burr Avoid component harm. Thus the existences of major bearing bolt and cap loosening system turns up the records friendlier tobetter standards.

REFERENCES

[1] Ligier, J.L.; Dutfoy, L. Modelling and prediction of a simplified seizure mechanism occurring in conrodbearings. Méc. Ind. 2011, 12, 265–273.

[2] Bravo, A.E.; Durán, H.A.; Jacobo, V.H.; Ortiz, A.; Schouwenaars, R. Towards new formulations forjournal bearing alloys. Wear 2013, 302, 1528–1535.

[3] Khonsari, M.M.; Booser, E.R. Effect of contamination on the performance of hydrodynamic bearings.In Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology,Baton Rouge, LA, USA, 1 May 2006; IMechE: London, UK, 2006; Volume 220.

[4] Gangopadhyay, A.; McWatt, D.G. The effect of novel surface textures on tappet shims on valvetrainfriction and wear. In Proceedings of the STLE/ASME 2006 International Joint TribologyConference, San Antonio, TX, USA, 2008; Volume 51, pp. 221–230.

[5] Ciulli, E. A review of internal combustion engine losses. Part 2: Studies for Global Evaluations.Proc.Inst. Mech. Eng. D J. Automob. Eng. 1993, 207, 229–240.

[6] Ruchik D. Trivedia*, Dhaval B. Shahb, Kaushik M Patel"3D Parametric Modeling for Product VariantsUsing Case Study on Inner Ring of Spherical Roller Bearing" science direct 2012 .

[7] Ronkainen, H.; Valkonen, A.; Kapulainen, M.; Simo, V.; Hokkanen, A.; Stuns, I. Embedded opticalsensor for oil film pressure measurement in journal bearings. In Proceedings of the NORDTRIB2008,Tampere, Finland, 10–13 June 2008.

[8] Tala-Ighil, N.; Maspeyrot, P.; Fillon, M.; Bounif, A. Effects of surface texture on journal-bearingcharacteristics under steady-state operating conditions. Proc. Inst. Mech. Eng. J J. Eng. Tribol.2007,221, 623–633.

[9] Adatepe, H.; Biyikhoglu, A.; Sofuoglu, H. An investigation of tribological behaviors of dynamicallyloaded non-grooved and micro-grooved journal bearings. Tribol. Int. 2013, 58, 12–19.

[10] Ronkainen, H.; Valkonen, A.; Kapulainen, M.; Simo, V.; Hokkanen, A.; Stuns, I. Embedded optical

sensor for oil film pressure measurement in journal bearings. In Proceedings of the NORDTRIB. 2008,Tampere, Finland, 10–13 June 2008.

[11] Pawan Kumar Singh, Dr. L. P. Singh, Vicky Lad and Anil Kumar Vishwakarma, Modelling ofCrankshaft by CAD Tool and Finite Element Analysis Using Ansys Software. International Journal ofMechanical Engineering and Technology, 7(4), 2016, pp. 205–211.

[11] Praveen Padagannavar and ManoharaBheemanna, Automotive Computational Fluid DynamicsSimulation of A Car Using Ansys International Journal of Mechanical Engineering and Technology,7(2), 2016, pp. 91–104.

[12]. S. Arun, SK. Nagoorvali, K. Sunil Kumar and G.S. Mohan. Automation of MainBearing Bolt and Cap Loosening Machine for Automobile Crankshaft. International Journal ofMechanical Engineering and Technology, 8(2), 2017, pp. 41–49.http://www.iaeme.com/ijmet/issues.asp?JType=IJMET&VType=8&IType=2