

Reduction of Testing Failure in Engine Components by Improving Non-Adherence Process

J. Bharani Chandar ¹,

¹Assistant Professor,

Department of Mechanical Engineering,
Vel tech engineering College, Chennai, India

M. Kingston Daniel ², P.M. Ram Prasad ²,

K. Somesh ², R. Subash ²,

²Student,

Department of Mechanical Engineering,
Vel tech engineering college, Chennai, India

Abstract: - The work is done to eliminate the problems which arise in the Engine while testing due to leakages of oil in the oil pump and the Strainers. This can be achieved by making sure the parts that hold the oil and function with it are fitted properly. Since these parts are held on bolts, the worker might miss some and even forget to tighten them to the required torque limit if this happens then this problem can be identified only in the testing area. Hence by introducing an interface between the worker and the machine and by using specialised torque wrenches the operations of the workers are monitored and the engine moves to the next stage only when all the conditions are satisfied. Doing all this helps in increasing the productivity and the quality of the Engine and avoids rework and hence the Engine can be successfully dispatched.]

Keywords: Oil pump, Strainers, Torque limit, Torque wrench, Productivity.

1. INTRODUCTION:

There are many issues occurring in the engine. These problems can be identified only in the test bed, so it takes enormous amount of time to correct the problem only when the faults are rectified they can be successfully sent to the next section. But doing all this consumes a lot of time so if there is a proper system which monitors the work of the worker to prevent him from not installing and not properly fitting the components in the required place it would be better and it wouldn't take much time in the testing area if that system is proper. Sometimes the human who does the work may forget to do a work and might send the engine to the next stage thinking the work in his stage has been completed.

In order to avoid this, by improving the non-adherence process the worker has to complete all the tasks which is given by the system. Unless and until he finishes all that tasks the engine will not move from his stage, which ultimately helps in reducing the engine testing failures and to improve the quality of the engine and it also saves time, which in turn gives rise to increase in productivity. The main problems occurring in the engine testing area are,

Improper fittings of

- Oil pumps
- Strainers

2. OIL PUMP:

The main function of the oil pump is to circulate the oil and send it to the critical parts in the engine where lubrication is essential. The oil pump is responsible for conveying the oil for engine lubrication and building up the oil pressure in the lubrication system.

The Problems arises due to the improper fitting of oil pump

- There are leakages found in the engine due to the forgetfulness of installing the Oil gaskets.
- Improper tightening of the bolts also gives rise to this issue.

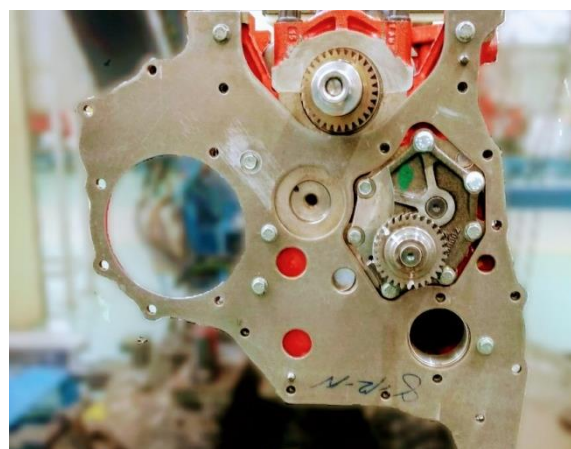


Figure1. Oil pump fitted in engine.

3. STRAINERS:

In order to make sure there is a clean supply of the oil, the oil should be without any type of solid contaminants and any other impurities. The process of removing these solid particles from the oil is known as mechanical separation, which is achieved by using the components such as filters and strainers. The strainer is also a kind of a coarse filter which is used for separating solid particles which is of a different size.

The main difference between a filter and a strainer assembly is that the latter is most frequently used to remove large solid contaminant particles while a filter on the other hand is employed in places where fine filtration is required. Both,

filters and the strainers are mounted in pairs, with one of them working and the other one kept as a standby.



Figure2. Strainer

4. PROBLEMS CAUSED BY HUMAN ERROR

The strainers are an integral part which helps the oil to circulate throughout the engine, because without the strainer the suction of the oil from the oil sump will not occur which in turn will cause the engine to stop and will create problems. Since the fitting of strainers is an important task, and once if its sent from its stage to the next stage the worker in the next stage will have no idea whether the strainer is fit or not because it is an internal part of the engine and it will not be visible outside. So by implementing suitable techniques and systems we can eliminate the human errors and can put out an end to the unwanted problems which are occurring due to the fitting of strainer in the engine.

5. RECTIFICATION OF PROBLEMS:

Since this problem is occurring in this stage due to the carelessness of the worker, there is a program which is set and there is a Setting tool which is used to tell the worker how much bolts that he must tighten in that section before sending it, so unless the worker tightens the required number of bolts in that section the engine will not move to the next stage so, the worker will be forced to fit the strainer in the engine and tighten it and use the torque wrench to convey the signal to the setting tool which in turn will give the information to the conveyor and it will move because of the pre-programmed logic that if the required number of bolts are tightened in that section that it can move it to the next section or stage.

By implementing new technologies like that torque wrench which is enabled by Wi-Fi it is easier to send the information and it is easier to handle as well there are no wires no disturbances and the worker can work at ease and not commit any mistakes if systems like this were present everywhere. By monitoring the proper fitting of the strainer in the strainers section we can eliminate the problems such as engine cease because there is zero suction if there is no strainer present so major failures can be prevented and the qualities of the engines sent out will increase and so will the errors of the human workforce involving in the fitting of the parts.

6. TORQUE WRENCH

In order to eliminate the human errors and the faults in giving the proper torque to each bolts in the engine pump, the tool which is called as the Torque wrench is used it is enable with Wi-Fi and it is interfaced with the conveyor, so only when the signal is sent from a particular stage the engine will move to the next stage.

Let's see how this actually works in detail,

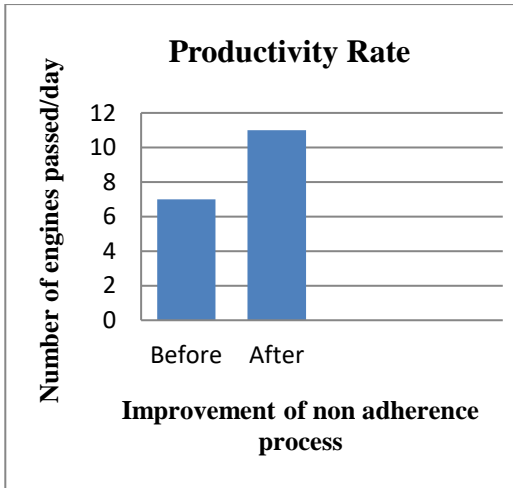
- The system displays the required number of bolts that the worker must torque tighten it in a particular stage so even if the worker misses tightening some bolts it'll still show the number of bolts yet to be tightened in the display and the worker will know that he has left some and he'll tighten it.
- Another use of this is that even if the bolts has not been tightened to the required Torque limit this wrench can find that out and eliminate that and that particular bolts will be torqued again.
- There is another problem in this section is that the missing of the installation of the oil gaskets, which also arises to the oil leakage if it is not present in the oil pump, by monitoring that we can ensure that problems regarding this can be reduced in the engine testing.



Figure3.Torque Wrench

7. THE WORK OF A TORQUE WRENCH:

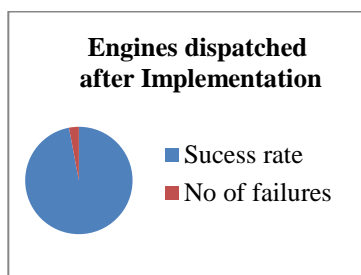
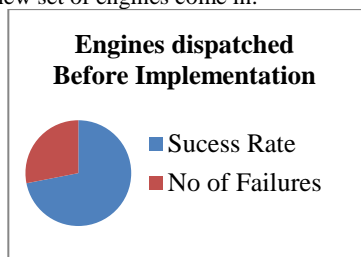
The work of the bolt is not just simply clamping down on something, it's only because of the pressure that you apply twisting the nut. The steel actually can stretch for about thousandths of an inch. It's the elasticity property of the steel trying to pull it back to its original length that allows a bolt to ensure that it provides a consistent clamping load. And this constant pulling force which remains long even after the wrench has been removed helps to keep the nut from coming loose due to various conditions of vibrations which occur during the working of an engine. So if the bolt is not stretched enough when tightening the fastener, it is impossible to get that pulling or retracting force on the nut. But application of too much force is not also good because it causes the bolt to fail.



8. RADIO FREQUENCY IDENTIFICATION DEVICE:

The RFID Scanner is placed in the beginning of the stages where the engine comes in, there will be a RFID tag placed in the engine it will be stickered in it. So once the scanner reads the tag the required information about that engine will be fed in the system and the system will recognize the type of engine i.e. whether 4 cylinder or 6 cylinder and whether it s a BSIII or BSIV engine. And the required torque that should be given for a particular bolt even that will be stored in it and hence even a slight variation between the engines can be specified by means of this technology and this also is one of the means by which the efficiency of the procedures in each stage can be improved.

So when the engine reaches the end of the stage before it is sent to the testing area the tag will contain all the information regarding all the processes that it has gone through and all the changes that has been done from the torque tightening of the bolts to the specialized parts that are fitted in the Engine. The system might hold lot of memories and it might be a problem at the later stages hence once when a particular shift is over the tag memories are deleted and the required basic data's are stored in a server hence it can be used when a new set of engines come in.



9. CONCLUSION:

We took the case of engine testing failures and identified the most occurring failures in it and found that the problems occurring due to oil was one of the main issues in that area. So we thought of eliminating the testing failures in the engine components by monitoring the fitting of the parts in the assembly section itself so that we can avoid these problems which occur due to the small mistakes and the errors which happen due to lack of concentration which happens due to continuous operation that he carries out throughout the day that he might tend to miss some part to install or he might fit some part in an improper manner and not in a perfect way.

Hence by improving the non-adherence process i.e. the non acceptance of the system, which means that the system will accept only if the required number of actions are performed in each stage and only if that information is send to it, it will accept it and there is no other means that the worker can escape from skipping a task hence new tools and technologies such as the torque wrench which is enabled by Wi-Fi and Radio Frequency Identification Device to ensure the type of engine which enters and the Pre-Programmed logic which is done using the PLC these are all interlinked with the internal conveyor so whenever the system accepts that proper work has been completed in a stage it will move it to the next stage and the information of the engine which has gone through all the process will be stored in a server. By doing all this we accomplished the ultimate aim of our project we increased the productivity and we increased the quality of the engine sent to the testing area and we reduced the rework which happens due to the problems regarding oil. And hence by installing all these new features, techniques and tools it is evident that any workplace can give a perfect output if similar ideas are implemented.

10. REFERENCES:

- [1] Godwin, P.E., October 1998. Fundamental operation and economic advantages of gear pump.
- [2] K. Ogushi, T. Ota, K. Ueda, Proposal of a precise calibration method of reference torque wrenches, in: Proc. SICE 22nd Sensing Forum, Osaka Pref., Japan, 2005, pp. 267–272.
- [3] A. Nishino, K. Ogushi, K. Ueda, Uncertainty evaluation of a 10 N m dead weight torque standard machine and comparison with a 1 kN m dead weight torque standard machine, Measurement 49 (2014) 77– 90.
- [4] Alireza Bahadori, PhD, CEng, MChemE, CPEng, MIEAust, RPEQ - Strainers and Filters.
- [5] The influence of oil pressure in the engine lubrication system on friction losses - Ewa Rosteka *, Maciej Babiakb , Emil Wróblewskib.
- [6] A. Brüge, R. Konya, Investigation on transducers for transfer or reference in continuous torque calibration, in: 19th Conference on Force, Mass and Torque Measurement, Cairo, Egypt, 2005.
- [7] Oil seal and gasket -Neeraj Nijjaawan, Rasshmi Nijjaawan.
- [8] Can technology eliminate human error? A. G. FOORD and W. G. GULLAND 4-sight Consulting, Harpenden, UK.
- [9] K.Y. Jhang, H.H. Quan, J. Ha, N.Y. Kim, Estimation of clamping force in high-tension bolts.
- [10] Accuracy and precision of as-received torque wrenches Eduardo Britton-Vidal, DDS,a Philip Baker, DDS,b Donald Mettenburg, AS,c Darshanjit S. Pannu, BDS, DDS,d Stephen W. Looney, PhD,e Jimmy Londono, DDS,f and Frederick A. Rueggeberg, DDS, MSg.