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Thermal Different Types of Materials

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ABSTRACT

The profilometers available in the industries are of different techniques. But most of them use a pointed crystal stylus which rubs on the specimen for a small linear dimension. The various surface topographical factors like waviness, texture, lay, manufacturing pattern, clusters of metallurgical phases etc. are spread throughout the surface which are random and therefore only surface roughness value for a local gauge length is not suitable for surface contact of mechanical engineering / tribological components. This has been observed by many researchers in the field.

The contacting and non-contacting type of techniques used for the measurement of surface roughness is very expensive even when the measurement comes to a flat component and those of spherical surface is even more expensive. With each technique there is a surface parameter that is associated. This parameter associated is to be interpreted to come to a result that can be accepted and compared with the other results.

The contacting type instruments involve movement of stylus over the specimen who can scratch the specimen surface and the tip of the stylus also deteriorates. With contacting type of instruments, the hardness of the material of the two coming in contact is also a point to be considered as the more hard material would try to change the geometry of the other material.

INTRODUCTION

The Tribology is a science that deals with the relative motion, wear and friction of interacting surfaces. The study of surface thus becomes important for the proper understanding of the operation, hazards and maintenance in machinery. Machine components when manufactured with high precision run quite smoothly. The various machining processes like grinding, lapping, electro-polishing etc. produce highly finished surfaces than those produced by conventional machining methods. The solid surfaces contain irregularities of various orders i.e. from the order of shape deviation to the order of inter-atomic distances. Till date no manufacturing method, however precise, could produce a molecularly flat surface on conventional material [1]. The geometric shape of any surface is determined by the finishing process used to produce it. There will be undulations of wavelengths that range from atomic dimensions to the length of the component. These often result from the dynamics of the particular finishing process or machine used. Engineering surfaces are far from smooth surfaces when viewed under a microscope. They consist of a multitude of apparently random peaks and valley. Surface texture and friction can be considered inseparable in the sense that they represent cause and effect respectively in particular applications. The asperity is used to identify individual texture elements, whereas the term macro-roughness is applied to combination of such elements.

The wear rate of systems at running-in phase is much greater that those systems at steady state. The running-in phase wear rate can be reduced by controlling the surface roughness of the interacting surfaces. Pre-machining process like turning and milling are backed up with finishing process like grinding and honing to decrease the surface roughness of the specimens. The surface roughness therefore is an important factor in the tribological aspects [2]. There are two parts of surface roughness- the height of features above and below the mean surface level and, the lateral separation of these height features. The former is given in terms of Ra, CLA, Rq values while the latter is known as ‘surface spatial wavelengths’. More sensitive instruments show that smooth surfaces contained a network of tiny scratches left by abrasive particles in the polishing compound.

OBJECTIVE OF THE WORK

One surface measuring technique is needed to identify the surface more than the gauge length dimensions which should be useful for contact surface analysis/ surface engineering. At the same time an approximate relation should exist amongst the R_a, R_t, RMS and other surface indexes.

With the initial survey and preliminary experimentations, the work is focused on - Development of a Fluid / Pneumatic Profilometer to use it as a measurement technique for comparing surface finish of flat components’ surfaces.

The surface roughness measurement is done by a Fluid Method. Though there are many surface measurement techniques and surface roughness parameters to give us information regarding surface roughness. But there are cases where surface parameter like R_a has same values for the different surfaces.

The surface roughness measurement instruments are very expensive. The objective of this project is to compare the surface roughness of the various specimens and obtaining a reliable result in less expensive way.

The highlights of this project are:

1. To compare surface roughness of the various surfaces.

2. Using pneumatics to achieve the aim of the project.

3. Making a system that is of similar accuracy as of the existing systems but cheaper.

4. Designing of a Pneumatic Profilometer.

5. Calibration of the same with the existing parameters.

In order to measure the surface roughness in a cheaper and an accurate manner: A pneumatic profilometer is designed and fabricated to compare the surface roughness of the machined surfaces. The values of the experiment thus obtained are standardized and calibrated with the existing parameters. Pneumatics system has been preferred over hydraulics system because of its better operational advantages: The explosion proof characteristic and wide availability of the air. Simple construction of pneumatic systems and easy handling.

Result:-

The modification done lead us to a more steady performance of the model but yet not satisfactory. The operation and results though were better than the previous used model but there were still many uncertainties in the process being conducted.

a) The self-weight of the equipment was small to withstand the pressure of the compressed air.
b) It was required for the model to be given support by hand so that it can be at the position placed.
c) The location of probe was not systematic. It was observed many times that probe rose up in its position due to the effect of compressed air.

The perpendicularity required between locator and probe; surface of the specimen and probe was not achieved which led to random irregular readings

CONCLUSION

The surface roughness parameter introduced by the pneumatic profilometer was found of great importance as it does not only covers a gauge length more than those of the profilometers measuring five peaks and valleys but is also very cheap considering the expensive instruments used for the measurement of the roughness. It has been till now the cheapest and reliable method to measure the surface roughness/finish of the flat components.

The present Pneumatic Profilometer is used to measure the surface roughness of the flat machined components but modification should be done so that the round, spherical and other profiles can also be checked for the surface finish.

The costing of pneumatic profilometers measuring spherical or other profile components is very high from those of the profilometers measuring flat components. So, if this can be modified to measure that surface finish it can prove to be very useful for medium industries.

At the end of the legs of the Pneumatic Profilometer can be attached a roller ball which can facilitate the shifting of it from one place to another without making any impressions on the specimen to be measured.

A further advancement in the instrument can be made with the help of the pantograph. The pantograph with Magnification Factor = 4x can be used to transport the pneumatic profilometer from one location to another without re-locating the instrument manually. This at the same time will improve the standards of the instruments and will also be able to avoid the differences that may occur due to constant re-positioning of the instrument.

The pantograph should be made light weight and the relative motion between the links should be much précised because if not made with high precision can lead to misplacement of the pneumatic profilometer.

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