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A REVIEW PAPER ON: A MEASURING TECHNIQUE FOR SURFACE FINISH

Sourabh Tripathi[1], Suresh Batni[2]
M.tech Scholar[1], Asst. Prof.[2]
[1,2] Department of Mechanical Engineering, SIMS, Indore

ABSTRACT

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 findings of this project work include a method that is reliable and effective. This technique is again a contact type profilometer but does not involve rubbing of the surface to be measured with any stylus. This technique is based on fluid method of the measurement. The costing of the presently available surface roughness measuring instruments whether contact or non-contact types are very expensive. This Pneumatic Profilometer developed uses pneumatics for the achievement of the objective.

KEYWORDS: Raw material SS-302, Pneumatic Profilometer, Cylindrical Tube, Probe.

INTRODUCTION

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. 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 R_a, CLA, R_q 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 [3]. Usually component failure starts from the surface it can be either due to any manufacturing discontinuity or it can be due to deterioration in quality of surface gradually. The former causes fatigue failure due to the laps and folds while the latter causes failure due to stress concentration and fatigue failure may be due to use of a worn wheel at the time of grinding. Surface roughness is very important factor describing the surface integrity. At every manufacturing industry, the roughness of surface produced must be in certain limits.

The advantages of using a pneumatic system are

1. Simple construction of pneumatic elements and easy handling.

2. Comparatively cheaper in cost than other systems.

3. Compressibility of air.

4. Easier maintenance.

The basic system requirements for introducing pneumatics are

1. Air compressor

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2. Pipeline

3. Control valves

4. Air actuator

5. Auxiliary appliances

LITERATURE REVIEW

The surface roughness measurement can be done by the help of profilometers. These can be classified as:

A) Contacting type: 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.

B) Non-contacting type: An optical profilometer is a non-contact method for providing much of the same information as a stylus based profilometer. There are many different techniques which are currently being employed, such as laser triangulation (triangulation sensor), confocal microscopy (used for profiling of very small objects), low coherence interferometry and digital holography.

Russell D. Young et.al. have suggested In-process and On-line process Measurement of Surface Finish. (Elsevier) Future trends in surface finish measurement for manufacturing are discussed. It is expected that optical techniques will be used increasingly for measurement of surface roughness and of other parameters as well as because these techniques are inherently fast and three-dimensional. Four optical techniques are discussed and evaluated. Stylus techniques, however, will continue to play an important role in research and metrology. Statistical methods for the three dimensional characterization of surfaces are briefly reviewed [2].

ADVANTAGES OF CONTACT PROFILOMETERS

Acceptance: Most of the world's surface finish standards are written for contact profilometers. To follow the prescribed methodology, this type of Profilometer is often required.

Surface Independence: Contacting the surface is often an advantage in dirty environments where non-contact methods can end up measuring surface contaminants instead of the surface itself. Because the stylus is in contact with the surface, this method is not sensitive to surface reflectance or color.

RESOLUTION

The stylus tip radius can be as small as 20 nanometres, significantly better than white-light optical profiling. Vertical resolution is typically sub-nanometer as well.

RESULTS

The concept was found to be acceptable for the objective of the project. But it was not giving any proper pattern so to get a proper pattern the needle-pen-refill-pipe model was replaced by a Probe. Since at initial stage the practical was done using water which raised issues like

a) Spilling of water all over the specimen.
b) After practical situation of drying up the specimen before another reading.
c) Taking care of the material through which water was dried and,
d) To also take care of the rusting and eroding effect that could be caused by the water to the specimen and to the model then prepared.

Modification:

The modifications done to the previous assembly were:

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a) In-place of using water as the medium to conduct practical; compressed air was to be used to avoid the ill-effects of the water.
b) Making of a proper probe was done to avoid the leakage that was caused due to the needle-pen-refill-pipe arrangement.
c) The probe was made of aluminum as a hole of dia <0.5mm can be made with less difficulty in this material. (Such a hole is required at one end of the nozzle to keep the surface area in contact minimum.

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.

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