VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

kauno technologijos universitetas

The 13th International Conference

Mechatronic Systems and Materials MSM – 2017

Abstracts

Compiled by Justinas Gargasas

3 – 5 July, 2017

Vilnius, Lithuania

The 13th International Conference “Mechatronic Systems and Materials (MSM - 2017)”

Abstractsnof Papers for the 13th International Conference: “Mechatronic Systems and Materials (MSM – 2017)”. Vilnius, Lithuania, 03 – 05 July 2017. Compiled by Justinas Gargasas. Vilnius: Technika, 2017. 125p.

This book constitutes the abstracts of Papers presented for the 13th International Conference on Mechatronic Systems and Materials – MSM 2017, which is being held in Vilnius from 03 – 05 July 2017 and organized by Vilnius Gediminas technical university, Kaunas University of Technology, the Lithuanian Academy of Sciences, Opole University of Technology, Bialystok Technical University, the IFToMM National Committee of Lithuania.

The aim of the conference is to provide an opportunity to share information and facilitate co-operation in mechatronics, new materials and dissemination of current research results in this multi-disciplinary field. The task of the Conference is not only to acquaint participants with the works of scientists from different countries, but to expand their collaboration in the future.

The abstracts are printed without editing, but as presented by their authors.

For information write to:
Vilnius Gediminas Technical University, Faculty of Mechanics,
Organizing Committee of International Conference MSM-2017
Facuclty of Mechanics, J. Basanavičius str. 28, LT-03224, Vilnius, Lithuania
http://www.msm2017.vgtu.lt/index.php/mechanika/index/pages/view/home2017;
E-mail: msm2017@vgtu.lt

eISBN 978-609-476-043-3

CALCULATION POSSIBILITIES OF 3D SURFACE ROUGHNESS PARAMETERS

*Natalija Bulaha[a] *, Janis Rudzitis[b]*
[1]Riga Technical university, Viskalu street 36A, Riga, LV-1006, Latvia
E-mail: [a]natalija.bulaha@rtu.lv, [b]mti@rtu.lv

Keywords: surface texture, Pearson criterion, 3D roughness parameters, distribution function.

ABSTRACT

Nowadays, a great interest is paid to engineering tasks solution, it is the determination of wear, surface contact area, the coefficient of friction, surface contact deformations. Surface roughness parameters, which define details surface quality and exploitation characteristics, play a huge role in these types of tasks.

Surface with irregular roughness very often is modeled by normal random field of two parameters X, Y, for which the typical is:

- Symmetrical arrangement of random variable in relation to its average value. It means, that roughness parameter Ssk - skewness of ordinates distribution function, has to be equal to "0".
- Kurtosis of roughness ordinates distribution function, which is characterized by roughness parameter Sku, has to be equal to "3".
- The probability that surface ordinates values will be grouped in interval from -3σ to + 3σ have to be equal to 99.7% , where σ is a root mean square deviation of distribution function.
- Empirical distribution of roughness ordinates has to comply with the theoretical with a high probability, which have to be checked by Pearson criterion [1].

In this work roughness measurement experiments for surfaces with irregular roughness were carried out with the aim to determine the roughness parameters and the ordinates distribution histograms using modern measuring equipment Taylor Hobson Talysurf Intra 50 [2]. Using the obtained experimental data, Prison criterion calculations were made for surfaces, obtained by grinding operations, spark erosion, sandblasting, shot peening and lapping in order to check the compliance of ordinates distribution function to normal Gaussian distribution law. While the calculations it was established that the normal Gaussian distribution law is appropriate for all types of such surfaces, as evidenced by compliance of calculated Pearson coefficient to its tabulated values with a probability greater than 90%.

The next step was the calculations of several 3D roughness parameters (from the standard ISO 25178-2 [3]) using the normal random field formulas [4,5] with the aim to determine the relevance between modeled surface parameters and experimental data. The values of parameters Sa, Sp, Spc, Sdq, Sdr were compared with the experimental one. According to the obtained results it was concluded that calculated values of surface roughness parameters are quite close to the values obtained by measuring equipment Taylor Hobson. It can be explained by the surface roughness ordinates distribution, particularly by skewness Ssk and kurtosis Sku, which do not fully comply with normal distribution law [6], that why we can see the differences between the theoretical and real values of surface roughness parameters. In addition these results may be affected by the limited number of experiments. Nevertheless the obtained formulas may be applicable for 3D roughness parameters determination.

REFERENCES

1. V.S.Pugachev, Probability Theory and Mathematical Statistics for Engineers, first ed., Pergamon press, U.K., 1984.
2. Exploring Surface Texture, 7th edition. Great Britain: Taylor Hobson Limited, 2011, 110 p., [online] [01.03.2016], Available at: http://www.taylor-hobson.com/uploads/learningzone/ metrologybooks/Exploring%20Surface%20Texture%202014.pdf
3. LVS EN ISO 25178-2 standard "Geometrical product specifications (GPS) - Surface texture: Areal - Part 2: Terms, definitions and surface texture parameters"
4. K.J.Stout, P.J. Sullivan, W.P. Dong, E. Mainsah, N.T. Mathia., H. Zahouani, Development of Methods for Characterization of Roughness in Three Dimensions, first ed., Penton Press, London, 2000.
5. J. Rudzitis, Contact mechanics of surface, second part, RTU, Riga, 2007.
6. N.Bulaha, J.Rudzitis. Analysis of model and anisotropy of surface with irregular roughness: submitted to proceedings of 16th International Scientific Conference on Engineering for Rural Development (2017).