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CALCULATION OF ACCURACY MANUFACTURING MACHINERY

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Abstract: The quality of production depend from accuracy of manufacturing machinery too. The topic describe new calculation method of accuracy manufacturing machinery in manufacturing process. The accuracy of production in manufacturing process express the quality of production. When we want know what accuracy we achieve at manufacturing we must know calculation accuracy of manufacturing machinery. Uncertainty measured parameter of production in concrete manufacturing process depend from accuracy of manufacturing machinery.

Keywords:Accuracy, manufacturing machinery, uncertainty.

1 INTRODUCTION

With first publication international policy “Guide to the Expression of Uncertainty in Measurement” [1] was unify idea apprehension of accuracy, error and estimate uncertainty in measurement. Adoption of international policy is based on the approach to expressing uncertainty in measurement recommended by the International Committee for Weights and Measures /CIPM/ in 1981 and the elaboration of that approach given in the Guide to the Expression of Uncertainty in Measurement, which was prepared by individuals nominated by the International Bureau of Weights and Measures /BIPM/, International Electrotechnical Commission /IEC/, International Organization for Standardization /ISO/, or International Organization of Legal Metrology /OIML/. Acceptance this policy with oll state was unification apprehension and write result of measurement although the Guide represents the current international view of how to express uncertainty in measurement based on the CIPM approach. It is a rather lengthy document since the Guide itself is intended to be applicable to similar kinds of measurement results including results associated with

-International comparisons

-Research measurement

-Calibrating measurement standards

-Certifying standard and reference materials

-Creation of standard

-Technical measurement

In general, the result of a measurement is only an approximation or estimate of the value of the specific quantity subject to measurement, that is, the measurand, and thus the result is complete only when accompanied by a quantitative statement of its uncertainty.

2 ACCURACY OF MANUFACTURING MACHINERY

For manufacturing machinery is very important that the product of manufacture had the parameters in definite required limits. Know this limit for manufacturing machinery is calculation method of accuracy measurement and determine tolerance of dimension for production.

Production process is cyclic production method with affect influence cause:

-random errors and

-systematic errors

Effect of these errors express mixing distribution probable model. Stability of manufacturing process we understand ability of manufacturing process holds parameters production. It is ability hold parameter quantity specify of quality on require level.

Principal aim manufacturing production must be quality include all attributes products. The quality is determined mainly big amount quantity of measurement. The effects these quantity we must identificate, determine, measure and then we can they evaluate and regulate. Manage the technological process of quality production we must understand complex, solve in accordance with STN ISO 9001 [5] et:

-design and construction

-development and manufacture prototype

-manufacture

-instal to working

-service

For find out possibility reach manufacturing parameter of product we must determine accuracy manufacturing machinery. Et the determined model this computing we shall advance as follows:

3 LOCATE PROBLEMS AND ITS AIMS

3.1 Representative Selection

Determine representative selection ready product in competent production process in amount, time .

-from daily production

-from weekly production

-from annual production

according time in which we want know production value [2].

3.2 Measurement Method

Determine measurement quantities for express single elements of quality and specify measurement method of quality parameters take one´s quantity.

Here we determine solid parameters characterized product from viewpoint all attribute quality. Et determined measurement parameters goes out from prescription or test agreement [4]. Et the elect amount products carry aut from competent measurement prescription for calculation uncertainty measurement. We must prepare model of measurement et secure quality of production et know accuracy of manufacturing machinery [6].

4 DETERMINE TOTAL DEVIATION

Et the calculation total deviations we go out from total dimensions of products.

4.1 Calculation Total Deviation Form

$$D_i = R_{hi} - R_{di} \qquad (4.1)$$

R – measured parameter of product / dimension and following qualitative parameter /

R_{hi} **-** top parameter /dimension/ i-th product.

$\mathbf{R_{di}}$ – lower parameter /dimension/ i-th product.

h – we understand product parameters over nominal dimension – parameters.

d – we understand product parameters under nominal dimension – parameters.

nominal – is conventional right value on which is product make by project.

i – is i-th measurement representative select on element / product /.

n – selection representative amount element / product /. Olways concern of representative amount element in competent range – total, top or lower range.

4.2 Calculation Medium Value Total Deviation Form.

$$\text{ø} \quad 1/n \sum_{i=1}^{n} i \qquad (4.2)$$

5 DETERMINE TOP DEVIATION DIMENSION.

Et this calculation we go out from tops dimensions of products.

5.1 Calculation Top Deviation Dimension.

$$ì_i = R_{hi} - R_{hø} \qquad (5.1)$$

5.2 Calculation Medium Value Top Dimensions.

$$R_{hø} = 1/n \sum_{i=1}^{n} R_{hi} \qquad (5.2)$$

5.3 Calculation Medium Value Tops Deviations Dimensions

$$ì_{ø} = 1/n \sum_{i=1}^{n} ì_i \qquad (5.3)$$

6 UNCERTENTY IN TOPS DEVIATIONS DIMENSIONS

The idea uncertainty in measurement in primary connect only with random errors and value uncertainty was identical with interval reliability at election confident probability. When is the contuity of uncertainty type A with random errors and uncertainty type B with errors systematic no recomend use title random respectively systematic uncertainty [3]. Now we calculate uncertainty from tops dimensions of products.

6.1 Calculation Standard Uncertainty Type A in Tops Deviations Dimension

$$u_{Ah} = [1/n(n-1) \sum_{i=1}^{n} (ì_i - ì_{ø})^2]^{1/2} \qquad (6.1)$$

6.2 Calculation Combined Standard Uncertainty of a Measurement in Tops Deviations Dimensions

$$U_{ch} = (u^2_{Ah} + u^2_{B})^{1/2} \qquad (6.2)$$

Standard uncertainty type **B –** $\mathbf{u_B}$ we obtain from verification document of measurement instrument measured parameters of productes.

6.3. Calculation Expanded Uncertainty in Tops Deviations Dimension

$$U_h = k_u u_c \qquad (6.3)$$

Very good estimate of deviations dimensions productions we achieve at probability **P=99,73 %** with coverage factors $\mathbf{k_u = 3}$ at degrees of freedom **í = .**

7 DETERMINE BOTTOMS DVIATIONS DIMENSIONS

Et these calculation we go out from bottoms dimensions of products.

7.1 Calculation Bottom Deviation Dimension

$$ç_i = R_{di} - R_{dø} \quad (7.1)$$

7.2 Calculation Medium Value Bottoms Dimensions

$$R_{dø} = R_{di} - R_{dø} \quad (7.2)$$

7.3 Calculation Medium Value Bottoms Dimensions

$$h_q = 1/n \sum_{i=1}^{n} hi \quad (7.3)$$

8 UNCERTAINTY IN BOTTOMS DEVIATIONS DIMENSIONS

Now we calculate uncertainty from bottoms dimensions of products.

8.1 Calculation Standard Uncertainty Type A- u_A in Bottoms Deviations Dimensions

$$u_{Ad} = [1/n\,(n-1) \sum_{i=1}^{n} (h_i - h_q)^2]^{1/2} \quad (8.1)$$

8.2 Calculation Combined Standard Uncertainty of a Measurement in Bottoms Deviations Dimension

$$u_{cd} = (u^2_{Ad} + u^2_B)^{1/2} \quad (8.2)$$

Standard uncertainty type **B – u_B** we obtain from verification document of measurement instrument measured parameters of productes.

8.3 Calculation Expanded Uncertainty in Bottoms Deviations Dimension

$$U_d = k_u\, u_{cd} \quad (8.3)$$

Very good estimate of deviations dimension of productions we achieve at probability **P = 99,73 %** with coverage factors $k_u = 3$ at degrees of freedom $n = ¥$

9 DETERMINE TOLERANCES

For management system quality in manufacturing and service organisation is important measure thus that uncertainty result was in required limit.The tolerances dimensions of productions is fild in which are situated all deviations dimensions of maked products. Calculated tolerance of products is determine with absolute medium value total deviation form and with tops and bottom expanded uncertainty. This is very good coverage deviations of diferencis dimensions of products from nominal dimensions – parameters – values.

9.1 Tolerance Calculate Simple Mode

$$T_p = |\ ø| + U_h + U_d \quad (9.1)$$

9.2 Tolerance Calculate Statistical

$$T_s = |\ ø| + (U^2_h + U^2_d)^{1/2} \quad (9.2)$$

10 COMPARE THE TOLERANCE

Calculated tolerance in simple mode or in statistical mode we may compare with standardized tolerance or required with client. This method our show how accuracy we produce on the manufacturing machinery. We know determine how uncertainty will be have our products. It is knowledge about our manufacturingmachinery in workshop.

11 CONCLUSION

The above mentioned new calculation method of accuracy manufacturing machinery approach to the management of modern manufacturing systems. The aim of this new method is formulation of generally valid methods and application of modern knowledge used for manufacturing systém.It is task determine in manufacturing process possibility reach production parameter, which determine quality manufactured product express with uncertainty of measurement.

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