



THEORY AND TECHNOLOGY OF THE SINGLE-PROBE TWO-STEP METHOD TO SEPARATE ERROR

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Abstract- The multi-step error separation technique is a important method of roundness error separation, but it is not suitable to be used in measuring online for multiple inversion of tested parts, long measurement period and vulnerable to surroundings in the implementation process. In this paper, the studies of single-probe two-step error separation method have been realized by single sensor which is rotated by different angle two times. Not only the influence of harmonic control is reduced, but also the efficiency is greatly improved. It has the advantages of multi-probe method and multi-step method. A mathematical description of the method is given by this paper, which establishes a error separation equation and gives the solving method. The method of error fitting to simulate three circumstances is also used by it: same spindle's gyration error and existing

random error and carries on computer simulation analysis. The results show that when the gyration error are identical, high error separation accuracy can be achieved by the method when there exists random error, although the influence on the measuring results of roundness error cannot be eliminated, the random errors can be decreased or basically eliminated by averaging the testing values of repeated measurements. Several contrastive experiments of the on-line measurement are carried out in a grinding machine (MB1332A). The results of these experiments successfully verify that the theory and mathematical models are correct. The contrast of the measuring results in these experiments proves that the Single-probe two-step method can realize the complete separation of all kinds of errors basically and this method is applicable to on-line measurement of a workpiece and it can also make the measurement accuracy very high.

Index terms: Error separation technique, two-step method, roundness error, simulation analysis, experimental verification