

P R E F A C E

Use of stochastic models has already proved economical in large number of practical situations, involving questions of product quality — many more await attention of the researcher. 'Design and use of automatic size controllers' and 'design of locators' form two such areas in the field of machining.

In practically all situations of design and use of machining equipment, knowledge of the expected ratio of the unacceptable items to the total number of items produced — called rejection level in the present work — is necessary for the purpose of economic comparison of the alternatives under consideration. The probability distributions obtained from the stochastic models provide this knowledge.

A critical review of three situations of design and use of machining equipment, included in Part I of this presentation reveals the inadequacy of the empirical rules, and that of the deterministic and semi-stochastic models available for the purpose, and points to the necessity of developing fully stochastic models. The situations investigated are (i) design and use of unidirectional fixed-magnitude compensation type post-process feedback size controllers, (ii) design of diamond-pin locators, and (iii) evaluation of positional deviations in V-location due to ovality on the located work-surface. In each case, stochastic models have been developed, effects of the various design and use parameters on the rejection-level studied and advantages to be gained by using the

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proposed models discussed in Part II. The three investigations have been presented sectionwise in both the parts — Sections 1 and 4 dealing with the first investigation, Sections 2 and 5 with the second, and Sections 3 and 6 with the third one. Important findings and results have been summarized at the end.

In the interest of simplicity of presentation, a few symbols had to be used for more than one purpose each. However, the texts have been prepared in a manner that will avoid any confusion on this count. To further this objective, and to facilitate reading, an index to symbols has been appended after 'summary'. This index has been arranged investigationwise in the belief that it will save time for the reader; and contains only those symbols which have been used in more than one chapter of the same investigation without repeating the definition in each one of them.

It may also be mentioned that the equations, the figures, and the pages have been numbered chapterwise.

Section 3: Effect of Force-errors on Accuracy of Location.

3.1 Position deviation in V-location resulting from ovality on the located work-surface page 5.1

PART II

DEVELOPMENT OF STOCHASTIC MODELS FOR DESIGN AND USE OF MACHINING EQUIPMENT AND STUDY OF THEIR BEHAVIOUR

Section 4: Stochastic Models for Machining-systems incorporating Bidirectional Fixed-magnitude Compensation Type Post-process Feedback Controllers.

4.1 Stochastic Model-I page 6.1

4.2 Stochastic Model-II page 7.1