An application of the fuzzy theory for gauge repeatability and reproducibility of measurement system analysis / 黃文啟

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ABSTRACT

ISO9001:2000 and TS 16949 have become the major quality system management models in presently traditional industries and Hi-tech industries. Measurement System Analysis (MSA) manual, on the other hand, is one of the core tools in ISO/ TS 16949. MSA aims to evaluate Gauge Repeatability and Reproducibility (GR&R) where control, monitoring, and the maintenance of measuring process are required in measuring systems so that the measuring capability could be ensured under statistical control. An ideal measuring system should present the statistical characteristic of zero error on any measured products. Nevertheless, such an ideal measuring system hardly exists. Managers therefore have to adopt such measuring systems with unsatisfactory statistical characteristics. When proceeding GR&R variability, personnel in quality-related industries have to follow the standards formulated in MSA manual in AIAG to determine the appropriateness of the measuring system. People are likely to ignore the computing process as it is simple; the determination of measuring systems do not merely depend on some simple indexes. Traditional MSA indexes are constructed with definitely observed values. However, measurements with observed values are not entirely error-free. For this reason, this study proposes the research and evidence on the three cases in a case company and applies the integration of Fuzzy Theory and Gauge Repeatability and Reproducibility to discuss the differences in the evaluation index %GR&R and Number of Distinct Categories (NDC). Having fuzzy numbers to substitute for definite numbers, it is found that the data of %GR&R are increased and NDC is decreased after the fuzzification. Such results verify that the fuzzified %GR&R and NDC become stricter on the determination criterion. The research outcomes could assist the case company in improving the reference data of measuring systems as well as promoting the measuring quality.

Keywords : Measuring system, Fuzzy Theory, Gauge Repeatability and Reproducibility

Table of Contents

目 錄

圖目錄

表目錄

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