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Control charts —

Part 8: Charting techniques for short runs and small mixed batches

Cartes de contrôle —

Partie 8: Techniques de cartes pour petites séries et pour petits lots combinés

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 4, *Applications of statistical methods in product and process management.*

A list of parts in the ISO 7870 series can be found on the ISO website.

Introduction

It is generally recommended that at least 25 subgroups of data be collected, and plotted, before any constructive analysis can take place to form the basis for establishing standard traditional variables control charts. This represents best practice for the application of *standard* statistical process control (SPC) charts to long production runs of a single product characteristic (for instance, a diameter) or a process parameter (for instance, temperature). However, it presents a problem in many potential applications of SPC.

In the business environment, there is an increasing need for versatility and flexibility in highly efficient systems. These support just-in-time inventories and create greater product variety, with smaller batches and shorter runs. The consequent ever-increasing resets, changeovers, die changes, and so on, bring new challenges to the meaningful application of SPC. These occur at a critical time when the pressure for continual performance improvement has never been greater.

Processes accommodate many part numbers, often of similar shape but different nominal sizes at best, and part configurations having multiple characteristics with different specified nominal values, units of measure and tolerances. For example, a bolt maker with short runs of various size bolts (diameter and length), or a tube extruder with tubes of different size outside diameter, inside diameter and wall thickness. The customary approach is to put a different standard control chart on each characteristic of each part number. The consequences of this administratively cumbersome, product-focused, procedure would include the generation of large numbers of run charts each containing data too sparse to be useful, either for control or improvement.

In the same way that other functions have responded to the challenge, for instance, the introduction of lean methods and single minute exchange of die (SMED) in production, so the SPC facilitating function responds. This situation presents both a problem and an opportunity.

The problem arises because, in many organizations, production runs are often too small to generate enough data to apply standard control charts. This can occur in two ways. Firstly, there is the case where the batch, or lot, size itself is very small. Secondly, there is the situation where the run is very short; for instance, the high speed stamping operation that may run only for a short period. It is frequently not practicable, in either case, to generate enough subgroups to make the control chart meaningful.

The opportunity arises because much current statistical *process* control is actually statistical *product* control, that is, SPC implementation is often product-focused rather than process-focused. Different products that are generated by a single or similar process are looked upon as dissimilar entities. Consequently, sources of process variation can be overlooked when analysing the product orientated control chart. Due to the sparseness of product information in short run, small batch situations, the focus has to be on the common element, the process. Short run SPC provides the means to transform a succession of short run product-related jobs into a long term process. An example is the “jobbing” shop that does not make many of the same part, but has a number of processes that are continually being employed. They turn many shafts, drill many holes, etc., continually. The grouping of drilling, turning, grinding processes and the like, or their corresponding facilities (for instance, machine tools) could make good candidates for the application of short run SPC.

Some basic statistical concepts, terminology and symbols are introduced in this document; however, these are kept to a minimum. The language chosen is that of the workplace rather than that of the statistician. The aim is to make this document readily comprehensible to the extensive range of prospective users and too facilitate widespread communication and understanding of the method.

It is advisable that those who are not familiar with the control chart technique read both ISO 7870-1 and ISO 7870-2 before reading this document.

