# Chapter 5
# Application of Statistical Quality Control in Testing Labs for Estimation of Machine Interference

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## ABSTRACT

*The performance and maintenance of testing laboratories is a prime issue. The quality of coal test results not only depends on performance of individual results but it also depends on the performance of various tests in the same laboratory. Machine interference is a significant problem in many manufacturing system and testing equipment. The variation of results for testing equipment may be due to various factors which need to calculate the uncertainty of measurement to show the accuracy of the machine. In case of coal testing laboratory, the plant layout and surrounding environment affects the performance of the system. The machine interference comes under variable causes which may affect the result. This chapter proposes a methodology for constructing system performance measures, finding out the various factors responsible for variations in result. The chapter deals with estimation of machine interference existence using variable control chart approach for coal testing equipment. The analysis of results for such machine interference will be useful and significant for system designers and practitioners.*

DOI: 10.4018/978-1-5225-5406-6.ch005

## INTRODUCTION

In nature two extremely similar things are difficult to obtain. If at all we come across exactly similar results it must be only by chance. This fact holds good for testing process as well. No testing process is good enough to produce an exactly similar result for the same sample on same equipment with same operator. The testing process gets affected by various sources such as quantitative as well as qualitative. The consistency of result gets affected by sample, operator and environmental conditions etc. The result of test process gets affected after controlling all above factors which may be due to machine interference.

A statistical quality control procedure is an important tool in total system of quality control. The purpose of this discussion is to outline a simple statistical procedure that is widely applicable and practical in testing laboratory (Westgard, Barry, & Hunl, 1981).

In case of material testing, the result of a measurement is only an approximation to the value of the measurand and is only complete when it is accompanied by the uncertainty. Computing the reported test result is straightforward, however, computing the uncertainty associated with the test result requires more consideration. The uncertainty evaluation process will encompass a number of influencing quantities that affect the result obtained for the measurand. In order to quantify the uncertainty we will have to consider all the factors that could influence the results. Material testing measurement process is always doubtful about the value of quantity to be measured which provides the basis for safe working of components during their operations. Therefore, it is essential that measurement professionals explain to their clients the value of their work and its limitations.

A reading will give the false impression that the measurement is accurate. As there are other variables which would be accounted for, critical applications those will rely upon if measurements might have errors. Those experienced with measuring equipment are typically aware of this fact and often provide a guess of a reading to the best of their knowledge. But skill and experience often plays a role in how accurate those guesses might be. However, as the benefits of measurement uncertainty (UOM) are becoming more widely known, the practice is being put to use with greater credibility in many critical fields.

Because a realistic uncertainty measurement can account for actual variables that may be encountered, possible solutions can be provided and procedures can be enacted to account for those variables. A realistic uncertainty reading also lends greater credibility to the measurement information being produced. International standards and procedures have been created that outlines how to take a realistic measurement uncertainty reading utilizing a tool known as the “Uncertainty Budget” (Mandavgade et al., 2011b).