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A case study on the application of Mahalanobis-Taguchi system for magnetic component

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Abstract- Control chart is a graphical record for visualizing the variations that occur in the central tendency and dispersion of a set of observations to achieve the process stability. The company under study mentioned that when the assignable causes have been eliminated from the process to the extent that the points plotted on the control chart remain within the control limits, the process is in a state of control or stable. Therefore, the company simply assumes that 10 parameters at magnetic component workstation are significant. However, by solely relying on the control chart to confirm the significant parameter is not sufficient. The purpose of the research is to emphasize on the SNR gain towards the magnetic component in production environment specifically visual mechanical inspection (VMI) at E&E industry. MTS works by classifying both normal and abnormal observations and optimize various parameters in workstation to produce better quality product. This work considered annual data of 2018. This work found that positive gain through signal to ratio (SNR) indicated the quality of system still in good condition from January with 0.3298 until December with 0.3667 after insignificant variable have been removed. This work also suggested height of excess plastic header as one of variables in VMI should be removed since the variable does not contribute to the system as shown in 2018. Meanwhile, there are two parameters reduced in March (Number of epoxy spot on winding coil and height of excess plastic header), July and August (Condition of marking and height of excess plastic header) and November (Number of scratches and height of excess plastic header). This concluded that MTS is a practical method for classification and optimization in the industry.

Indexed Terms- Mahalanobis-Taguchi system, magnetic component, Mahalanobis distance, SNR gain

I. INTRODUCTION

Industrial Revolution in modern history is a process of change from an agrarian and handicraft economy to one dominated by industry and machine manufacturing. As factories became widespread, additional managers and employees were required to operate them. There are four revolutions of industry started from Industrial Revolution 1.0 until Industrial Revolution 4.0. The overview of these industrial revolution was reported by Jeevita and Ramya [1], whereby the first Industrial Revolution began in the middle 18th century and was brought on by the invention of the steam engine. It was the reason for the creation of a new type of energy that later on helped speed up the manufacturing of railroads thus accelerating the economy. In Industrial Revolution 2.0 which was started at the beginning of 20th century, electricity became the primary power source to all factory activities and processes. As the machines are designed with their own power sources, they become portable and easy to handle. Industrial Revolution 3.0 began in the last decades of the 20th century. Two major inventions such as programmable logic controllers and robots helped give rise to an era of high-level automation. Consequences, it provides the opportunity to replace operators with automated machine. In the 21st century, Industrial Revolution 4.0 is a smart industry that marries physical production and operations with smart digital technology, machine learning, and big data to create a more holistic and better connected ecosystem for companies that focus on manufacturing and supply chain management. There are nine pillars of the Industrial Revolution 4.0 as reported by Erboz G. [2] which outlined the new