Chapter 18
SMED:
A Literature Review from 1985 to 2015

Jose Roberto Diaz Reza
Universidad de La Rioja, Spain

Julio Blanco Fernández
Universidad de La Rioja, Spain

Deysi Guadalupe Márquez Gayosso
Universidad Autónoma de Ciudad Juárez, Mexico

Emilio Jiménez Macías
Universidad de La Rioja, Spain

Juan Carlos Sáenz Diez Muro
Universidad de La Rioja, Spain

ABSTRACT

Short changeover times have always been critical in manufacturing and are a necessity nowadays in all types of industries, due every wasted minute means inefficiency. Single Minute Exchange of Dies (SMED) is a methodology developed by Shigeo Shingo in 1985, which seeks to reduce the setup time of a machine to less than ten minutes (Shingo, 1985). It provides a rapid and efficient way of converting a manufacturing process from a current product that is been running in the production process, to the next product (Tharisheneprem, 2008), aimed always to decrease the setup time in industrial machinery, given flexibility in product and their characteristics. Through this research, we found that we can achieve some benefits through the implementation of the SMED methodology such as: the reduction of changeover time up to 90% with moderate investments (Cakmakci, 2009), reduce waste and increase quality, it makes low cost flexible operations possible.

1. INTRODUCTION

The concept of lean manufacturing was developed for maximizing the resource utilization through minimization of waste, later on lean was formulated in response to the fluctuating and competitive business environment (R. Sundar, A.N. Balaji, & R.M. Satheesh Kumar, 2014). The process of waste elimination is achieved through the application of lean tools and techniques (Vinodh & Ben Ruben, 2015). Lean manufacturing has its roots in automotive industry and it is derived from the Toyota Production System, the management philosophy that had been developed through decades by Toyota after the Second World War (Haragovics & Mizsey, 2014). Lean system aims to improve value addition by means of removal of non-value added activities, making the value stream smooth, and converting push production to pull

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production and perfection by continuous improvement (Vinodh & Ben Ruben, 2015). Lean Manufacturing is a multidimensional approach that embraces a wide variety of management practices in a unified system. These practices comprise just-in-time, quality systems, cellular manufacturing, work teams, and supplier management, among others (García-Alcaraz, Maldonado-Macías, & Cortes-Robles, 2014), and Figure 1 illustrates a theoretical structure for Lean Manufacturing in industries.

As competition among companies increases, firms have been trying to find ways of having the competitive advantage in the market place (Cakmakci & Karasu, 2007), and due to the intricacy of market order and competitiveness, many manufacturing organizations are under pressure to produce and dispatch products in shorter delivery times (Rahul.R.Joshi & Prof.G.R.Naik, 2012), hence to compete effectively short lead times are essential to provide customer satisfaction (Alad & A.Deshpande, 2014), having materials flow along the production process, and long set-up times are an obstacle to the flexible use of production resources and are therefore a core production organization issue (Herr, 2014).

Another important issue in this matter is to gain flexibility, that defined as the ability of a system to perform proactive and reactive adaptations of its configuration in order to cope with internal and external uncertainties in production process that affect the materials flow (Winkler, 2009). A key enabler for achieving flexibility and implementing lean production is the reduction of set-up times (Fritsche, 2011), defined as the time running from the last good part of the previous lot until the first good part of the follow-up lot, that is the aggregate period with the manufacturing equipment not producing good parts (Fritsche, 2011), the representation of change over time is shown in Figure 2.

Hence, the setup time reduction is an important challenge to setup time reduction resulting in a lean production system. In such a context, lean manufacturing systems have the ability to achieve responsive, small batch manufacture so that they can meet rapidly changing market, especially when it comes to realizing the ability to serve high-mix, low-volume markets (Herr, 2014). However, producing more products at smaller batch sizes, results in more changeovers. Thus, a rapid changeover capability is critical

Figure 1. Basic lean manufacturing tools (Vinodh & Ben Ruben, 2015)