

Chapter 14

CAD Applied to the Design and Cost Reduction in the Use of Molds for DIE Casting Process

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ABSTRACT

During the last three decades the increase of utilities is the principal aim of the international companies, focus on this topic, many companies have been invested resources on investigation and innovation, develop new techniques and implementation of procedures standardized by the global competitors. According to the references mentioned before, a case of study is used to improve the productivity of a die casting process, the methodology used consists in the integration of a design technique and the methodology DMAIC. The results showed that the new design of the casting mold weight reduced by 18% percent the quantity of material requires for the original product, from an initial weight of 2.77 lb to 2.20 lb. Also, through the modification of gates and metal runners in the mold, a 60% reduction of material waste was achieved. With the new prototype, the scrap was reduced from 13.65% to a new 6.45% of the piece. This is a 54% reduction on the SCRAP. With the information above mentioned, it has been achieved a save of \$2.23 USD per unit, a total of \$25,958.00 USD by year.

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INTRODUCTION

During the present chapter, the method used to improve a process of die casting implemented by a company in Baja California, Mexico, will be illustrated. This international company is focused on the production of metallic products, specifically aluminum, using the die casting process. More than 80 percent is designated to be sold abroad, being the USA its main destination. Therefore, a continuous improvement program was implemented to all the production systems. As a consequence, it was noticed that a mold replacement was needed to improve production.

The main objective of the chapter is to expose a case of study where we have integrated the methodology of Define, Measure, Analyze, Improve and Control (DMAIC) to the technique of Design for Manufacturing (DMA). The aim is to improve the process and reduce the cost of manufactured aluminum parts.

BACKGROUND

Focused on the impact and the correct explanation of the methodology used by the authors, the next section describes in a first step the DMAIC Six Sigma methodology, and in the second step the die casting process for aluminum manufacturers.

DMAIC (DEFINE, MEASURE, ANALYZE, IMPROVE, CONTROL)

There are different ways to describe the perception of the methodology of Six Sigma (SS). The most common is “philosophy of work and philosophy of life”; for others it is a “business strategy”. In general, the aim of this methodology is to eliminate variability in the processes and achieve a level of 3.4 defects per million or less (Escalante Vázquez, 2004).

Cardenas (2013), indicates that the history of Six Sigma begins when Mikel Harry an engineer of Motorola, influenced the company to analyze the variation in processes, as a way to improve them. These variations are now known as a typical standard deviation, this ideas and concepts at the time have been represented by the greek letter sigma “ σ .” This proposal became the starting point of the effort to improve the quality of Motorola, with a new target 3.4 ppm of defects in their processes, this objective catapulted the company to the success.

Nowadays, Six Sigma is considered as a management strategy that seeks improvement by incorporating the concept of error-free performance. This concept applies first at processes baseline operations and second at management processes, the main idea is “there are no industrial reasons to have different standards of satisfaction” (Escalante Vázquez, 2004).

According to Jiju, A. (2011), the benefits of adopting Six Sigma business strategy will have the following advantages:

- Effective management decisions due to heavy reliance on data and facts instead of gut feelings and hunches. Hence, costs associated with firefighting and misdirected problem-solving efforts with no structured or disciplined methodology could be significantly reduced.

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