

# The Integrated Six-Sigma Method to Reduce Losses in the Production and Supply Chain Process (Case Study: Polyethylene Pipe and Fittings Company)

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**Abstract-** In recent years, the use of six sigma techniques has been expanded. In today's competitive world, six sigma can be a winning company to improve quality and reduce costs. The purpose of this study was to investigate the Six Sigma approach to reducing losses in the production and supply chain process at Polyethylene Pipe and Fittings Company. The statistical population of this study was 1100 employees of the company. A sample of 285 people was selected using the Morgan table as a sample. The data collection tool was a researcher-made questionnaire. The reliability of the questionnaire was confirmed by experts and the reliability of the questionnaire was confirmed by Cronbach's alpha coefficient and for data analysis, Pearson correlation coefficient was used. The results of this study showed that six sigma dimensions include leadership and vision, management commitment and resources, customer focus, right people selection, improvement management and process, company strategy have a positive and significant relationship with reducing waste in the products and supply chain process.

**Keywords-** Six sigma, Waste products, Polyethylene, Company, Production and Supply Chain Process.

## 1. Introduction

In the new circumstances, increasing competitive pressure and business difficulties, and resource constraints, on the other hand, have pushed organizations to focus on the needs of their customers to increase their satisfaction, while not overlooking the amount of Effectiveness of the internal processes of the organization [1]. One of the tools that today is used as a systematic approach to the coherent use of various

quality tools to achieve a high level of quality is the six sigma approach. Six sigma is a process with a set of statistical tools, which is used to achieve a vast number of 3.4 in million. Six Sigma is done in accordance with the set goals and data collection, which uses statistical techniques and management tools along with the analysis of results, by reducing the defects in products and services, to make changes in the organization and provision Quality required and customer satisfaction [2]. Today, the efforts of human societies in the competitive world will not be achieved except by optimizing the solutions, the proper use of time, financial resources and manpower, in this regard, must multiply the effort to move the wheels of the economy and the industry could be victorious in the realm of competition. The 21st century is the hundreds, thousands, and millions of seconds, and should also be familiar with advanced approaches to engineering, human, medical, and so on, so that it can be triumphant through the use of these new sciences in our country. This will not happen unless we increase our knowledge and knowledge in every field day-to-day, and this is simply possible in the current world, because we live in a world where information tools are accessible to all its people. In this research, using the Six Sigma method in a polyethylene pipe manufacturer and manufacturer, we will measure the advantages of implementing Six Sigma and seek to answer the question whether the implementation of six sigma has affected the reduction waste products and supply chain process or not.

## 2. Research Literature

Due to the advent of various methods to improve the implementation of processes, we see the increasing progress of enterprises in different dimensions. The purpose of these methods is to provide strategies that can be used to identify the various stages of work correctly and with the full details of the best method for carrying out each step. One of these methods is the Six Sigma method. Six Sigma is a collection of statistical

techniques for measuring process performance. The aim of this study is to measure the level of product sigma during the construction phase using the product's reliability. This approach will simultaneously lead to improvements in product quality and product reliability during construction [3]. In our country, along with other countries in the world, valuable work has been done on the implementation of this methodology. Many of the major industries in the country, such as automotive, petrochemical, defense industries and many manufacturing and service industries, have used this approach successfully. Six Sigma seems to be an attractive tool for improving processes in organizations. This tool is suitable for organizations that are ready to run it. An important part of the launch of a six sigma project is the ability of the company to measure the readiness of the six sigma project and its ability to select the right tool to start the six sigma system. [4] identified six successive Six Sigma success factors as:

management commitment, cultural change, the relationship of Six Sigma to business strategy and leadership styles. The least important factor in their research was the association of six sigma with the rewards of human resources and the expansion of the six sigma of the supply chain. [5] presented a study of important factors in the success of Six Sigma projects in Turkish construction companies. These factors include: senior management involvement and commitment, linking quality components to the customer, linking the quality component to suppliers, leadership and commitment of senior management and teamwork. [5] and [6] identified 32 success factors for six sigma projects and categorized in five dimensions of empowerment of the European Excellence Model. [7], while briefly reviewing the theoretical foundations, describes the factors for the implementation of pure six sigma.

Table 1: Six sigma dimensions

<b>Leadership and Vision</b>
Management commitment and resources
Focus on customer
Choosing the right people
Improve management and process
Company strategy

### 3. Research Methodology

This is an applied research and correlation study. The population of this study was 1100 employees of Polyethylene Pipe and Fittings Company. A sample of 285 people was selected using the Morgan table as a sample. The data gathering tool was a researcher-made questionnaire. Experts verified the questionnaire and the reliability of the questionnaire Cronbach's alpha coefficient was confirmed and for data analysis, Pearson correlation coefficient was used.

### 4. Findings

Investigation of Normality of Data Using Kolmogorov-Smirnov Test:

In order to use the statistical technique, it must first be determined that the collected data is normal or abnormal? If the distribution of the collected data is normal for testing the hypotheses, one of the parameters  $t$  can be used and if non-parametric tests are used, one of the nonparametric one is used. In this step, we will examine the results of this test for each of the dependent and independent variables and based on the results, we will select the appropriate test for verifying the validity of the research hypotheses.

Table (2): Comparison of the distribution of the variables of the research with the normal distribution of respondents

Variables	Kolmogorov-Smirnov statistics	Significance level
Leadership and vision	1.21	0.056
Management commitment and resources	0.89	0.091
Focus on customer	1.11	0.063
Choosing the right people	1.01	0.076
Improve management and process	0.98	0.083
Company strategy	1.15	0.058

Based on the table findings, k-s-z statistic at level  $0.05 \geq p$  for all variables was not significant, so the distribution of the research variables follows the normal distribution.

To test the research hypotheses, the correlation coefficient test was used in Table 2.

Table 3: The relationship between six sigma dimensions and reduction of waste products

Reduction of waste products and supply chain process		
	r	Sig
Leadership and vision	0.485	0.000
Management commitment and resources	0.565	0.000
Focus on customer	0.405	0.000
Choosing the right people	0.385	0.000
Improve management and process	0.396	0.000
Company strategy	0.410	0.000

First hypothesis: There is a significant relationship between the leadership dimension and the prospect of six sigma and the reduction of waste products and the supply chain process.

The results of Table (3) show that the Pearson correlation coefficient is significant. There is a significant relationship between the leadership dimension and the prospect of six sigma and the reduction of waste products and supply chain process.

Second hypothesis: There is a significant relationship between the dimension of management commitment and six sigma resources and the reduction of waste products and the supply chain process.

The results of Table (3) show that the Pearson correlation coefficient is significant. There is a significant relationship between the dimension of management commitment and six sigma resources and the reduction of waste products and supply chain process.

Hypothesis 3: There is a significant relationship between the focus of the six-sigma customer focus and the reduction of waste products and the supply chain process.

The results of Table (3) show that the Pearson correlation coefficient is significant. That is, there is a significant relationship between the focus on the customer's six sigma and the reduction of waste products and supply chain process.

Fourth hypothesis: There is a significant relationship between the choice of six sigma and the reduction of waste products and supply chain process. The results of Table (3) show that the Pearson correlation coefficient is significant. There is a significant relationship between the choice of six sigma and the reduction of waste products.

Fifth hypothesis: There is a significant relationship between the dimension of management improvement and the process of six sigma and reduction of waste products. The results in Table 3 show that the Pearson correlation coefficient is significant. There is a significant relationship between the dimension of leadership and the perspective of six sigma and the reduction of waste products. Sixth hypothesis: There is a significant relationship between the Six Sigma strategy dimension and the reduction of waste products. The results of Table (3) show that the Pearson correlation coefficient is significant. There is a significant relationship between

the Six Sigma Strategy dimension and the reduction of waste products [8], [9].

## 5. Results

The evolution of global developments towards the acquisition of new and superior technologies in the delivery of products and services is inevitable, the importance of quality and the need to pay attention to it. Several tools have been used to improve this fundamental factor by managers, and at this point, since the competitive world needs the best to survive, the Six Sigma method has been proposed as a systematic approach for the coherent application of various quality tools. In this way, we try to reduce the process deviations, and its basic goals can be summarized in cases such as reducing changes, reducing defects, improving productivity, increasing customer satisfaction, and improving financial issues. Therefore, the purpose of this study was to investigate the Six Sigma approach to reducing waste in Polyethylene Pipes and Fittings Company. The results of the research showed that there is a positive and significant relationship between the six sigma dimensions, including leadership and vision, management commitment and resources, customer focus, right people selection, process management and management, company strategy with reduced waste products and supply chain process. Finally, the results showed that six sigma reduced the rate of waste generated and, as the experience of the company increases in the implementation of six sigma, the rate of waste is reduced further. This research has been able to demonstrate that Six Sigma is a successful approach that can reduce the number of lesions and increase the quality of the product. It will achieve more success if the method fits in with the organization more and more employees and managers gain experience in implementing it.

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