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AN INTEGRATED MODEL FOR APPLYING AGILE SIX SIGMA TO CONTROL PRODUCT QUALITY

Jasim Hussein Znad
Department of industrial Management, College of Administration and Economics, University of Baghdad, Iraq
Jasnad79@coadec.uobaghdad.edu.iq

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Abstract:

One of the modern approaches followed to reach a high degree of quality and excellence in products is the six sigma approach. For the purpose of applying this approach, organizations must develop an integrated plan to control product quality that includes setting standard specifications starting with the materials used and passing through the production processes and ending with the specifications of the final products, as well as Determine the methods of examination, testing, methods of sampling, determine what is acceptable and conform to the specifications, and take the necessary measures to reduce deviations from the established specifications in a way that contributes to raising the efficiency of the production system.

The inspection process by sampling is one of the procedures followed in quality control, especially when assessing the quality of the product by samples instead of a comprehensive inspection that requires great effort, time, and money, especially if the inspection of units leads to their damage in some cases and examination by sample, regardless of its type, single or double sample. Or sequentially, it is applied to reduce deviations, purify the product, and obtain a product that conforms to standard and workmanship specifications. The inspection plan, whatever its type, depends on the probabilities of the risk of the product and the risk of the consumer and on the acceptance curve between the rates of defective and the probability of acceptance, and this curve is one of the basics of quality control in the company.

Based on the foregoing, the research has tended to study and design an integrated model for quality control in a scientific manner, which is the six-sigma method that aims to reduce spoilage and defects to a minimum and control the deviations that occur in quality during the production process..

Keywords: six sigma, single sampling plan, quality control panels, operation curve, process improvement.

1.INTRODUCTION:

Controlling and monitoring processes is one of the physical processes, and therefore it is considered one of the production processes themselves, as other processes are not complete unless completed by the quality control processes and these processes differ according to the type of production processes. The need for control operations increases with the rapid development in continuous production processes. As for batch operations, control processes are less, because there is sufficient time to monitor and take the necessary measures for repair. Thus, some chemical and physical operations cannot take place unless they are provided. Automatic control processes, as the quality of production, the amount of spoilage, the ease of operations and even the cost of production depend directly on the control operations and the method of carrying them out.

2. METHODOLOGY

2.1Research problem:

The weakness of technological capabilities and information in industrial companies to use and introduce modern industrial philosophies that enable them to face international competition in order to be able to enhance their competitive position in the local and global markets, penetrate foreign markets and achieve optimal investment of their various resources. This research focuses on evaluating the company's performance and its usefulness to know the current position of the company through the agile sex-sigma tool, as this study will be useful to identify the technical gaps prevailing in the company. It is one of

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the reasons that prompted the researcher to choose the General Company for the Manufacture of Tires, Babel Factory, because the products of this company have a good reputation and competitiveness.

2.2The importance of research:

The importance of the research lies in that it provides a set of tools to improve quality, including initial individual tests in the early stages of the production process, which work to avoid costly disassembly and repair work. It is possible to integrate the initial tests into the idea of the total testing so that no final examination can start later except after passing an early test, in addition to providing logical solutions that contribute to the full integration of test techniques in achieving the optimal production flow, and production quality control techniques to avoid recycling Defective parts are expensive and take a long time.

2.3 Research objective

The research aims to achieve high product quality through the application of an integrated technology to control product quality and reduce defects in the units produced through the six sigma technique. The research also aims to study the operating curve formulas for accepting the production operating curve under the single and double inspection system and by using some statistical distributions (Kai-Square Distribution and Poisson Distribution)and to assess the level of the variable quality of the tire product, and the ability to give confidence to its customers in its ability to achieve and maintain the required quality of the product.

3.THEORETICAL FRAMEWORK:

3.1: The Concept of Quality Control

Quality Control is the control of production processes, in other words, a set of procedures that are applied to improve quality or limit possible deviations in quality levels that may occur during the production process due to random and attribution factors that cause quality change. It is a set of structured scientific methods applied by the administration to compare actual performance with specific specifications and standards. Corrective actions when deviations appear. (Jacobs& Chase 2009)

3.2: The concept of specification (NVR Naidu 2006)

Buffa defines inspection as "a measurement system for generating the information on which the quality control work is based, and it is also defined as" observing and measuring the inputs and outputs of the operation process visually or mechanically for the purpose of seeing whether the physical properties of a product meet specifications.

3.2.1 Inspection strategies

Inspection strategies include deciding what type of inspection is appropriate at each stage of the operation process and include:

-**Inspection by the worker**: that is performed by the worker personally and it is also called inspection at the source, and it is a method that may include producing good products all the time.

- In-operation inspection: It is carried out at specific times from one machine to another and from one station to another during the operation process to assess the current positions of the quality of production by following specific methods of Inspection.

- **Static Inspection**: It is takes place at the inspection station that is fixed in the stages of the production process in order to control the level of quality of the outputs of a particular section before it is processed in a later section

- Immediate comprehensive inspection: It is carried out on all producing units to isolate the good from the bad immediately.

- Self-Inspection (automatic): It is a quick and accurate self- Inspection of defects by means of an automatic compatibility measuring machine to carry out the inspection with the help of a computer. (Al-Shaheen 2001)

3.2.2control charts

A- Control charts for variables: These schemes are used if the product's qualitative specifications are quantifiable, such as length, weight, density, temperature, ... etc.

B- Control charts for attributes: used to control qualitative characteristics that are difficult to quantify, so they are divided into only two cases, one of them acceptable and the other unacceptable (rejected)

3.2.3 Sample acceptance program using the Poisson distribution

Sample acceptance means the process of assessing the batch of the total quantity of products and commodities with the aim of approving or rejecting it through its conformity with the specifications and quality conditions set for it, or its non-conformity with them. And that the main advantage of the method of accepting the sample lies in the economic aspect because the abundance in the costs of inspection and testing is one of the factors leading to the reduction of production costs. There is no doubt that the simplest way to control quality is the comprehensive inspection of all produced goods and isolating the defective ones,

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but this method is not economical and sometimes it is impossible to apply.

Therefore, taking a decision such as accepting or rejecting the batch using the method of samplinginspection depends on the percentage of defects in the sample drawn in a random manner. Therefore, the batch is accepted while it should have been rejected because it contains more defective items than the agreed upon rate and this constitutes the consumer risk, or the batch may be rejected while It should have been accepted because it contains defective items less than the permissible percentage. This constitutes the risk of the product. (Al-Ali 2008)

Because of the likelihood, we face one of the two errors in the decision taken:A- The possibility of rejecting a good batch.

B- The possibility of accepting the damaged batch.

Rejection of a good batch is called a first type error or what is called a producer risk (α) and this means that the product will lose the deal if the batch is approved. As for accepting a damaged batch, it is called an error of the second type or a consumer risk (β), where the consumer bears the cost of a decision to accept the payment, and since the decision to accept the payment to reject it depends on the sample drawn from it, which requires preparing a specific program for the sample and this requires determining the sample size. And the upper limit for the number of defects c for that sample. If the number of defects in that batch is equal to or less than c, it means the decision to accept the lot and vice versa. (Oakland 2003 / Jamkhaneh, 2010).

3.2.4 Operating Characteristics Curve (OC)

Operating Characteristics Curve the probability of accepting the advance lot at defective rates specified and agreed upon under a certain inspection plan. In addition, this curve shows the ability of sample plans to distinguish between accepted and rejected batches, and that the curve represents the probability of accepting the produced batch as a function of quality under a certain sample size.

It represents the sampling program (the sampling program consists of the compatibility between the sample size n on the one hand and the number of defective units c on the other hand) and uses the operating curve as a dividing line between good and poor quality.The operating curve is the graph of the probability of accepting the batch versus the percentage of defects in that batch. The larger the batch, the more accurately the batch is examined. Likewise, the optimal curve is one that can be obtained by performing the test (100%) for the whole batch without making errors during the OC: The probability of accepting the advance lot at defective rates specified and agreed upon under a certain inspection plan. In addition, this curve shows the ability of sample plans to distinguish between accepted and rejected batches, and that the curve represents the probability of accepting the produced batch as a function of quality under a certain sample size.It represents the sampling program (the sampling program consists of the compatibility between the sample size n on the one hand and the number of defective units c on the other hand) and uses the operating curve as a dividing line between good and poor quality.The operating curve is the graph of the probability of accepting the batch versus the percentage of defects in that batch. The larger the batch, the more accurately the batch is examined. Likewise, the optimal curve is one that can be obtained by performing the test (100%) for the whole batch without making errors during the inspection.

Choosing the appropriate type of operating characteristics curve when preparing the sample program in accepting samples requires both the producer and the consumer to reach appropriate decisions for the following variables:

AQL Acceptable Quality Level: This means that a low percentage of defects will lead to acceptance of the whole batch and this level of quality fulfills the consumer's desire. It means (product risk α)

- The percentage of defects in the batch LTPD Lot Tolerance Percent Defective and this means that the largest percentage of defects will lead to the rejection of the batch, i.e. the opposite of the first variable in the above paragraph, and this means that the consumer cannot accept the batch in which the percentage of defects is more than what is allowed. Consumer Risk β.see figure (1) (Aslam, 2010)

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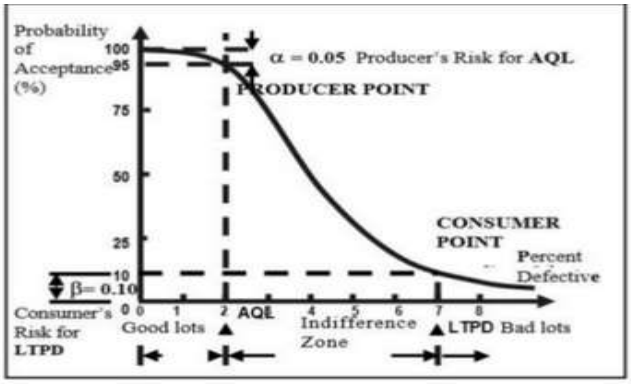

Figure (1) Operating Characteristics Curve
Source: Al-Ali, Abdul Sattar, "Total Quality Management Applications", 2018.

3.2.5 The Agile six sigma Concept

The Lean Six Sigma method came about by merging and unifying both the Lean and Six Sigma method together. The researchers called this method "reduced" because it combined and reduced the two methods together in a new third method, by focusing on the merging of similar elements. Together and link the other elements and arrange them in an integrated manner. As this method controls the flow of the product and its flow during the production process and within various activities easily, and produces a high-quality product that meets all the needs of customers, as well as eliminates all forms of defect and damage.

"As a methodology, philosophy, system, measure of quality, a set of quantitative and qualitative tools, and a work environment for creativity, development and innovation that leads to customer satisfaction and to achieving financial gains by reducing deviation in operations and waste in production.

It is a philosophy that developed as a result of intense competition in quality and an attempt to reach the zero defect. And companies that seek to gain market share do this by providing high quality products, which have long been considered a source of concern for companies (because they require a lot of financial, human and informational resources), and that Most of the companies, especially the American ones, have relied on a comprehensive quality examination, which is considered an ineffective and economically feasible method, so it required innovation and use of new technologies that enable them to overcome competitors, including the hex diffraction technology (Eckes, 2001: 1-3).

The goal of Six Sigma is to assist people and processes aiming to achieve a great goal of providing flawless products and services. The idea that there are no zero defects does not work here; Six Sigma understands that there are always some potential flaws, even with bestrun processes or the best products. But at 99.9997 percent performance, Six Sigma sets a performance target where defects in many processes and products are almost non-existent.(Heizer&Render, 2017: 210)

Not surprisingly, the primary focus of Six Sigma is putting the customer first and using facts and data to drive better solutions to improve customer satisfaction. By doing this better profits are also preserved. Hence, there are three main areas targeted by Six Sigma efforts (Marnewick, 2011: 18): improving customer satisfaction, reducing cycle time, and reducing defects. The basic elements of Six Sigma can be summarized as follows (Knowles, 2012: 9):

1- Focus on the strategic direction of the organization.
2- Customer value is the heart of this approach.
3- A rigorously structured approach to understanding customer requirements and minimizing wastage and variance.
4- Management according to facts
5- Establishing a strong support structure
6- Clear links for business.

3.2.6 The stages of applying six sigma

There are five basic stages or phases in implementing the Six Sigma performance improvement approach in a process: Defining, Measuring, Analyzing, Improving and Monitoring (DMAIC). This is an improvement cycle based on the original (PDCA) Plan, Do, Check, Act. In the Six Sigma approach, DMAIC offers a breakthrough strategy and disciplined methods to use rigorous data collection and statistic-based analysis to identify sources of errors and ways to eliminate them.

Sigma level is defined as the number of standard deviations that fall between the average of the process and the limits of a customer's specification. As the level of Sigma increases, more process outputs, products and services meet the requirements of

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customers, resulting in fewer defects. The true Six Sigma process is 99.9997% of the tests flawless - almost perfect (Bridge, 2016: 14).

4.CASE STUDY

4.1 Data collection

The Babel Tire Factory is the case study.The production Department selects the raw materials, conducts tests on it, verifies the safety factor of the frame structure and the extent of its conformity with the specifications predetermined by the work team and makes sure of the safety factor for the iron rings and to ensure the extent of suitability to the specified specifications and standards:

A- Calculating the cost of the production operations activity: A report has been prepared on the costs
in addition to the quality costs shown in Table 1

Table 1 cost of the production operations activity

Industrial buildings	2723654500
Machinery and equipment	3556080400
Templates and the tools	2,625,000,000
Evaluation costs (checking raw materials, production in progress and finished / maintenance of test equipment and equipment out of stock)	1299758500
Poor quality costs (recycling / failure analysis and re-examination)	215015143
Prevention costs (quality assurance, training and qualification, research and consultations)	15678000
Total	10435186543

4.2-Determine the main reasons for the emergence of poor quality costs:

The poor quality costs represented by internal failure costs that arose as a result of the factory's failure to produce products that conform to the specified specifications and to reduce these costs requires research and investigation of the fundamental reasons for the emergence of these costs, which are the defects that occur in the presented products, and were determined from the reality of the defective analysis form in the Quality Control Department Which is prepared monthly and determine the causes and the amount of defectiv.as shown in table (2)

Table 2 causes and amount of defectives

The damage of tires causes	Amount
Raw materials	25000
The electric current	9050
Maintenance of machines and machines Obsolescence	7050
workers	5579
test equipment faults	2000
Total	48679

- Raw materials

The company suffers from a problem of a shortage of internal raw materials in production, as most of its industry depends on imported raw materials, and this can be seen in Table (3)

Table 3 the row materials in company

Types of raw materials	The quantity (ton)	the percentage	the value	the percentage of its source	Source
Natural Rubber	1402	55.4	3613600	61%	Malaysia - Indonesia
Synthetic	331	13.1	839655	19.6	Iran-Turkey

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rubber					
Carbon	669	26.4	826520	19.2	Iran - Turkey - Egypt
Various oils	130	5.1	7279	0.2	Domestic
Total	2532	100%	4278054	100%	

4.3 - Applying the lean six sigma method.

-**The first stage**: Definition, where the problem is defined, what are the causes of the problem and the quantity of damage for each cause, and by using the Pareto chart and arranging them upward to find the affected few, so we find that the raw materials the most common problems lie in the preparation section, and table (4) shows the cause of spoilage and its quantities.

Table 4Causes of spoilage and it quantities

Caused spoilage	Quantity	Relative frequency	Accumulated relative frequency
raw materials	25000	51.35	51.35685
electric current	9050	18.60	69.94803
Maintenance of machines and machines Obsolescence	7050	14.48	84.43066
Workers	5579	11.46	95.89145
test equipment faults	2000	4.10	100
Total	48679	100	

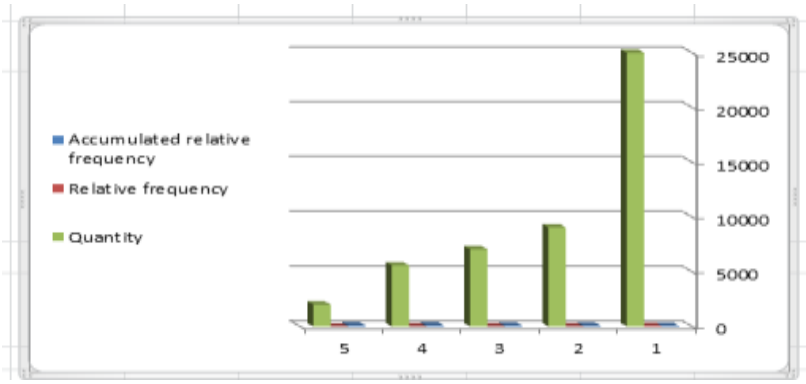

Figure (2) Pareto chart

-**The second stage** is the analysis: Test systems and devices were used to obtain samples randomly, as well as to conduct routine tests while carrying out serial production operations, as well as to test different types (approval) in the laboratory. Tire data were given for light-duty cars, and 25 batches for each batch were 100 samples, and for a period of 25 weeks, the results were as shown in the table**(5)**

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Table (5) quality control results

Quality Control Results

Sample	Number of Defects	Fraction Defective		3 sigma (99.73%)
Sample 1	28	28	Total Defects	497
Sample 2	10	1	Total units sampled	2509
Sample 3	25	25	Defect rate (pbar)	1988
Sample 4	23	23	Std dev of proportions	0399
Sample 5	30	3		
Sample 6	15	15	UCL (Upper control limit)	3185
Sample 7	20	2	CL (Center line)	1988
Sample 8	35	35	LCL (Lower Control Limit)	0791
Sample 9	28	28		
Sample 10	17	17		
Sample 11	15	15		
Sample 12	10	1		
Sample 13	12	12		
Sample 14	13	13		
Sample 15	18	18		
Sample 16	26	26		
Sample 17	28	28		
Sample 18	35	35		
Sample 19	20	2		
Sample 20	22	22		
Sample 21	13	13		
Sample 22	21	21		
Sample 23	12	12		
Sample 24	12	12		
Sample 25	10	1		

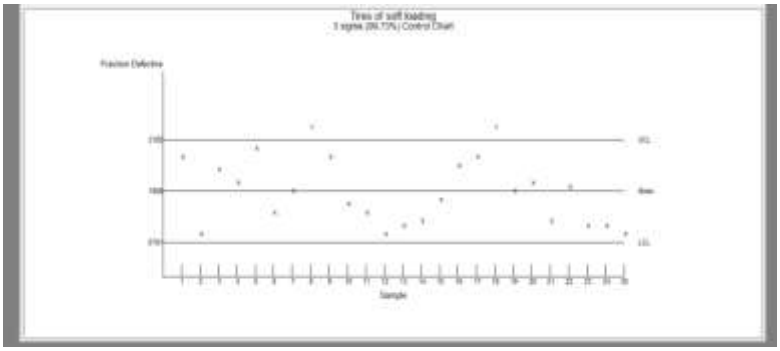
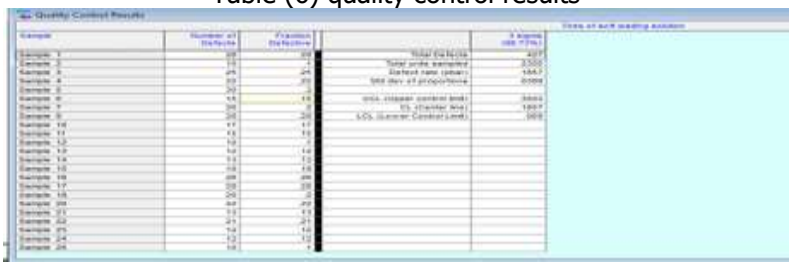


Figure (3) quality control chart

After excluding sample 8 and sample 18, the results were as follows

Table (6) quality control results



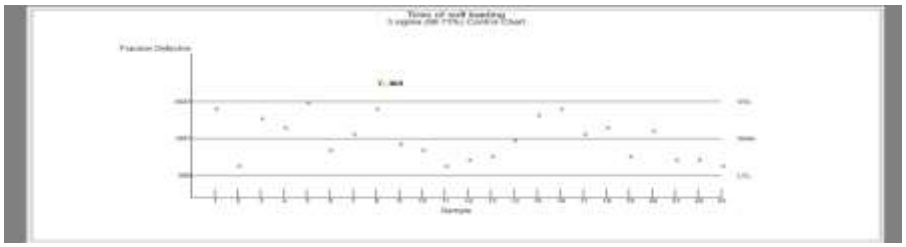


Figure (4) quality control chart

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As for tires for saloon cars, the first type, samples were taken and 25 batches for each batch were 100 samples for a period of 25 weeks, the results were as shown in table(7) and figure(5)
Table (7) quality control results

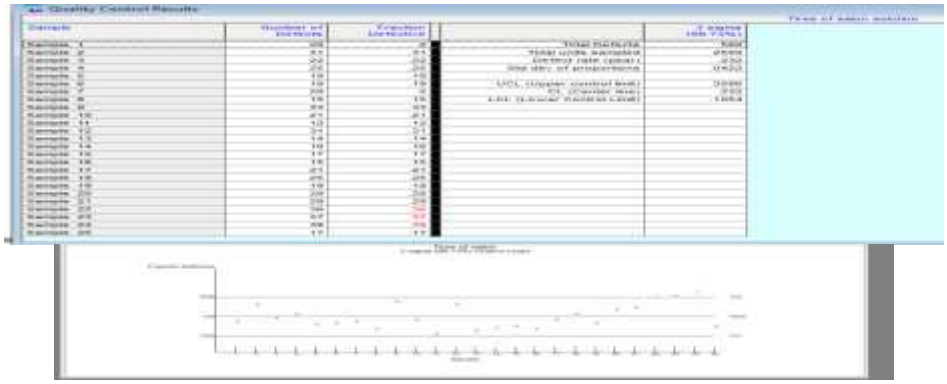

Figure (5) quality control chart
By excluding samples 22, 23 and 24 we gain the results shown in table (8) and figure (6)

Table (8) quality control results

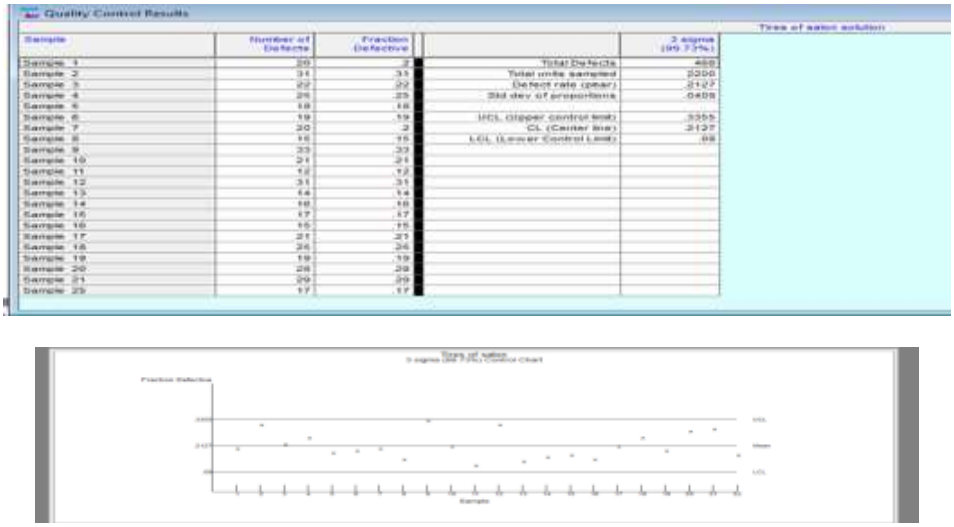

Figure (6) quality control chart

4.4Analysis of the results

As a result of analyzing the quality control panel, whose upper and lower limits were set, and after fixing the percentage of defective units, a number of samples were found largely outside the limits of control in the preparation section for the products of the research sample, and the rest of the sections were of varying proportions, and through the inquiry it was found that some maintenance work was done on the production line to continue Complaints have been received from the workers about the presence of stoppages as a result of some malfunctions related to preparing machines for raw materials and because of the electrical energy.

The non-conformity of the producing unit to any of the specifications indicates the existence of a defect. Either if the difference from one or more specifications indicates the unfit for use of the product, it means that the produced units are defective and that the role of quality control depends on where the conformity is affected or not, either to determine the possibility of acceptance The commodity with defects in the produced units, the matter is related to the higher management and it may be a marketing problem, so the right decision is taken**,** To say that the fundamental cause of the occurrence of poor quality costs and when determining the share of the defective

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unit from the costs of poor quality through the following:
Poor quality cost / quantity of defects = = 4417 dinars for each defective unit
215015143/48679

We determined the level or degree of Sigma in the factory **by using**
The formula to calculate the DPMO is thus=1,000,000.(1-ф(level-1.5)

Table 9
sigma level

Sigma level	Sigma (with 1.5σ shift)	DPMO	Percent defective	Percentage yield	Short-term C_{pk}	Long-term C_{pk}
1	−0.5	691,462	69%	31%	0.33	−0.17
2	0.5	308,538	31%	69%	0.67	0.17
3	1.5	66,807	6.70%	93.30%	1	0.5
4	2.5	6,210	0.62%	99.38%	1.33	0.83
5	3.5	233	0.09%	99.98%	1.67	1.17
6	4.5	3.4	0.00%	100.00%	2	1.5
7	5.5	0.019	0.00%	100.00%	2.33	1.83

In order to determine the level of toxicity used in the laboratory to carry out the improvement process, it is therefore necessary to identify defects in a million opportunities and this is done through defects per million chances = Quantity of defects / Quantity of production x 0000 100/ 243395 = 0.2 x 1000000 = 200,000 = 48679
Defect in every million chance DPMOIf the quality level represents 2.4 sigma, the success rate is approximately 80%, as shown in table(10)

Sigma degree	DPMO	DEFECT%	Yield
1	691462	69	31%
2	308538	31	69%
2.4	200000	20	80%
3	66807	6.7	93.30%
4	6210	0.62	99.38%
5	233	0.023	99.98%
6	34	0.00034	99.99966

On this result, the company's position is between level 2 and 3, and accordingly, the output of the factory is weak, which puts it among the products that are unable to compete due to 200,000 opportunities for quality in it, and this leads to customer dissatisfaction, which leads to the loss of many customers and the loss of shareholders.
Raising the level of sigma in the factory by reducing the cost of poor quality
Knowing the effect of applying the six-sigma approach on the costs of poor quality, as if the factory wanted to raise the level of toxicity, this would require focusing on prevention activities to reduce the percentage of defects in the factory and thus raise the percentage of accuracy in the performance of operations, noting that these activities have a long-term effect where it takes a period In the long term, the effect of this varies in the factory . Therefore, it can be said that raising the level of toxicity leads to a reduction in the amount of defects and a reduction in the cost of poor quality.

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To reach a higher level, for example 4, the amount of defects will be 6.210 units per million chances, as in the above table. And to calculate the costs of poor quality by multiplying the number of defective units by the share of defective units from the poor quality costs, which equals (4417 dinars), so that
Poor quality costs = 6.210 x 4417 = 27429570
Therefore, we see that it decreased by 1875855
- To determine the poor quality costs for each level of sigma, by multiplying the share of units of poor quality costs, as shown in table (11)

Sigma level	amount of defects	cost of defective units	cost of poor quality, / dinars
1	691,462	4417	3054187654
2	308,538	4417	1362812346
3	66,807	4417	295086519
4	6,210	4417	27429570
5	233	4417	1029161
6	3.4	4417	15017.8

The table shows that the application of the Lean Six Sigma method works to reduce the number of defects, and this leads to a reduction in the costs of poor quality in the factory, meaning that it achieves significant financial savings in the factory.

-The third stage: the analysis stageThe main task at this stage is to determine when, where, and why the defect occurred, which requires at this stage to etermine the true root causes of the defect. The researcher worked to find out the causes of defects occurring by conducting personal interviews with a number of supervising engineers who have experience in the field of implementing construction projects, and accordingly the root causes of the occurrence of each type of defect that were identified in the definition phase were identified to determine the most influential causes in the occurrence of defects. For the purpose of studying and analyzing the root causes of problems made through:
* - Designing specification inspection plans to control quality of product components in light of the relationship between the producer and the consumer:
The concept of quality differs according to the difference in the community, so from the consumer's point of view is effectiveness in performance, as for the product, it means conforming the product to the specifications specified in the design, and to determine the product's specifications and its suitability for use, we think that it is necessary to rely on the sampling theory in designing the inspection plans with the specifications to control quality of industrial products , As inspection depends on specifications and manufactured on the basis that it is defective or not defective.

The decision is based on the acceptance or rejection of the batch depending on one or more of the randomly selected samples from the batch, and it is called the single inspection plan when the decision is based on one sample and the double inspection plan when the decision is based on more than one sample, and the single sample plan will be explained in addition to clarifying a curve Operating characteristics.

4.5Applications for graphing operating characteristics:

The operating characteristics curve is the important criterion for measuring the performance of the single sample acceptance program, because it shows the probability of accepting the lot against the batch containing defective and damaged items. Therefore, this curve shows the characteristic strength of the sample acceptance program. The consumer and then depends on the acceptance curve (OC), which shows the relationship between the defective ratios and the probability of acceptance, which is one of the basics of quality control in the factory, and the use of

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the defective ratios as an estimate of the P value on which it depends in determining the parameters of the inspection plan and then extracting the OC value through the following equation.

$$OC= Pr (x\leq c) =\sum_{x=r} (e^{-ч} * \mu^{x}) / X! \quad \text{---------20}$$

To find the value of the acceptability probability Pr related to the value of the number of inflicted words c from Poisson distribution so

$$Pr(x\leq c) = 1- Pr (x\geq d) \quad \text{----------} \quad Pr(x\leq 5) = 1- Pr (x\geq 6)$$

This means to know the probability that the withdrawn lot with defective and damaged items will be accepted or rejected. Table (12) for the sample acceptance program (n = 100, c = 5) shows the sample size that was obtained from the design of the inspection plan and by following up the final product before The encapsulation process has observed the percentage of defective and it is easy to show how the points are obtained and fixed in the curve shown in the figure(7)

	P	NP	PA	PAP
1	0.2	20	0.0132	0.00264
2	0.1	10	0.0166	0.00166
3	0.25	25	0.0166	0.00415
4	0.22	22	0.1424	0.031328
5	0.3	30	0.4191	0.12573
6	0.15	15	0.6993	0.104895
7	0.2	20	0.8959	0.17918
8	0.28	28	0.9329	0.261212
9	0.17	17	0.9625	0.163625
10	0.15	15	0.9945	0.149175
11	0.1	10	0.9986	0.09986
12	0.12	12	0.9997	0.119964
13	0.13	13	0.9998	0.129974
14	0.18	18	0.9999	0.179982
15	0.26	26	0.0132	0.003432
16	0.28	28	0.0166	0.004648
17	0.2	20	0.0166	0.00332
18	0.22	22	0.1424	0.031328
19	0.13	13	0.4191	0.054483
20	0.21	21	0.6993	0.146853
21	0.12	12	0.8959	0.107508
22	0.12	12	0.8959	0.107508

The column related to AOQ = PrP values from the table above gives the necessary coordinates values to plot the operating characteristics curve for the acceptable quality level with the partial defect P, so the figure that was drawn using the data in the previous table shows that the AOQ level is adjusted for the acceptable quality. = 0.0265 represents the highest acceptable quality rate and the highest point on the OC curve resulting from the implementation of

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the program as well as being a criterion for measuring quality.

-The fourth stage: the improvement and controlling phase

The main objective of this stage, with its improvement and monitoring stages, is to eliminate defects that have been identified based on the information obtained from the analysis stage. Eliminating the root causes of defects, eliminating defects, raising the sigma level, and improving performance and quality.

Suggested actions to improve performance The procedures proposed to improve performance and achieve quality that are applied by the divisions and units of the Quality Management Department can be explained as follows:

- Design Control: One of the most important responsibilities and duties of the Design Control Division is to review and audit the design and ensure that it conforms to the agreed specifications and standards in order to avoid errors in implementation due to errors in the plans and other design documents.

-Procurement: Purchases represent a vital and important aspect in the life of any party, whether it is a contractor or a business owner, because the purchase of materials is part of the process of supplying resources to the company and it affects the quality of its business and its financial resources. The responsibility of the Procurement Division is to ensure the purchase of materials (devices, equipment, and raw materials) in compliance with the approved specifications, through the following:

1- Accurate identification of purchase data through plans and specifications and preparing bill of quantities.

2- Setting specific criteria for evaluating suppliers, the most important of which is the ability of the supplier to prepare materials in accordance with the requirements of the contract, and that the delivery of materials is in accordance with the project schedule. The date of the supplier should also be reviewed to determine his technical capacity and thus determine his eligibility for processing.

3- Records should be established to evaluate suppliers and keep these records.

4- Analysis of the offers and prices offered.

5- Verify that the purchased material conforms to the specifications and conduct the necessary checks.

-The movement of raw materials inside the store must be controlled and to ensure that they are not damaged or exposed to conditions that lead to deterioration of their quality, and the process of documenting the times of entry of raw materials into the store and their exit from it is necessary to control that the materials are not late in the stores. There must be a system to know the location of any piece in the warehouse in order to facilitate locating and distributing it, and a floor map that identifies the location of all the assets to help the movement within the store, in order to ensure that the materials are placed in their appropriate place.

-Devices and equipment: Ensure the use of approved and reliable devices and equipment that work to complete the work appropriately with the required level of accuracy by calibrating all devices and equipment and checking them periodically to ensure their suitability for use

- Control of laboratory tests: A specialized team must be appointed responsible for controlling the quality of the incoming raw materials by taking samples to be tested and sending them to the factory. And documenting the factory or consultant's notes about the rejected materials.

5.Conclusions

Through what the research included, the researcher has come to some of the following conclusions.

1- Control panels are one of the most important methods used to control the production process, as they are used for several purposes, and they are to control the changes or deviations that occur in the production process, whether it is on changes in the production rate or in production variation or deviations, or both. It is a graphic map used as a means to take the appropriate decision regarding the progress of the production process in the stages of production and starting from the stage of receiving the raw materials until the commodity reaches the consumer according to the specifications specified for it.

2- The Six Sigma technique seeks to use materials with samples that fall within the limits of the standard first, and then seeks to reduce the dispersion from the target quality to the least possible until the level is close to zero.

3- The Six Sigma is here to make improvements wherever you require it. There is also the possibility of applying the DMAIC methodology to improving quality.

4- Poor performance of some workers as a result of the lack of training courses and lack of experience and skill

5- The lack of documentation of the data for the examination by the Quality Control Department for the

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two research samples, to determine the causes and problems that recur, analyze them and work to address them

6- The emergence of many faults, errors and problems for several reasons, including:

• Reliance on visual inspection, which leads to not seeing some defects that cannot be seen with the naked eye, but require special devices and equipment

• Weak motivation among workers, which makes them work to complete their tasks only, and their lack of interest in working in the best possible way.

6.Recommendations

1-Paying attention to modern quality improvement tools and quality control at the source and working to apply them in all production stages (manufacturing and assembly) to improve operations and avoid the emergence of defects

2- The use of modern quality techniques and their application in order to make improvements, especially Six Sigma, because it is possible to apply in both types of production lines.

3- Using the Pareto chart to collect and diagnose the statement of operational problems.

4- Paying attention to the process of documenting the data and information related to the examination to provide a database to be used in the event that problems arise Holding training courses for workers in order to improve and develop the style of work and raise their achievement rates to improve the efficiency of business completion

5- Designing a sample program well usually requires studying the true level of quality required by the consumer.

6- Using the sampling method by relying on the method of sampling inspection instead of a comprehensive inspection in order to predict the expected deviations in the course of the production process before their occurrence, to determine the causes of the deviation in the quality characteristics, study the influencing factors and take remedial measures.

7 - The company must continuously check and maintain product quality to meet customer requirements and give confidence to its management in its ability to achieve and maintain the required quality.

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