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THEME:

"DESIGN OF A STATISTICAL CONTROL OF PROCESSES FOR THE LINE OF PRODUCTION OF COTTON T-SHIRTS MADE IN THE MEGASPORT COMPANY"

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"DESIGN OF A STATISTICAL CONTROL OF PROCESSES FOR THE LINE OF PRODUCTION OF COTTON T-SHIRTS MADE IN THE MEGASPORT COMPANY"

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SUMMARY:

The present investigation arose from the need to improve the quality in one of the star products of the company "MEGASPORT" which are the cotton t-shirts, for which a statistical control of processes was designed in the production line of the shirts to improve The capacity of the process and therefore increase the quality of this product.

By means of the respective analysis of the problematic, a systematic sampling was carried out to the measures of the T-shirt that presented variability: the length and width, with the compilation of these data the calculation of the six sigma metrics was carried out, giving as a result that the Process was poor.

In order to carry out the improvement actions, the PHVA methodology was applied, which allowed a hierarchical order of activities to be established and the corresponding improvements in the production line

Procedural manuals were carried out in processes that were vulnerable to quality problems with respect to the variability of sizes that were: laying, cutting, making, with the preparation of these manuals a pilot plan was carried out for a month to verify If the application of these gave positive results, for this a new systematic sampling to the measures mentioned above and the respective calculation of the six sigma metrics were carried out, this allowed to determine that the variability of the process was reduced comparing with the charts of control of the Current situation and the pilot plan.

KEYWORDS: Quality, process, capacity, statistical control, capacity indices, variability, continuous variables.

1. INTRODUCTION

Statistical control of processes is a useful technique that allows identifying possible shortcomings in the production process of a product, thus highlighting critical areas that affect quality and proposing solutions that help improve the quality of products.

The importance of statistical control in the company "MEGASPORT" is mainly focused on customer satisfaction, attributing advantages such as fidelity, trust, compliance with product requirements, and quality increase. Reducing complaints, returns that involve loss of money and therefore loss of customers looking for products that meet their needs in the competition.

2. THEORETICAL FRAMEWORK

2.1 Statistical Process Control

Statistical process control (SPC) involves the use of statistical methods to assess and analyze variations in a process. SPC methods include simply keeping records of production data, histograms, and process capability analysis and control diagrams.

2.2 Quality

Set of inherent features that meet the requirements.

2.3 Variability

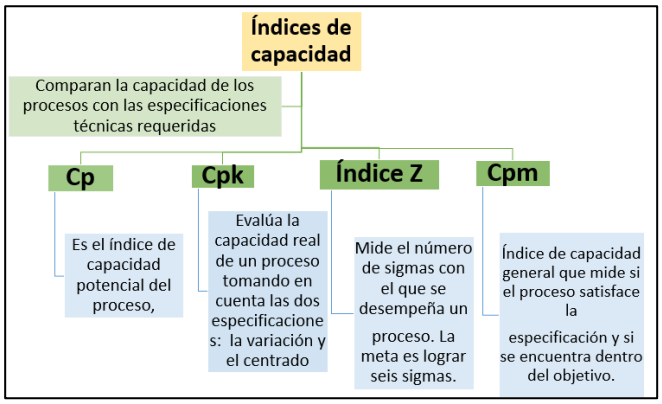
2.3.1. Common Causes

Common causes are the sum of the effects of a total set of uncontrollable random causes, which produce a variation in the quality of the finished product, and which are similar to the set of forces that cause a currency to fall from one or the other Side when thrown into the air. With respect to these common causes, there is little that can be done to reduce them, because they are inherent to the process, to the precision of the machines, etc. The standard deviation "σ" of the curve is just the reflection of the variability due to these random causes.

2.3.2. Special Causes

In a system, variability does not depend only on the common causes, which are inherent in the system. There are also causes that do not depend on the natural functioning of the system and that can themselves create a variability. These causes that are outside the system are called special causes, they alter the natural variability and generate an unpredictable variability that disturbs the operation of the process. For example, a measuring instrument Misalignment or breaking, use of raw materials outside of specifications.

2.4 Capacity ratings



3. METHODOLOGY

3.1 Planning

• Implementation of the SIPOC diagram to have a complete visualization of the production process.

• Brainstorming with all staff to identify key quality issues.

• The verification sheet determined the main effects affecting quality-

• The Pareto diagram identified the less vital problems of the very trivial ones.

3.2 Doing

• Standard NMX-A-243-1983 was used to have a tolerance pattern of the measurements of the t-shirt.

• A systematic sampling was carried out on the length and width of the t-shirts, the sample size being 352 t-shirts with a subgroup size of 70.

• Capacity indices were calculated to know if the process was

• Capable or unable to meet specifications.

.3 Check

• Discussed with management the issue

• The findings and potential for improvement were described.

• Suggestions were designed to create a pilot plan that would justify whether improvements would

be successful and feasible to optimize the process by reducing its variability.

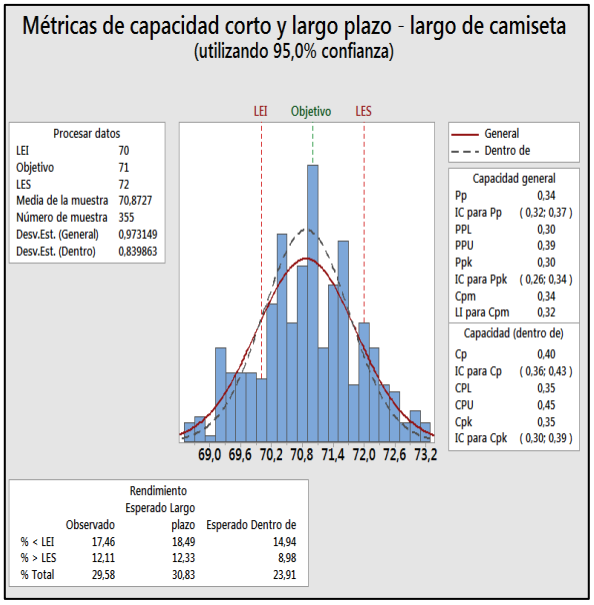
3.4 Act

• Changes were made in the working method due to the machinery and the adequate reorganization of the personnel to reduce the problems of variation

• Manuals of procedures were designed to generate guides that allow to have a standardized process in the production of shirts

4. ANALYSIS:

METRICS SIX SIGMA AND CONTROL CHARTS OF THE CURRENT PROCESS

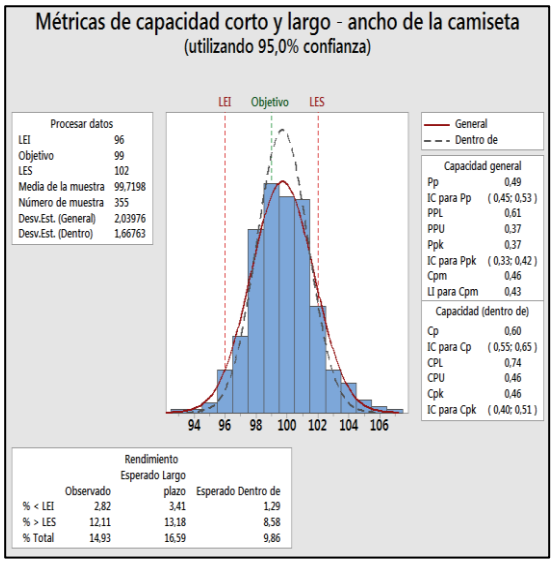


Cp (0.40): The value of Cp indicates that the process requires very serious modifications to reach the improvement and that it is in category 4, being unfit.

Cpm (0.34): The process does not meet specifications due to variability or offset, even both.

Cpk (0.35): The short-term Cpk index shows that the process is not skilful and has problems of centering or variability.

Pp (0,34): This value indicates that the process is not suitable for the job. It is in category 4 and requires very serious modifications to achieve improvement.



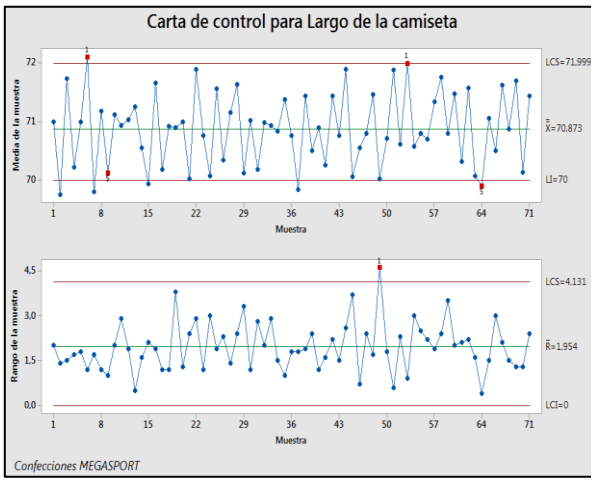
Cp (0.60): The value of Cp indicates that the process requires very serious modifications to reach the improvement and that it is in category 4, being potentially unfit.

Cpm (0.46): The process does not meet specifications due to variability or offset, even both.

Cpk (0.46): The short-term Cpk index shows that the process is not skilful and has problems of centering or variability. Other if you consider the evaluation of Cp vs CPk you will find problems that show decentralization.

Pp (0.49): This value indicates that the process is not suitable for the job. It is in category 4 and requires very serious modifications to achieve improvement.

Letters $\bar{X} - \bar{R}$ for the length of the shirt



Interpretation:

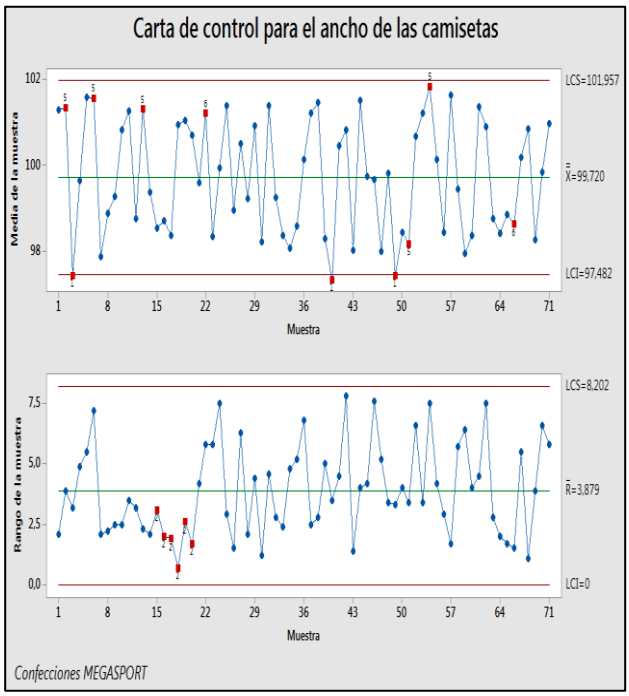
The test failed in subgroups 6 and 53, thus obtaining 2 special causes of variation. This low index of just two points expresses that the process is stable and can be predicted.

The failure in point 6 was due to the operator, who attempted to change the working method in the cutting process with respect to normal working conditions.

Item 56 was the result of the accumulation of orders in the manufacture in the lots of garments that are made by order, which interfered with the process of making standard shirts. In addition to this special cause, there is an organizational problem.

The test failed in points 9, 53 and 64. Where it can be asserted that there is variation pattern at the level of small changes in the process, attributed to changes in the personnel or the method of work used by the operator.

Letters $\bar{X} - \bar{R}$ For the width of the shirt



Interpretation:

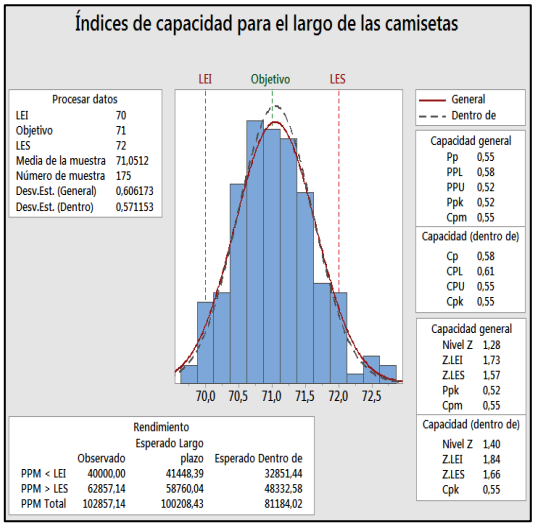
The test failed in subgroups 3, 40 and 49, thus obtaining 3 special causes of variation. This low index of just three points expresses that the process is stable and can be predicted.

The failure in point 3 was due to the operator, trying to meet the established time and production for that working day.

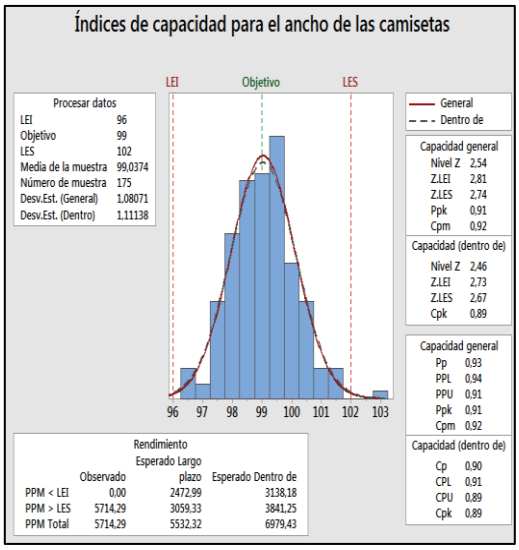
Item 40 and 49 was the result of the accumulation of orders in the manufacture in the lots of garments that are made by order, which interfered with the process of making standard shirts. In addition to this special cause, there is an organizational problem.

METRICS SIX SIGMA AND CONTROL LETTERS FOR THE ADJUSTED PROCESS

Process capacity improved for the length of the shirts



Improved process ability for the width of the shirts



Cp (0.90): In the short and long term potential capacity indicates that the process can still be improved, leading to a category jump from 4 to 3.

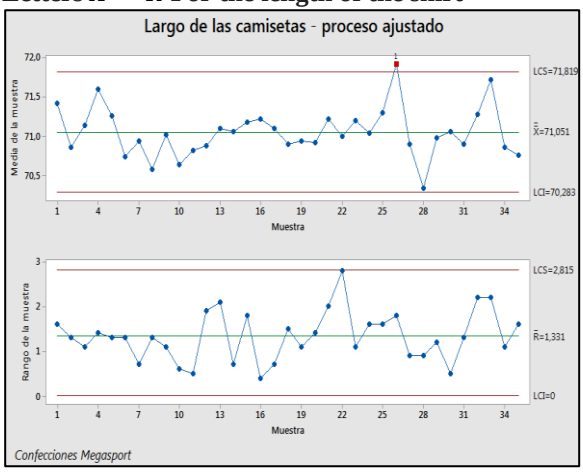
Cpk (0.89): The actual process capability indicates that both the short and long term process improved a quality category level.

CPm (0.90): Short and long-term Cpm reflects that the process is very close to being declared fit in terms of quality, being only 0.8 tenths of the target value.

Z (2.46): The sigma level of the process finally was only 0.5 sigma to be considered good. Nevertheless the improvement that was had was of 1.5 sigmas, achieving an excellent change in the reduction of the variability of the process

Yield (99.31%): In general, in the short term, the process improved its quality performance by 9.3% and in the long term it will do so by 6.24% with respect to the offered quality of the variables analyzed.

Letters $\bar{X} - \bar{R}$ For the length of the shirt

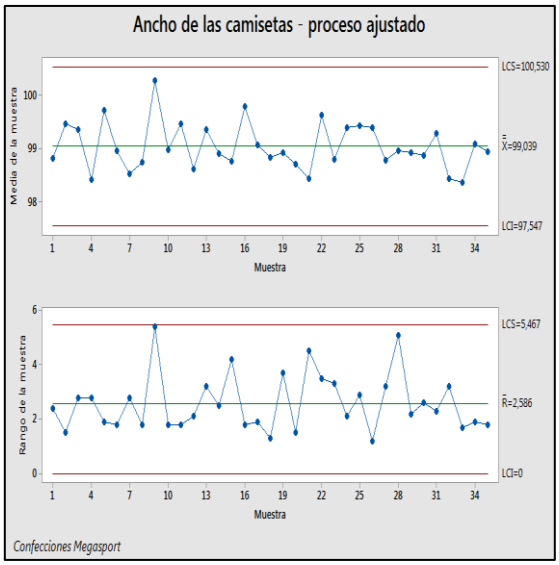


Interpretation:

It is possible to observe a behavior with less variability of the process and fulfilling the designed tolerances. It is generally appreciated that the behavior of the subgroups is close to seeking the central value. Although a special cause of variation (point 26) and latent variability between subgroup 25 to 28, process improvement is evident.

The special cause of variation was due to the deadlines of delivery of orders that still has the company regarding the non-standard lots, being a

problem related to management, it is not possible to completely mitigate this cause.



Interpretation:

The chart shows that subgroups without exception are within the range of tolerances designed for the process. Particularly from point 16 a reduction in variability is shown, resulting from the emphasis on the control of the working method.

The rank card reveals a very acceptable behavior when surpassing all the tests realized on her. There are no special causes of variation that degenerate the process and it can be affirmed that for this variable an excellent change was achieved when reaching a reliable and stable process.

CONCLUSIONS

• The necessary theoretical bases were established on the statistical control to carry out this research and to properly base the study.

• Procedural manuals were created for the laying, cutting, assembly and quality control processes, in which the standardization of these processes is highlighted through the investigation of several sources regarding the production of T-shirts.

• A pilot plan was implemented to verify if the proposed improvement proposals reduced the variability of sizes due to inadequate procedures performed by workers at the time of making the T-shirts.

• Improved process analysis resulted in potential process capacity upgrading from grade 4 to grade 3 quality improvement.

• The yield improved with an increase of 16% and 9.3%, respectively, in the continuous variables analyzed in the process.

• With the proposals of improvement established in a month, it was possible to reduce the complaints and returns of the product from 9% to 5%.

RECOMMENDATIONS

• The company must continue with the controls and working methods designed in the procedures manuals and in this way achieve the quality assurance of its products.

• Time should be allocated to the preparation and training of workers, and to involve them in quality improvement processes to comply with the strategic direction of the company.

• Sales department staff should improve communication with the production area when ordering, in order to establish real and effective delivery times.

• In order to continue to improve in terms of quality, emphasis should be placed on reducing the major defects found on T-shirts that were defects due to blemishes, seams, and tonal variability.

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