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QUALITY MANAGEMENT OF PRODUCTS AND PROCESSES DURING THE PRODUCTION OF COVERS FOR SOFT FURNITURE

The paper presents a case study regarding the analysis of the quality of the manufacturing process of covers for soft furniture within the company "Miso Textile" L.T.D. The research methodology included the application of Shewhart statistical control charts for the quality indicator - the weight of the defective products, identified at the final control of the products manufactured for a period of two consecutive years. It has been found that the manufacturing process as a whole is not stable because the variation of the quality indicator analyzed exceeds the calculated control limits of the process. It is recommended to develop measures to improve the quality of products through actions aimed at the personnel directly involved in the production and at the methods of organizing the work.

Keywords: *quality, enterprise, furniture covers, statistical control, defective.*

Introduction

In developed countries, the quality and reliability of products and services have become important factors in the competition of attracting and retaining customers.

The activity of the companies in the light industry field is mainly carried out through partnerships with foreign companies or they are founded with foreign capital, making products for famous brands and making products for export, which are marketed all over the world. That is why the quality of the manufactured products must be at the highest level, being ensured by an adequate quality of the manufacturing process.

The purpose of the paper is to identify / develop / establish measures to improve the quality of the products based on the analysis of the current situation regarding the level of internal quality. Quality improvement represents a set of measures aimed at reducing the variability of a process, to minimize the products or services that do not comply with the specifications [1].

Research methodology

The paper presents a case study within the textile product company for the furniture industry "Miso Textile" S.R.L, which makes soft furniture covers (various models of beds, sofas, armchairs and chairs). Production is intended for export. About 500 employees are active in the company, of which about 330 are directly involved in the

production sector.

The percentage of defective products was calculated as an indicator of non-quality, calculated based on the data recorded at the final control of the manufactured products. In order to verify the stability of the production process and the fact that it is kept under statistical control, the method of statistical control sheets type $\bar{p}$ was applied with the construction of the Shewhart diagram, according to the methodology presented in ISO 8258 - 91 [2].

The statistical control sheets allow the determination of whether or not the processes are kept under statistical control based on the analysis of quality indicators regarding the quality, the assessment of the stability of the manufacturing process, the determination of when the process should be adjusted. In this paper, the data collected for the period included in the study were analyzed and the Shewhart statistical control charts were constructed. This diagram, also referred to

as the "behavioral diagram of a process" is a statistical tool meant to evaluate the nature of variation (change) in a process and to facilitate its forecast and management [3,4].

The calculations for determining the statistical parameters are presented in table 1.

Table 1- Calculations for determining the parameters of the statistical control chart [4]

Statistical parameter	Calculation relation
Center line CL	CL= $\overline{p}$ = (p1 + p2 + …p12) / 12
Upper control line UCL	UCL = $\overline{p}$ + 3$\sqrt{\frac{p(1-p)}{n}}$
Lower control line LCL	LCL = $\overline{p}$ – 3$\sqrt{\frac{p(1-p)}{n}}$
$\overline{p}$ – the average weight of defective products in the 12 months analyzed, expressed in absolute values	
n - number of products checked each month (average value) = 1470 units	

Results and discussions

At the analyzed company, the production process is organized being subjected to the financial reports in periods of 12 months starting from September and ending in August. The situation regarding the quality of processes and products was analyzed during two consecutive years 2017 and 2018 (tab.2, fig.1).

Table 2 - Weight of non-compliant products during the analyzed period,%

No.	1	2	3	4	5	6	7	8	9	10	11	12	Ave
Month	09	10	11	12	01	02	03	04	05	06	07	08	rage
Year I	10,5	8,17	4,71	6,54	8,84	5,26	2,66	4,40	5,03	8,85	4,85	5,09	6,25
YearII	6,76	3,38	6,36	7,02	8,59	4,36	6,85	7,21	6,00	5,57	2,73	4,32	5,76

The data presented in table 2 and fig.1 attest a variation of the weight of non-conformities from one month to another without indicating a certain trend, the percentage being between 2.66% (minimum share) and 10.56% (maximum share) in year I. The percentage of non-compliant products decreased from 6.25% to 5.76% on average in year II as compared to year I. This is a small decrease, but overall in year II the dynamics of non-conformities shows a smaller variation.

Figure 2-3 shows the Shewhart diagrams for each separate year. The statistical parameters calculated for year I have values as follows:

CL = 6.25%; UCL = 7.7%; LCL = 4.8%

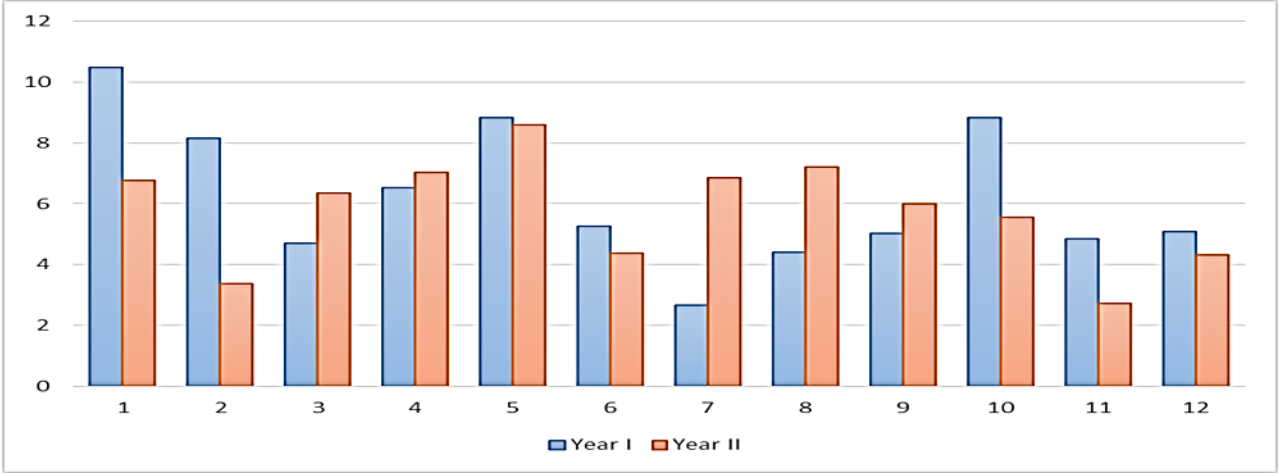

Figure 1- Evolution of the percentage of defective products during the analyzed period

From fig. 2 it is observed that in September, January and June the share of defective products exceeds UCL, which indicates that the process is not stable, is not kept under statistical control and requires correction.

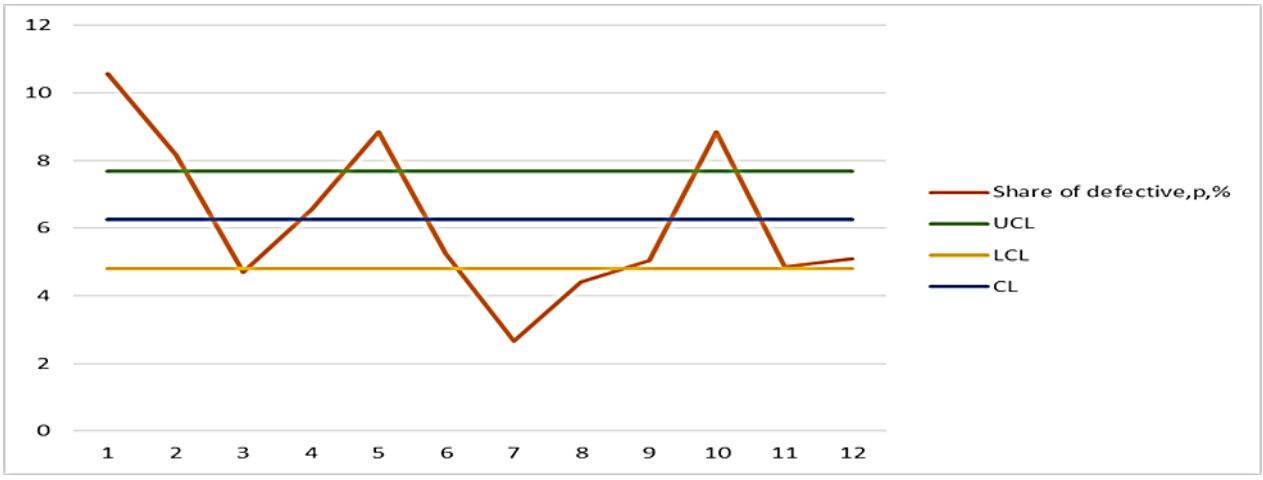

Figure 2 - Shewhart diagram for the share of defective products in year I.

The causes of a higher percentage of non-conformities could be the volume of manufacture and the complexity of the product. Also in September the large number of defective products could be conditioned also by the fact that this month is the first one after the summer holidays and the employees need a period of adaptation.

For the following year, year II the calculated statistical parameters are:

CL = 5.76%; UCL = 7.0%; LCL = 4.6%

From fig. 3 it is observed that in January and April the share of defective products exceeds UCL, which indicates that the process was not kept under statistical control this year, being unstable. In such a situation, the quality level and the additional efforts to remedy the non-conformities cannot be predicted. The production process must be brought in a state of control and subsequently initiated to reduce the average percentage
of non-quality.

The causes of a large percentage of non-conformities could be the same as the higher volume of manufacture in these months, more complex products and the fact that January is the first month after the winter holidays.

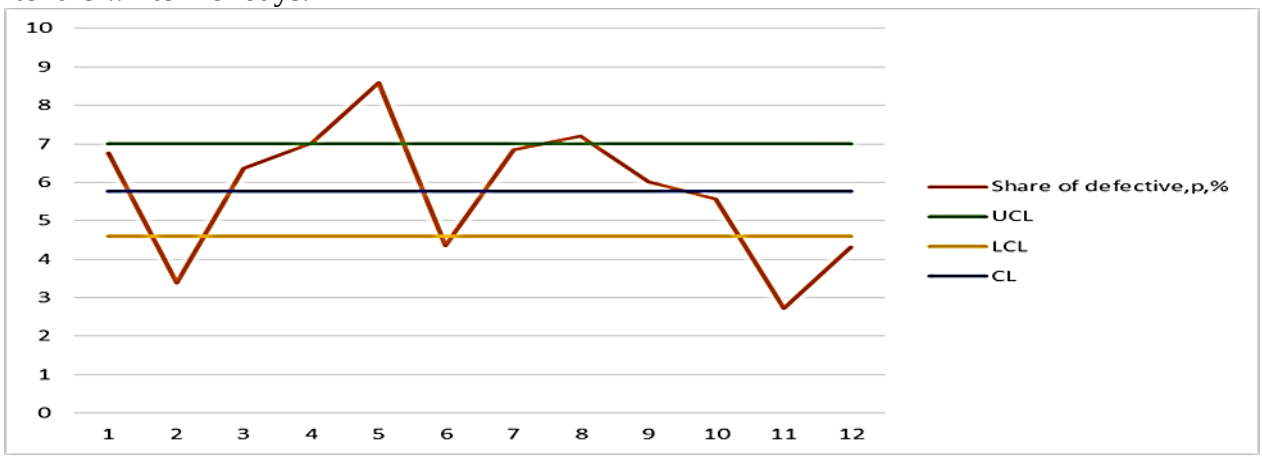

Figure 3 - Shewhart diagram for defective products identified at final control in the second year

If we start from defining the production process as "all the conscious actions of the employees of an enterprise, directed with the help of different machines, machines or installations on the raw materials, materials or other components in order to transform them into products, works or services with certain value of market "[5], we understand that its stability is dependent on a number of factors related to both machines, materials and the human factor.

The analysis of the current situation at the analyzed company suggests that the necessary actions should be planned and carried out must be oriented first and
foremost to the staff. It is recommended:

• *Improvement / development / diversification of methods and methods of*