IMPROVEMENT THE QUALITY OF INDUSTRIAL PRODUCTS BY APPLYING THE PARETO CHART

Raluca NICOLAE (MĂNESCU), Anişor NEDELCU, Adela-Eliza DUMITRAŞCU
"Transilvania" University of Brasov, Romania
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Abstract: *Into an organization it can apply various methods in order to improve the product quality for monitoring and measurement of manufacturing processes, so as to demonstrate that by keeping under control the processes it obtain an improvement in terms of quality of industrial products. In this paper, using the diagram Pareto, the defects are examined for a manufacturing process of a drill with CMS interchangeable plates. A two months data had been collected (March 2015 and April 2015). The results indicate that the share of the biggest flaws is the tool traces on the head, scratching, streaking and variation of trading in spare parts. For this purpose, it was implemented corrective actions in order to minimize the defects and to improve the manufacturing process.*
Keywords: *Pareto diagram, Pareto Analysis, defects analysis, manufacturing process, product quality improvement.*

1. INTRODUCTION

Methods and techniques to improve quality are known as "quality management tools", being used to solve process improvement steps that can solve most of the problems of quality and is used for [1]:

- coordinate and consolidate the data concerning quality;
- making decisions on the quality of batches of products (spare parts), based on the analysis of the sample taken;
- process control in order to achieve the level of quality.

In production, Pareto's observations generated the analysis of product distribution according to their presence in the list of goods. Thus, in every enterprise we have 3 groups of products offered by the specialized literature in the following percentage [2]:

Table 1. Class formation limits

Class	The technological component/ The value component
A Class	5-15% / 50-60%
B Class	20-30% / 25-40%
C Class	55-75% / 5-15%

2. CASE STUDY

The case study is based on monitoring and control of defects for the manufacturing process.

To identify the main problems which cause frequent defects of manufacturing process, a two months data had been collected (March 2015 and April 2015).

The Industrial product is made of drill, with OLC from CMS with interchangeable plates.

The actual rejection is grouped in their respective type of defects identified (Table 2 and Table 3) [10].

Table 2.Defects analysis (March 2015)

No.	Type of defects	Total number of defects	Defects percent
1	Traces of tools on the head-scratching, streaking	30	23%
2	Variation of quotas to spare	21	16%
3	Under bavurehead/ head on	18	14%
4	Cracks on the head	16	12%

5	Surface roughness after finishing process	14	11%
6	Burr on the stem or on intermediate diameters	11	8%
7	Traces of tool Rod-scratching, streaking	8	6%
8	The lack of intermediate diameters	6	5%
9	Incompletely net formed or top ogivale without net	4	3%
10	NOK looking-dirt, oil on surface	3	2%
	Total	131	

Table 3.Defects analysis (April 2015)

No.	Type of defects	Total number of defects	Defects percent
1	Traces of tools on the head-scratching, streaking	17	16%
2	Variation of quotas to spare	16	15%
3	Under burrhead/head on	16	15%
4	Cracks on the head	15	14%
5	Surface roughness after finishing process	13	12%
6	Bavure on the stem or on intermediate diameters	10	9%
7	Traces of tool Rod-scratching, streaking	8	7%
8	The lack of intermediate diameters	6	6%
9	Incompletely net formed or top ogivale without net	4	4%
10	NOK looking-dirt, oil on surface	3	3%
	Total	108	

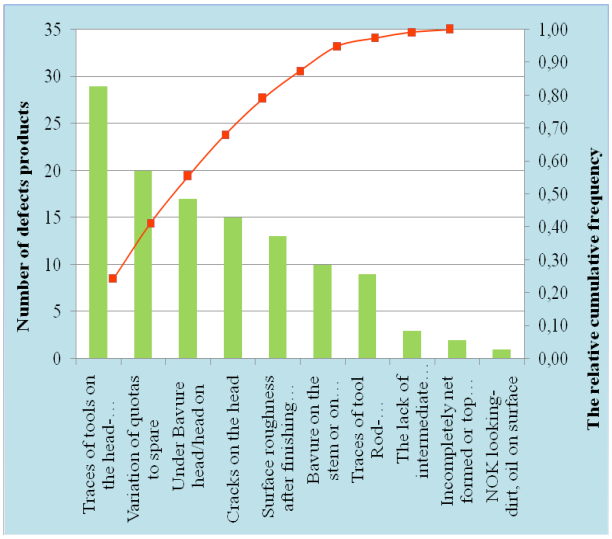

Fig. 1 Pareto chart for March 2015

Analyzing the diagram in Figure 1, it is easy to draw conclusions on the main causes of defects. It can be seen that the most significant of them have as their cause, “traces of tools on the head, scratching, streaking” and“ variation of quotas to spare”. The first category of defects has the largest share of 23%.

We observe that the most expensive or most frequent question appears to the left while the others are displayed in descending order. The segment of the line, we start from the bottom left corner and ending in the upper right corner, showing cumulative percentage.

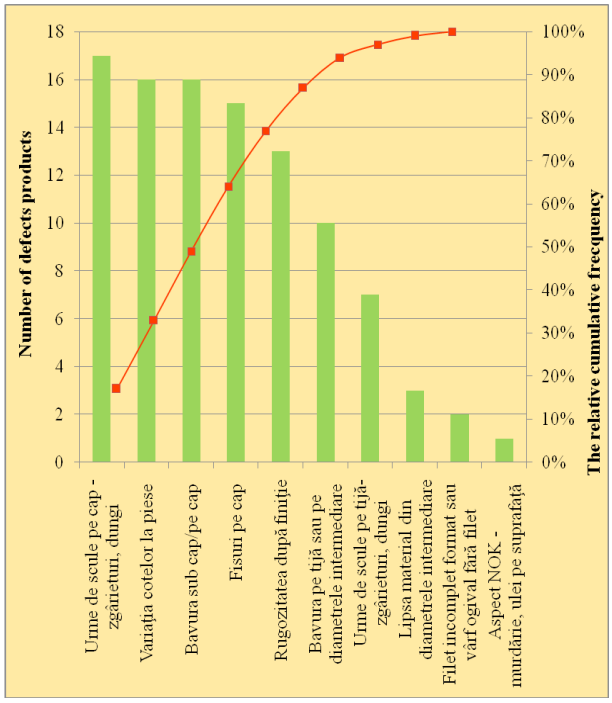

Fig. 2 Pareto chart for April 2015

Analyzing the diagram in Figure 2, it can be seen that nearly two-thirds of them have as their cause, traces of tools on the head, scratching, streaking "and" variation of quotas to spare".

The first category of defects has the share of respectively 16% (Figure 2). Taking into account the fact that it's easier to reduce a high frequency, low than one diagram shows that would be more useful to focus on the improvement of the first two reasons (few and important) than secondary ones (many and insignificant).

CONCLUSIONS

A Pareto chart is used to highlight the most frequently occurring defects, the most common causes of defects, or the most frequent causes of customer complaints [11]. The prioritization of evaluated defects consists on their analysis and implementation of corrective and preventive actions.To improve the quality of industrial products, it can apply the Pareto Analysis, this contributing to keeping control of defects and improve manufacturing processes. By applying them it will get many advantages such as:

• Solving in the effective mode problems by identifying and prioritizing major cause in order of importance to them;

• Establishment priorities of many practical applications, such as efforts to improve a process, customer needs, suppliers, investment opportunities;

• Shows us in what direction must be directed at efforts in order to improve the process/product.

To analyze and prioritize the manufacturing defects it was used Pareto chart that allows to eliminate or to minimize the causes. Pareto diagram allows us to identify the problems (causes) and to minimize the defects with the highest percent. To identify and analyze the main problems which cause the most important defects of manufacturing process, a two months data had been collected (March 2015 and April 2015).

Analyzing Figure 1 it can be observed that the first two categories ("traces of tools on the head, scratching, streaking" and "variation of quotas to spare") of defects represent 39%of the total number of defects for March month.

Analyzing Figure 2 it can be noticed that the same categories of defects represent 31% of the total number of defects for April month.

It was implemented corrective actions in order to minimize the defects and to improve the quality of industrial products. In this respects, the implemented corrective actions consists on adjusting the parameters of the cutting regime and periodical operators' training. In conclusion, it can be observed that the defects percentage of 39% for initial stage it is reduced to the 31%.

After it has been implemented the necessary measures to minimize or eliminate these two categories of defects we can draw another Pareto diagram to verify the effectiveness of the actions implemented, as well as for the reduction in the number of complaints relating to both categories.

BIBLIOGRAPHY

1. Pareto Diagram Process Analysis Tools (2015). Institute for Healthcare Improvement Boston, Massachusetts, USA, available at: http://www.health.state.mn.us/divs/opi/qi/toolbox/docs/paretodiagram_ihi.pdf

2. Cândea, D., Abrudan, I., *The Organization and leadership of industrial enterprises*, Polytechnic Institute of Lithography, Cluj-Napoca, 1984.

3. Chiş, I., Lungu, F., *„Comparative analysis between the methods to determine typical core"* Engineering and Management Journal, No.3, Cluj-Napoca, 2010.

4. Radziwill, N., (2012). Pareto Charts, available at: http://qualityandinnovation.com

5."ParetoChart:Howtodoit",<http://syque.com/quality_tools/toolbook/Pareto/do.htm>.

6."ParetoCharts",<http://www.skymark.com/resources/tools/pareto_charts.asp >.

7. Haughey, D., (2015). Pareto Analysis Step by Step, available at:http://www.projectsmart.co.uk/pareto-analysis-step-by-step.php

8. Deaconescu, T., Deaconescu, A., *Robust design of lapping processes*, 6th International Conference of DAAAM Baltic Industrial Engineering, 2008, 221-226

9. Mohiuddin Ahmed, Nafis Ahmad (2011). *An Application of Pareto Analysis and Cause-and-Effect Diagram (CED) for Minimizing Rejection of Raw Materials in Lamp Production Process*, Management Science and Engineering, Vol. 5, No. 3, 2011,p.87-95, DOI:10.3968/j.mse.1913035X20110503.320

10. Nicolae(Mănescu), R., *Quality-Risk integrated management for manufacturing flexible systems*, "Transilvania" University of Brasov, 2015.

11. Yonatan MengeshaAwaj, Ajit Pal Singh, WassihunYimerAmedie (2013). *Quality improvement using statistical process control tools in glass bottles manufacturing company*, International Journal for Quality Research, ISSN 1800-6450, Vol. 7, No. 1,p.126, http://www.ijqr.net/journal/v7-n1/8.pdf