Annals of Warsaw University of Life Sciences - SGGW
Forestry and Wood Technology № 82, 2013: 65-69
(Ann. WULS - SGGW, For. and Wood Technol. 82, 2013)

Pareto-Lorenz analysis as a tool for performance management of the production process for furniture companies

NICOLETTA BASKIEWICZ[1]

Czestochowa University of Technology , Faculty of Management

Abstract: *Pareto-Lorenz analysis as a tool for performance management of the production process for furniture companies.* This paper presents a practical example of the application of Pareto-Lorenz in (selected furniture manufacturing companies). This method is based on the principle that 80% of effects is determined by 20% of the causes, this led to the Pareto principle working in all areas of life (20% of the clothes we own is worn 80% of the time, 20% of our work gives 80% of the results, 20% of our life gives us 80% of happiness).

Keywords: analysis of the production process, Pareto analysis, Pareto diagram Lorenz

1. PRODUCTION PROCESS OF A DESK

The table presented below includes the whole production process, step by step, one of the company products, which is a desk. Each stage of the production process is supervised by qualified workers. They care of the product quality very precisely, in order to meet the highest quality standards. The table also presents the time in which the workers do specific parts of work. In a production process also machines and devices take part and they significantly shorten its time, besides without them the process could not be successfully finished. Unfortunately, production process is also full of various shortcomings and faults which interfere it in a negative way. They were also included in the table. In the next chapter the attempt of minimizing their influence, and finally- of eliminating them will be described.

In a production process each stage has its specific time. The longest of all stages is undoubtedly, supplying of components, which lasts 24 hours. Of course it is possible to deliver elements ordered faster, but it is more probable, that the supplier will be not reliable enough and as an effect- late with delivery. The next, very time-consuming stage is a receipt of goods. It requires to arrange the whole material delivered in certain areas in a warehouse. The next, slightly sorter stages, taking the workers about 1,5 h of their time are component processing, and finishing. The longest operations were enumerated, now it is time to list the shortest ones.

Table 1 Production process of a desk

No	Process	Description	Time	People	Faults occurrence
1	Supplying of the materials for production	Delivery of materials necessary for the furniture production	24h	Driver/ Courier	Unpunctuality
2	Receipt of goods	Arranging of the materials in certain areas of a warehouse	8h	Warehouseman/ helper	Lack of product labeling
3	Preparing of the materials for processing	1. Clearing of the surface 2. Transport to the work place 3. Preparing of the machines and tools 4. Collecting of the additions	10 min 12 min 8 min 15 min	Jointer's assistant	Delays in the consecutive production processes No power

[1] e-mail: nicola@zim.czest.pl, Czestochowa University of Technology , Faculty of Management, al. AK 19B, 42-200 Częstochowa

4	Processing of the construction components (partitions, tops, shelves)	1. Cutting 2. Drilling 3. Surface grinding	35 min 1 h 15 min	Jointer	No power; Break of the holdfast; Bearing seizure; Machine blockade
5	Finishing of construction components	1. Wrapping 2. Painting 3. Laquering	40 min 30 min 30 min	Sprayer/Jointer	Delays in materials delivery to the workplace
6	Hardware installation	1. Installation of handles 2. Installation of rails 3. Installing of decorative strips and hinges, 4. Installing and gluing of drawers	15 min 15 min 10 min 25 min	Jointer	Unsuitable properties of glue
7	Final assembly	1. Gluing of the tops, partitions. 2. Control. 3. Improvements and correcting of deffects	30 min 10 min 15 min	Jointer/Jointer's assistant	Long time of waiting for materials, causing the worker's down time.
12	Packaging	Packaging of furniture to the cardboard boxes and foil	30 min	Warehouseman/ helper	Foil damage Unsuitable properties of glue
13	Transport of furniture to the store	Ready-made furniture are transported to the stock	30 min	Warehouseman/ helper pomocnik	None
14	Delivery	Delivery of the furniture to the client	Dependent on the target place of delivery	Driver, courier	Unpunctuality Lack of drivers in a given period of time Problems with a car

Source: Own elaboration based on observation

The least time-consuming stages of the production process are furniture packaging to the cardboard boxes and foil, as well as all activities connected with transport of a ready-made product to the store.

2. PARETO ANALYSIS

„Vilfredo Pareto (1848−1923) was an Italian sociologist and economist, professor at the Lozanna University, inventor of the elite theory, co-founder of the Lausanne Mathematical School of Economics. In his research connected with the layout of the wealth in the word he concluded that 80% of goods (according to their value) are possessed by 20% of people. This phenomenon is called „Pareto Principle, or 80-20 rule."[2] „When Pareto ratio is equal 20/80, we observe a symmetry: 20% of causes gives 80% of effects, so remaining 80% of causes gives 20% of effects."[3]

The analysis presented was conducted on the basis of data collected in an observation process in a furniture factory, during one month practice. All variances appearing in a production process are presented in a table below.

[2] Blikle A.: *Doktryna jakości*. © Copyright by Andrzej Blikle. Warszawa 2011, p.212
[3] Ibidem, p.213

Table 2. List of variances and their frequency in a production process (1 month)

No	Type of a variance	Frequency
1	Unpunctuality	1
2	Lack of product labeling	6
3	Problems with power supply	4
4	**Delays in supplying materials to the workplace**	**55**
5	**Delays in finishing of the consecutive production processes**	**71**
6	Machine blockade	2
7	Break of the holdfast;	8
8	Bearing seizure	5
9	Rupture of the driving belts	5
10	Unsuitable properties of glue	4
11	**Long time of waiting for materials, causing the worker's downtime**	**34**
12	Delays in unloading	2
13	Lack of drivers in a given moment	2
14	Problems with a car	1
		Sum: 200

Source: Own elaboration

After analysis of the above table a summary table should be created. All the variances are ordered from the most to the least frequent. There is also calculated a percentage of appearing of each variance in 200 cases, which is 100%. There are also marked cumulative values of every single variance. All the data are included in the table below.

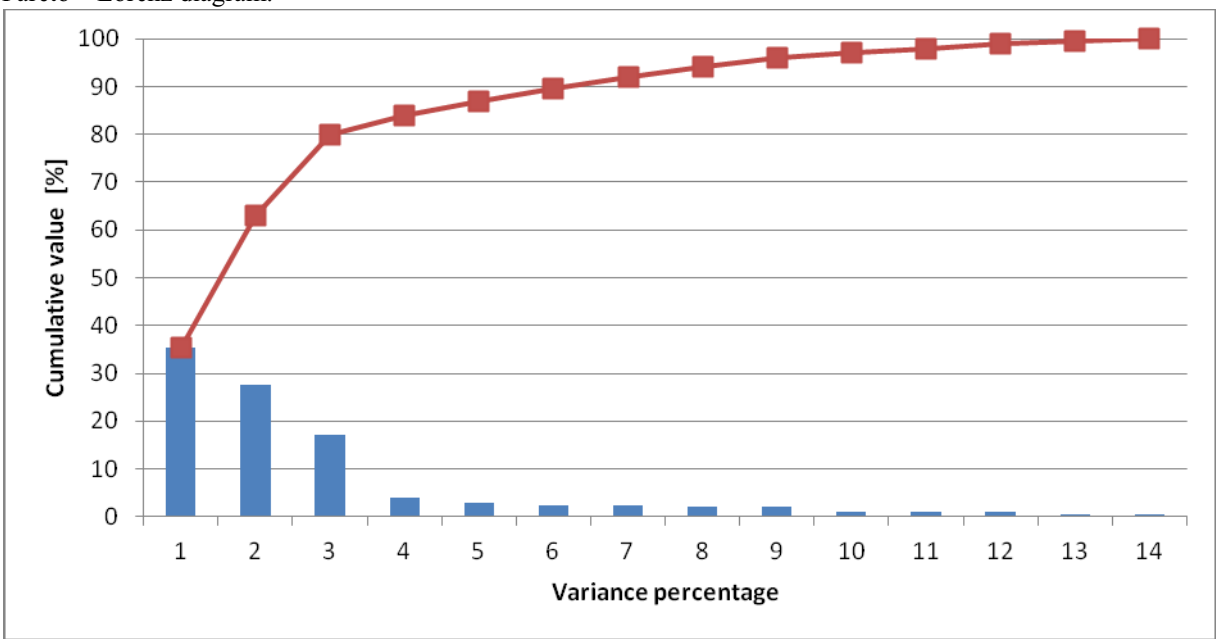
Table 3. Variances ordered according to the frequency.

No.	Type of a variance	Frequency	Percentage [%]	Cumulative value [%]
5	Delays in finishing of the consecutive production processes	71	35,5	35,5
4	Delays in supplying materials to the workplace	55	27,5	63
11	Long time of waiting for materials, causing the worker's downtime	34	17	80
7	Break of the holdfast;	8	4	84
2	Lack of product labeling	6	3	87
8	Bearing seizure	5	2,5	89,5
9	Rupture of the driving belts	5	2,5	92
3	Problems with power supply	4	2	94
10	Lack of air in a system	4	2	96
12	Delays in unloading	2	1	97
13	Lack of drivers in a given moment	2	1	98
6	Machine blockade	2	1	99
1	Unpunctuality	1	0,5	99,5
14	Problems with a car	1	0,5	100

Source: Own elaboration

On the basis of the above table a Pareto-Lorenz diagram may be created.

Diagram 1
Pareto – Lorenz diagram.



Source: Own elaboration

On the basis of the diagram presented it may be concluded, that 20% of faults influence 80% of total variances. 80% of all defects are caused by three main factors: delays in finishing of the consecutive stages, delays in material deliveries to a given position, and finally- too long time of waiting which causes employee's downtime. It appeared that the defects are caused by ineffective system of interoperable transport, which should be taken into account as first. The variances cause 80% of all faults and defects in a production process. The remaining 20% of faults in a production process are caused by remaining 11 defects, in relation with their general number. Analyzing the results we may define the direction of actions that should be taken in order to eliminate, or limit the three main problems.

CONCLUSIONS

This method encourages those interested in minimizing manufacturing defects for a detailed analysis of the production process in order to identify defects in workmanship at every stage of production. Patero-Lorenz method is both a basis for initiating action to remove the defects which cause most of the losses for the company.

BIBLIOGRAPHY

1. BLIKLE A.: *Doktryna jakości*. © Copyright by Andrzej Blikle. Warszawa 2011.

Streszczenie: Analiza Pareto-Lorenz jako narzędzie do zarządzania efektywnością procesu produkcyjnego dla firm meblowych. W niniejszym artykule zaprezentowano praktyczny przykład zastosowania metody Pareto-Lorenza w wybranym przedsiębiorstwie produkującym meble. Niniejsza metoda opiera się na zasadzie , że 80% skutków, wyników determinowana jest przez 20% przyczyn, niniejsza zasada jak dowodził Pareto sprawdza się we wszystkich sferach życia (20% ubrań nosimy przez 80% czasu, 20% naszej pracy daje 80% efektów, 20% naszego życia daje nam 80% szczęścia).

Słowa kluczowe: analiza procesu produkcyjnego, analiza Pareto, diagram Pareto-Lorenza

Corresponding author:

Nicoletta Baskiewicz
nicola@zim.czest.pl,
Czestochowa University of Technology ,
Faculty of Management, al. AK 19B,
42-200 Częstochowa