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G Method as a New Model to Manage the Flow of Materials in a Distribution Center in The Industrial Logistics of Mexicali, BC, Mexico

Research Article

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Abstract: This A detailed analysis was developed to be applied in distribution centers using logistic tools, such as industrial logistics, with activities of reception of materials, process of assembly of a product, sale in the center of distribution-manufacture-sale, and shipment of products to customers. Based on the evaluation developed, a new method called Method G was designed and applied as a new model of distribution form in an industrial distribution center that also generated the sale of the product. The manufacturing process was the assembly of electronic alarms for auto as final product, as well as its sale, being a center of manufacture, distribution and sale. This small industry is located in a residential area of the city of Mexicali and is not a source of pollution, and damage to the environment, and not generates solid waste or hazardous waste.

Keywords: Industrial logistics, G method, Industrial Distribution Center.

INTRODUCTION

The design of warehouses and distribution centers is of great importance in the distribution of a product that you want to put on the market and within the reach of any customer[1]. This is why when a micro-company at the local level wants to grow in the industrial field, it must develop innovations that support it to obtain a greater number of clients that lead it to transcend and stand out along with other worldwide recognized companies. This is part of the transformation of industrial logistics worldwide, where entrepreneurship is formulated to develop new innovations that lead to competitiveness among companies and thus increase the quality of products and reduce costs, to access a greater amount of customers.as large companies[2].

Design, organization, distribution and sale of industries

In all industrial activity, the operations are based on globally standardized procedures such as ISO standards. That is why the design, organization and sale in the industry, should be considered important to form and achieve the rapid expansion of a company, when it is proposed to start the manufacture, distribution and sale of a product locally, nationally or globally[3]. The great challenge of achieving sales goals when starting a company at the micro level, is to be in the innovative field to be able to quickly climb the big leagues of the industrial approach. Due to this, new methods, techniques and innovative systems are constantly sought to optimize the manufacturing, distribution and sale processes of the manufactured products. With this, a microenterprise can quickly achieve its expansion to be considered first as a medium-sized company and later as a large company on a global level[4].

Manufacturing process in the industry: Once the design, organization of the microenterprise has been developed, the manufacturing processes are developed with the specialized and standardized procedures that are strategic for the manufacture and assembly of the manufactured products[5]. In addition to the manufacturing area, an area should

be considered for storing the products manufactured for their prompt distribution, which sometimes, when not using the appropriate logistic tools, may be for longer periods than required and generate costs not included in the activities of planning at the start of each industrial operation[6, 7]. Another function of the industries is to have the department that generates the sales of the manufactured products, with the aim that at the end of the manufacturing process, they are quickly distributed to the clients. But, in some times, this does not happen with the adequate flow and there are events of having oversaturation of products when stored for long periods that cause great economic losses due to lack of movement of the products manufactured. This is why the need to apply the necessary logistics tools and in an adequate manner[8].

Types of distribution flow

In the processes of distribution in warehouses and distribution centers of manufactured products, three types of design that is called plant diagrams or layouts are mainly contemplated, which support to organize the operations of the activities to be carried out[9, 10]. Then the three types of distribution processes are shown and explained:

a) Linear distribution process. It is elaborated with an input, a process and an output with a linear approach that is represented below:

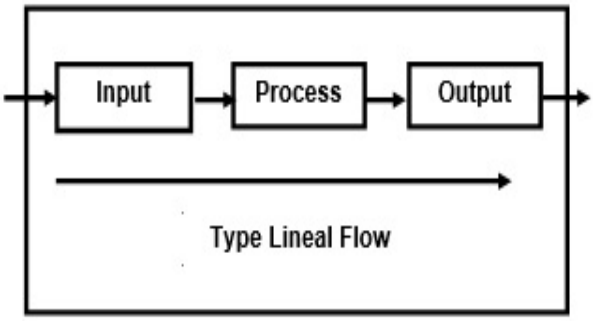

Figure 1. Layout of lineal flow

b) Type U distribution process. It is developed with an entrance, a process and an exit with a U-shaped structure, as indicated below:

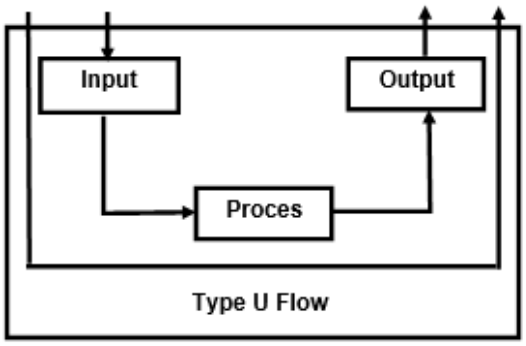

Figure 2. Layout of type U flow

c) Process of distribution in T. It is done with an input, a process and an exit with a structure in the form of T, as shown below:

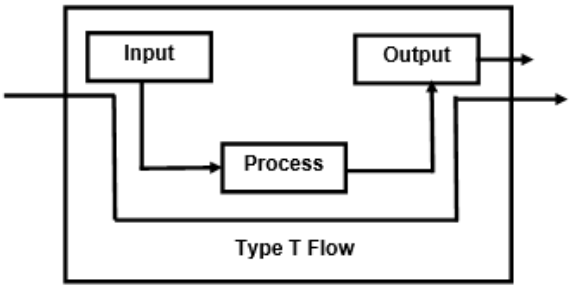

Figure 3. Layout of type T flow

In all the plant diagrams mentioned and shown in figures 1, 2 and 3; the types of flow required for each manufacturing model are indicated, using the most appropriate, to optimize operations and achieve the goals quickly and efficiently.

METHODOLOGY

The investigation was developed to achieve the innovation of a new flow method in a distribution center or warehouse. The main objective was to unite a microenterprise, together with a distribution and sales center. Logistics tools that are mentioned below were used:

a) Space organization system. It was used to properly organize the operations making the most of the spaces of a place to develop manufacturing activities.

b) Route device. It was used in order to determine the most suitable route or flow to speed up operations and save time and movements.

c) Supply chain analysis. It was applied to know the materials and processes to be used in manufacturing processes, distribution centers and sales.

d) Performance evaluation. It was used with the objective of evaluating performance in each manufacturing operation, distribution centers and sales.

e) Continuous monitoring. It was applied to detect certain types of anomalies or errors that occur in the manufacturing processes, distribution centers and sales, and prevent them from being repeated or estimated so that they do not arise. In addition, innovation designed and developed with operations management processes was developed with experts.

RESULTS

The innovation of the new type G method, greatly supported a micro-company dedicated to the electronic industry with the manufacturing of electronic alarms to cars, to increase its sales, by joining the manufacturing processes and distribution and sales center. The increase in sales was 50%, in a period of one year, being a very relevant information for the micro-company evaluated.

Productivity and sales analysis

In the microenterprise, a detailed analysis of the level of productivity was made in a period of 24 months, including the year of 2016 to 2017. The year 2016 was analyzed and in 2017 the innovation method was applied with the type G layout. In the time span of the two years, the following information was evaluated:

a) Analysis of productivity in the manufacturing process. It was developed with the objective of determining by periods of time of daily, weekly, monthly, seasonal; the levels of production and defects generated before and after the innovation mentioned above, and was applied to evaluate improvements of the presented innovation. The analysis was in manual and automated operations with industrial electronic systems. The major relevant information is represented in table 1.

Table 1. Efficiency of productivity level (%) and defects (%) with different types of flow

P	ELF		ETUF		ETTF	
	PL	D	PL	D	PL	D
D	52	44	69	36	64	38
M	57	42	67	34	66	37
S	55	46	66	33	62	40
A	56	48	69	36	65	37

P. Periods; PL. Production Levels; D. Defects; ELF. Efficiency with Lineal Flow; ETUF. Efficiency with Type U Flow; ETTF. Efficiency Type T Flow. D. Daily; M. Monthly; S. Seasonally; A.Annually

Table 1 shows the Efficiency of productivity levels and defects, in according to the product manufactured and mentioned above, with ranges of 52% to 57% of producvity of levels from 52% to 57% and defects from 42% to 48% in the lineal flow. In the type U flow the ranges are from 66% to 69% to the productivity levels and from 33 % to 36% to defects and finally the type T showed ranges from 62% to 65% to the productivity levels and 37% to 40% to defects, being the better to the product manufactured and evaluated in this investigation the type U flow.

b**)** Evaluation of the operations organization of the distribution and sales center. It was carried out with the objective of evaluating the flow of the proposed innovation and comparing it with the three existing ones mentioned above. The major relevant information is showed in table 2.

Table 2. Efficiency of organization (%) with different types of flow

P	ELF		ETUF		ETTF	
	ET	CC	ET	CC	ET	CC
D	68	56	56	42	59	49
M	67	54	54	40	61	50
S	70	53	56	39	60	48
A	66	58	58	43	62	46

P. Periods; ET. Extra Time; CC. Customer's complaints; ELF. Efficiency with Lineal Flow; ETUF. Efficiency with Type U Flow; ETTF. Efficiency Type T Flow. D. Daily; M. Monthly; S. Seasonally; A.Annually

Table 2 represents the efficiency of organization, in according to the product manufactured and mentioned above, with ranges from 67% to 70% of extra time and customer's complaints from 53% to 58% in the lineal flow. In the type U flow the ranges are from 54% to 58% to extra time and from 39 % to 43% to customer's complaints and finally the type T showed ranges from 59% to 62% to extra time and from 46% to 50% to customer's complaints, being the better to the product manufactured and evaluated in this investigation the type U flow.

c) The levels of air pollution were determined. This stage was elaborated to know the levels of the climatic and environmental factors, to determine if they had any effect in the process from the beginning to the end of the operations. The major relevant information is indicated in table 3.

Table 3. Analysis of negative effect of atmospheric pollution (%) with different types of flow

P	ELF		ETUF		ETTF	
	CF	AP	CF	AP	CF	AR
D	62	67	46	38	53	58
M	60	65	51	41	56	60
S	65	63	49	43	50	57
A	68	69	47	41	58	61

P. Periods; CF. Climatic Factors; AP. Air Pollutants; ELF. Efficiency with Lineal Flow; ETUF. Efficiency with Type U Flow; ETTF. Efficiency Type T Flow. D. Daily; M. Monthly; S. Seasonally; A.Annually

Table 3 indicates the negative effect of atmospheric pollution, in according to the product manufactured and mentioned above, with ranges from 60% to 68% of negative effect of climatic factors from 63% to 69% in the lineal flow. In the type U flow the ranges are from 46% to 51% to of negative effect of climatic factors from 38 % to 43% and to air pollutants and finally the type T showed ranges to negative effect of climatic factors from 50% to 58% and to air pollutants from 57% to 61% and to air pollutants being the better to the product manufactured and evaluated in this investigation the type U flow.

d). Innovation design and test. It was carried out with logistics tools and evaluated the levels of productivity and sales with this type of innovation proposed and developed. The design is shown below:

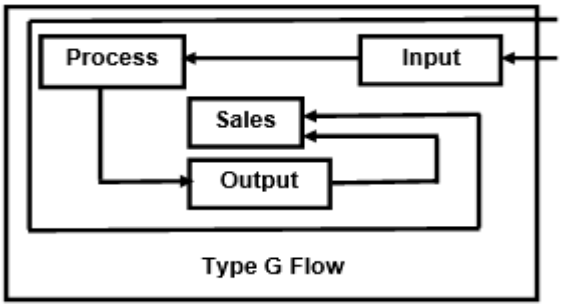

Figure 4. Layout of type G flow

In figure 4 is showed the innovation applied in the micro-company mentioned above, showing good results in the productivity levels, decreasing the defects, extra time and customer's complaints and the negative effect of atmospheric pollution as is showed in table 4.

Table 4. Analysis of the implementation of the innovation with type G flow

P	ETGF		ETGF		ETGF	
	PL	D	ET	CC	CF	AR
D	78	24	28	19	22	26
M	72	21	30	22	26	30
S	75	23	27	24	30	31
A	79	18	25	20	25	29

P. Periods; PL. Production Levels; D. Defects; ET. Extra Time; CC. Customer's complaints; CF. Climatic Factors; AP. Air Pollutants;

ELF. Efficiency Type G Flow D. Daily; M. Monthly; S. Seasonally; A. Annually

Table 4 shows the information of the application of the type G flow as the innovation method, in according to the product manufactured and mentioned above, with ranges of production levels from 72% to 79% and defects from18% to 24%. In the evaluation of extra time the information mention ranges are from 25% to 30% and customer's complaints from 19 % to 24% and of the negative effect of climatic factors is from 22% to 30% and to air pollutants from 26% to 31% indicating that the type G flow method improvement the production levels and reduce the others parameters, which having a negative effect in the study.

CONCLUSIONS

The use of the innovation as the type G flow using the logistic tools, improve the conditions of the manufacturing processes, in according with the analyses made. This investigation will be a positive effect in the new transformation in the world logistics that will be in a few time in the Mexicali city, in the region and in the Mexican Republic. The type G flow have great advantages, because the productivity levels improve and the negative effects of the others parameters involved were decreased, being a good factor. Then the type G flow is reliable to the industrial operations.

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