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Research Article

Searching time reduction of dies by implementing ABC analysis in Automotive Industry

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Abstract

This paper clarifies the execution of ABC analysis in store division of press part producing industry to improve the die searching time of all procedure of the organization .This examination depends on execution of ABC analysis framework and end of various sorts of misfortune from the organization .it tends to be seen that actualizing the ABC framework will prompts the major gainful change in die searching time reduction, just is likewise improve it workplace for instance improving the normal working ,improving visual die searching time. ABC method of inventory control involves a system that controls inventory and is used for materials and throughout the distribution management.

Keywords: *ABC Analysis, non-value added time, Performance improvement, 5S, Productivity Improvement*

1. Introduction

A key concern for any manufacturing company is the ability to produce a variety of high quality products by reducing die searching time and non-value added time. In given auto ancillary company the main task is improvement in productivity by improving searching time of dies at store. So the task was to improve the ABC analysis will best suits to their part family (A.Almeida et al, 2017). Some of the common problems of the small scale and unorganized sector industries are improper workplace design, searching time for dies and set for next operation as per the production plan (Subodh Patil, 2019). The main goal of this work is to describe the implementation of the ABC principles in a press shop dies store department of the company. ABC is a method for measuring the cost and performance of activities and cost objects. In this sense, it is based on three basic premises: products require activities; activities consume resources and resources cost money (A.Almeida et al, 2017). Consumption value is the total value of an item consumed over a specified time period the implementation of ABC system is of particular relevance to this company, taking into account the following aspects. The production of a large number of press shop products occurs in the company, which is directed to different distribution at assembly line for setting on the press machine. The different productions and activity share human resources, equipment and dies during several stages, and at a given moment the separation dies from the various machine and keep these dies in rack at store department. In this sense, there is difficulty in reflecting on the searching time of operator to keep in the dies at store department.

The implementation of ABC method is to the improvement of the organization in many ways. It will help the organizations in many ways for instance:

- Decreasing of mistakes through error proofing
- Reduction of non-value added time
- Reduction of searching time to selecting of particular die
- Better utilization of working area
- Improved moral of employee.
- Increasing of awareness of employee.
- Improved internal communication.
- Reducing human efforts

2. Case Study

The study was conducted in a press shop company and was focused on a specific area. This study concentrated on dies store department. The detailed cycle time study was conducted on 15 repetitive cycles. The production of press part required different dies like drawing, blanking, trimming, piercing; punching etc.to carry out the improvement store department was chosen for pilot study. Dies are not stored properly. Based on study conducted at stores department we found

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bottlenecks there are large numbers of dies in rack so that dies has to search by an operator as per the production plan and Operator have to carry with the help of crane or forklift to workstation for the setting of dies on the machine.it was found that operator searching time was influence in the production process. Searching time was identified by using cycle time study. In present system materials traceability is too poor and no storage space is available in the stores department so this factors influence larger dies searching time and accumulation of dies and shop floor which results poor working condition of store department.

3. Methodology

The following methodology was adopted for effecting productivity improvement on spacer line.

- Cycle time study.
- Assessing current state of the line.
- Effective improvement of ABC analysis.

3.1 Cycle Time Study 1

To determine the production capability of each individual station, detailed cycle time study at each workstation was carried out .Cycle time study was done for 15 repetitive cycles. Then, activities were categorized in VA/NVA activities. NVA activities were focused to reduce or eliminate them in order to improve productivity at various workstations.

3.2 Assessing Current State of the Line 2

A detailed study of store department was carried out using time study. The Operator has to find dies as per the production plan and transfer it to respective workstations for setting the die on the machine for production. The previous dies transferred to the desired location on rack. Bottleneck operations were identified at each racking system that were kept by operator on rack randomly at any location where the space is available on the rack. This consumes more searching time for an operator in the next production plan. The table below shows data collected during initial state of study.

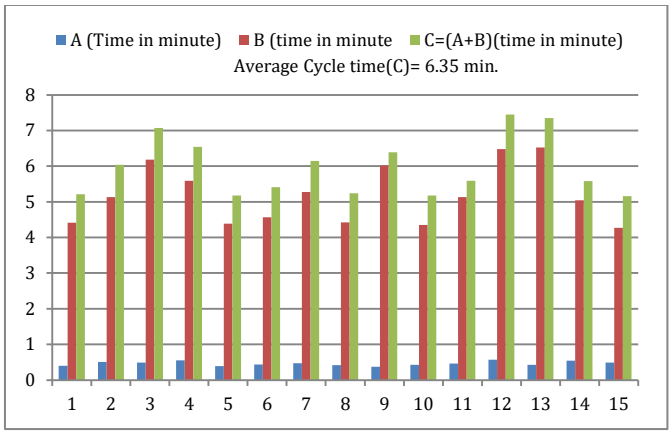

Fig.1 Time Study before Implementation

Where,

A- Time require to decide what is next production die. (See in the Production plan or Ask the production Supervisor)

B- Time require to search the Die in Racks.

C- Total Time required to actually searching the die.

3.3 Effective improvement of ABC analysis 3

ABC analysis is good at classifying individuals according to their importance. The ABC analysis is an inventory categorization technique often used in materials management and quality management. It is in essence similar to the Pareto principle. The common trait of these models is that a small percentage of items account for a large proportion of the overall item values. The ABC analysis allows organizations to separate inventory items into three classes: “A” items are very important; “B” items are important; “C” items are marginally important.

Based on this study we have collected the four-month previous data of production and also utilization of dies during the production of press parts. It is observed that company is producing 44 variants of press parts, to categorization A, B, C type that is 70%, 20% and 10%. We have find frequency of products per month for calculation of percentage of production and categorize type A contains 70% of dies, type B contains 20% dies and type C contains10% dies. Color coding was given to these dies as per the categorization of A.B.C type, which is to be stored in sequence on rack. Table shows the production plan and tables no shows frequency of dies used for production.

Table.1 Production Plan

Sr. No.	Part No	Part List	Sept 2019	Oct 2019	Nov 2019	Dec 2019
1	577999901	Height Adjuster Assembly New Version	3672	1224	2856	4488
2	5047345-01	Height Adjuster	0	0	0	0
3	5049079-01	Lift Lever Assembly (SMA)	0	0	0	0
4	5067786-01	Pulley SPA DP Diameter 112	3630	2160	3240	5400
5	5069221-01	Pulley SPA DP Diameter 90	4760	9240	10780	15400
6	5069748-01	Pulley + Bearing+ Diameter 90	1540	0	1540	1540
7	5354824-01	Pulley SPA DP Dia.90-129	3880	2100	2100	3360
8	5781894-01	Bearing Housing	0	0	0	0
9	5802674-01	Swing Axel Assembly	624	288	576	576
10	5354290-01	REMSKIVA SPA DP 112	1080	1080	1080	1080
11	5065327-01	Pulley+Bearing+Dia112.5	0	0	960	960
12	5819163-01	Pulley Assembly Middle	5130	1350	2970	3510
13	5819163-02	Pulley Assembly Middle	0	0	0	0
14	5838997-01	Bracket Steering Rod Assembly	5270	1680	3360	3360
15	5869693-01	Pedal Plate Hydrostatic	6320	2640	4400	5440
16	5869694-01	Pedal Plate Manuel	0	100	100	200
17	5853598-01	Belt Tensioned Assembly	1442	840	840	840
18	5889270-01	Lifting Arm	4000	2000	4000	4000
19	5254759-01	Hook Service Locking	1600	800	800	800
20	5010653-01	Lifting Lever Assembly (Black)	0	0	0	0
21	5908806-01	Lifting Lever Assembly (Gray)	5052	1152	2880	4896
22	5354799-01	Foot Plate	0	0	0	225
23	5441336	Spring	0	5500	0	0
24	5869664-01	Pedal Rubber 75mm	0	5600	0	0
25	5872574-01	Pedal Plate Assembly P524	0	0	160	160
26	5010972-01	Bracket Steering Rod Lower	0	0	0	0
27	5821908-01	Lifting Lever Assembly	0	0	0	0
28	5821982-01	Height Adjuster Assembly	0	0	0	0
29	5929109-01	Lever Swash	2000	1000	1000	2000
30	590701601	Pulley Assembly, SPA DP112, PTO	0	0	0	0
31	5896197-01	REMSKIVA, DP 82.5 (Sweden)	0	0	0	0
32	5896197-01	REMSKIVA, DP 82.5 (Poland)	2464	1232	2464	2464
33	5870883-01	Pedal Plate Battery (Sweden)	0	0	0	0
34	5069748-01	Pulley +Bearing + Diameter 90 (Sweden)	0	0	0	0
35	5903683-01	Lever Assembly, Height adjustment	0	540	0	0
36	5938417-01	Belt Tension Assembly (New)	0	0	0	0
38	5819164-01	Shaft, Pulley Middle	5000	0	5000	0
39	5819164-02	Shaft Pulley Middle	300	0	0	0
40	5354822-01	Pulley Assembly with bearing	0	0	0	0
41	5869664-02	Pedal Rubber 102mm	0	0	0	0
42	5976253-01	Link Arm	1500	0	0	0
43	5972480-01	Wire Holder	800	0	0	0
44	5802778-01	Link Arm HST	1000	1000	0	0

Table.2 shows frequency of parts and dies used for setting on the machine

Sr. No.	Part No	Part List	Frequency Of Product (Per Month Basis)	Expected Total production (up to 1st of jan.2020)
1	577999901	Height Adjuster Assembly, New Version	3060	12240
2	5047345-01	Height Adjuster	0	0
3	5049079-01	Lift Lever Assembly (SMA)	0	0
4	5067786-01	Pulley SPA DP diameter 112	3607.5	14430
5	5069221-01	Pulley SPA DP Diameter 90	10045	40180
6	5069748-01	Pulley + Bearing + Diameter 90	1540	4620
7	5354824-01	Pulley SPA DP Dia.90-129	2860	11440
8	5781894-01	Bearing Housing	0	0
9	5802674-01	Swing Axel Assembly	516	2064
10	5354290-01	REMSKIVA SPA DP 112	1080	4320
11	5065327-01	Pulley + Bearing + Diameter 112.5	480	1920
12	5819163-01	Pulley, Assembly Middle	3240	12960
13	5819163-02	Pulley, Assembly Middle	0	0
14	5838997-01	Bracket, Steering Rod Assembly	3417.5	13670
15	5869693-01	Pedal Plate Hydrostatic	4015	18800
16	5869694-01	Pedal Plate Manual	100	400
17	5853598-01	Belt Tensioned Assembly	990.5	3962
18	5889270-01	Lifting Arm	3500	14000
19	5254759-01	Hook, Service Locking	1000	4000
20	5010653-01	Lifting Lever Assembly (Black)	0	0

21	5908806-01	Lifting Lever Assembly (Gray)	3495	13980
22	5354799-01	Foot Plate	56.25	225
23	5441336	Spring	1375	5500
24	5869664-01	Pedal Rubber 75mm	1400	5600
25	5872574-01	Pedal Plate Assembly, P524	80	320
26	5010972-01	Bracket Steering Rod Lower	0	0
27	5821908-01	Lifting Lever Assembly	0	0
28	5821982-01	Height Adjuster Assembly	0	0
29	5929109-01	Lever Swash	1500	6000
30	590701601	Pulley Assembly, SPA DP112, PTO	0	0
31	5896197-01	REMSKIVA, DP 82.5 (Sweden)	0	0
32	5896197-01	REMSKIVA, DP 82.5 (Poland)	2156	8624
33	5870883-01	Pedal Plate Battery (Sweden)	0	0
34	5069748-01	Pulley + Bearing + Diameter 90 (Sweden)	0	0
35	5903683-01	Lever Assembly, Height Adjustment	135	540
36	5938417-01	Belt Tensioned Assembly	0	0
38	5819164-01	Shaft, Pulley Middle	2500	10000
39	5819164-02	Shaft, Pulley Middle	75	300
40	5354822-01	Pulley Assembly with bearing	0	0
41	5869664-02	Pedal Rubber 102mm	0	0
42	5976253-01	Link Arm	375	1500
43	5972480-01	Wire Holder	200	800
44	5802778-01	Link Arm HST	500	2000
Total number of product manufacture in 4 month shift				214395

Type -A

Table.3 Frequency of Product ≥ 2800

Sr. No.	Part No	Part List	Frequency Of Product (Per Month Basis)	Total Production
1	577999901	Height Adjuster Assembly New Version	3060	12240
2	5067786-01	Pulley SPA DP diameter 112	3607.5	14430
3	5069221-01	Pulley SPA DP diameter 90	10045	40180
4	5354824-01	Pulley SPA DP Diameter 90-129	2860	11440
5	5819163-01	Pulley Assembly Middle	3240	12960
6	5838997-01	Bracket, Steering Rod Assembly	3417.5	13670
7	5869693-01	Pedal Plate Hydrostatic	4015	18800
8	5889270-01	Lifting Arm	3500	14000
9	5908806-01	Lifting Lever Assembly (Gray)	3495	13980
Total production of 'A' type				151700

$$\text{Percentage of production} = \frac{\text{Total production of 'A'}}{\text{Total production in 4 month plan}} * 100$$

$$= \frac{151700}{214395} * 100$$

$$= 70.7572\%$$

Type -B

Table.4 2800< Frequency of Product > 1000

Sr. No.	Part No	Part List	Frequency of Product (Per Month Basis)	Total Production
1	5069748-01	Pulley + Bearing + Diameter 90	1540	4620
2	5354290-01	REMSKIVA SPA DP 112	1080	4320
3	5441336	Spring	1375	5500
4	5869664-01	Pedal Rubber 75mm	1400	5600
5	5929109-01	Lever Swash	1500	6000
6	5896197-01	REMSKIVA, DP 82.5 (Poland)	2156	8624
7	5819164-01	Shaft, Pulley Middle	2500	10000
Total Production Of 'B'type				44664

$$\text{Percentage of production} = \frac{\text{Total production of 'b'}}{\text{Total production in 4 month plan}} * 100$$

$$= \frac{44664}{214395} * 100$$

$$= 20.83\%$$

Type-C

Table.5 Frequency of Product < 1000

Sr. No.	Part No	Part List	Frequency of Product (Per Month Basis)	Total Production
1	5047345-01	Height Adjuster	0	0
2	5049079-01	Lift Lever Assembly (SMA)	0	0
3	5781894-01	Bearing Housing	0	0
4	5802674-01	Swing Axel Assembly	516	2064
5	5065327-01	Pulley + Bearing + Dia112.5	480	1920
6	5819163-02	Pulley, Assembly Middle	0	0
7	5869694-01	Pedal Plate Manual	100	400
8	5853598-01	Belt Tensioned Assembly	990.5	3962
9	5010653-01	Lifting Lever Assembly (Black)	0	0
10	5354799-01	Foot Plate	56.25	225
11	5872574-01	Pedal Plate Assembly, P524	80	320
12	5010972-01	Bracket Steering Rod Lower	0	0
13	5821908-01	Lifting Lever Assembly	0	0
14	5821982-01	Height Adjuster Assembly	0	0
15	590701601	Pulley Assembly, SPA DP112, PTO	0	0
16	5896197-01	REMSKIVA, DP 82.5 (Sweden)	0	0
17	5870883-01	Pedal Plate Battery (Sweden)	0	0
18	5069748-01	Pulley + Bearing + Diameter 90 (Sweden)	0	0
19	5903683-01	Lever Assembly, Height adjustment	135	540
20	5938417-01	Belt Tensioned Assembly (New)	0	0
21	5819164-02	Shaft, Pulley Middle	75	300
22	5354822-01	Pulley Assembly with bearing	0	0
23	5869664-02	Pedal Rubber 102mm	0	0
24	5976253-01	Link Arm	375	1500
25	5972480-01	Wire Holder	200	800
26	5802778-01	Link Arm HST	500	2000
27	5254759-01	Hook, Service Locking	1000	4000
Total production of 'C' Type				18031

$$\text{Percentage of production} = \frac{\text{Total production of 'C'}}{\text{Total production in 4 month plan}} * 100$$
$$= \frac{18031}{214395} * 100$$
$$= 8.41\%$$

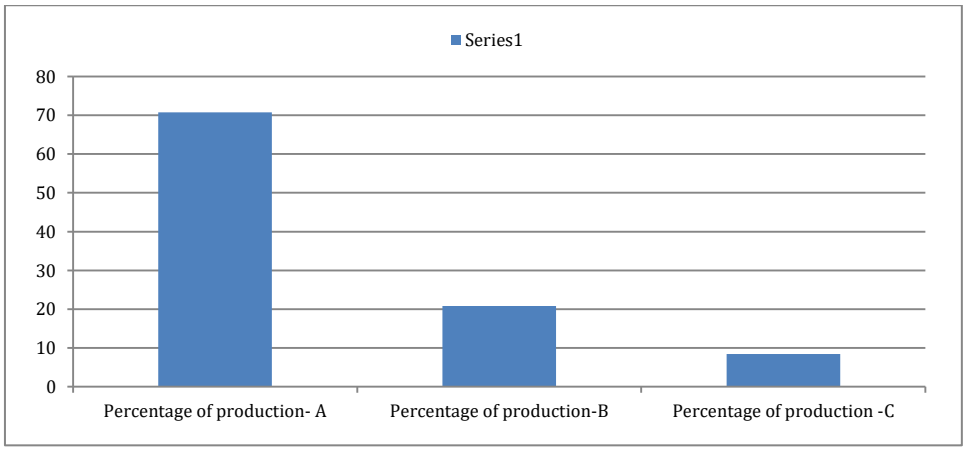

Fig.2 Summary of production Percentage

Type A dies	Type B dies	Type C dies
Green	Yellow	Red

Fig.3 Color coding for dies

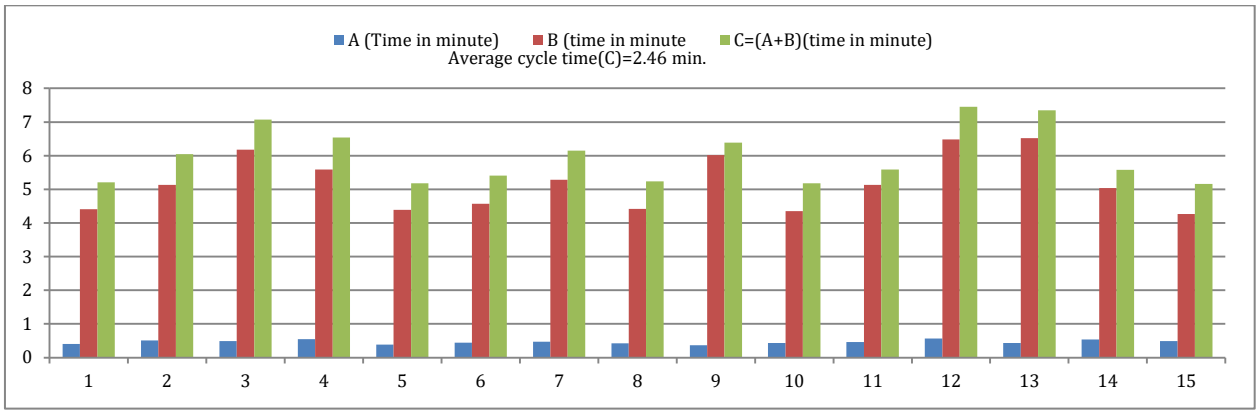

Fig.4 Time Study after Implementation

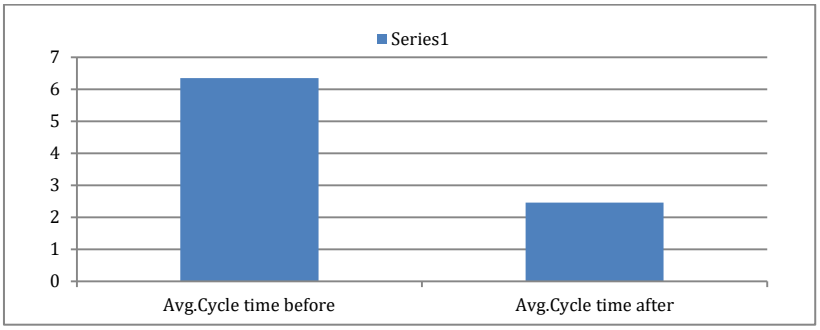

Fig.5 Result Summary

Conclusion

The implementation of the ABC system led to the obtaining of a wide set of information, with high detail which indicates that this ABC system that adapts to the needs of this company. Overall, this work contributed to a better knowledge of the company, providing a greater degree of detail about how the company's industrial activity develops. In this study, the problem regarding Searching time at store department cycle time study has taken from store to assembly workstation was solved by removing the non-value added activities by using time study, ABC analysis, implementation of 55 and color coding system on the dies and racking system. Searching time reduced to 2.46 min from 6.35 min.

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