IMPACT: International Journal of Research in Engineering & Technology (IMPACT: IJRET)
ISSN(E): 2321-8843; ISSN(P): 2347-4599
Special Edition, Mar 2014, 23-28
© Impact Journals

METHOD IMPROVEMENT IN DIE CHANGING PROCESS IN A PRESS SHOP OF AN AUTOMOBILE INDUSTRY

ANEESH M. R[1], BINU C. YELDOSE[2] & GEORGEKUTTY S. MANGALATHU[3]

[1]P. G. Scholar, Department of Mechanical Engineering, Mar Athanasius College of Engineering, Kothamangalam, Kerala, India

[2]Professor, Department of Mechanical Engineering, Mar Athanasius College of Engineering, Kothamangalam, Kerala, India

[3]Assistant Professor, Department of Mechanical Engineering, Mar Athanasius College of Engineering, Kothamangalam, Kerala, India

ABSTRACT

Primary goal of any of the production or manufacturing industry is to improve production efficiency. Efficiency of production depends on several factors. Line stop is one of the major causes of reducing production efficiency. In this paper reducing the line stop of press shop at an automobile company by reducing the Die changing time. For this detailed work study of Die changing process is conducted and suggestions were given to reduce Die changing time. By implementing suggestions about 3 min in die changing process can be reduced and thereby reducing the line stop.

KEYWORDS: Pattern System of Production, Die Changing Time, Total Production Time, Press Shop

INTRODUCTION

The automotive industry began in the 1890s. The business of producing and selling self-powered vehicles, including passenger cars, trucks, farm equipment, and other commercial vehicles. It played a key role in the growth of ancillary industries, such as the oil and travel businesses. There are several factors affect the efficiency of production of automobile industry. One of the major problems is line stop of production. This can be corrected by reducing idle time of machine. For reducing idle time of machine, detailed work study of the process to be conducted. In this paper reducing the line stop of press shop by reducing die changing time

PROBLEM SOLVING METHODOLOGY

Process in 22A servo press machine studied in detail. The problem regarding time reduction of die changing process is solved by the following problem solving methodology.

- Define the problem
- Data collection
- Conduct work study and time study for reducing SD time
- Counter measures are suggested

PROBLEM DEFINITION

Present condition of servo press is, seven parts are produced in a shift and it produced in a sequence as per pattern. When the limited edition car parts are being produced in 22A servo, because of its less demand the number of parts produced is also less. So the total production time is also less as compared to other parts. But the die changing is 28 min and the total production time is less than die changing time so there will be line stop occurs. To reduce the line stop of Servo press, reduce the die changing time by conducting work study. Hence an attempt to bring down the die changing time.

Pattern System of Production: The total number of parts to be produced is divided into sets and each set is considered as a pattern and each pattern is carried out in a shift. It is generally employed for scheduling of production activities in order to control inventory. Die changing time: It is the total time required for changing set of die from bolster to die storing area and from die storing area to bolster.

Total Production Time: It is the total time taken for completing one pattern of production.

DATA COLLECTION

The production sequence for 22A servo is obtained from planning section. The obtained data is summarised in Table 1.

Table 1: Pattern Sequence

Pattern	Servo Pattern							
	Part	**53311.2**	**58311**	**61112HB**	**6113.4**	**55111**	**61111**	**5111**
1	Moving bolster	LH	RH	LH	RH	LH	RH	LH
	Lot size	500	600	360	385	500	288	600
	Strokes per minute	15	16	15.6	13	16	15.6	16
	Production time	39	44	28	35	37	24	44
	Part	**5811HB**	**53811.2**	**58311**	**53321**	**57115**	**61112**	**63111**
2	Moving bolster	LH	RH	LH	RH	LH	RH	LH
	Lot size	400	500	665	525	380	288	360
	Strokes per minute	16	15	13.7	15	15.8	15.6	15.8
	Production time	31	39	55	41	29	24	28
	Part	**58211**	**53311.2**	**61111HB**	**55111**	**67113.4**	**63111**	**61111**
3	Moving bolster	RH	LH	RH	LH	RH	LH	RH
	Lot size	660	500	360	500	595	580	288
	Strokes per minute	14	15	15.6	16	13	15.8	15.6
	Production time	54	39	28	37	53	43	24
	Part	**67149HB**	**53811.2**	**64411**	**61633.4**	**63111**	**61112**	
4	Moving bolster	LH	RH	LH	RH	LH	RH	
	Lot size	400	500	608	960	510	288	
	Strokes per minute	16	15	16	16	12	15.6	
	Production time	31	39	44	68	49	24	

Present Stipulation is Examined by Using

- Standard operation sheet
- Standard work combination table
- Standard work chart

Standard Operation Sheet

Standardized work which is performed according to each work sequence. It is the supervisor's duty to set standard work and make all members observe it. Standard work is a living, flexible tool that can be changed and improved along the way. Once the most efficient sequence has been determined it is repeated in exactly same way.

Table 2: Standard Operation Sheet

Sl No	Sequence Operation	Time			
		Manual	Auto	Wait	Walk
1	Schedule conformation by operator	10	0	0	25
2	Die data sheet conformation	15	0	0	25
3	Die sequence and N2 pressure check	30	0	0	10
4	Unclamping of bolt from all bolsters	80	0	0	35
5	Bring crane from crane parking area	30	0	0	20
6	Lift the die from bolster	48	0	0	0
7	Move the die towards the die storage area	98	0	0	0
8	Place the die to its specified location, move crane to the next die location	112	0	0	0
9	Pick the next die and move towards the bolster	50	0	0	0
10	Place the die on the bolster	55	0	0	0
11	Move the crane towards the next die position	45	0	0	0
12	visual conformation of surface of dies	60	0	0	0
13	Lift the die from bolster	43	0	0	0
14	Move the die towards the die storage area	61	0	0	0
15	Place the die to its specified location, move crane to the next die location	100	0	0	0
16	Pick the next die and move towards the bolster	48	0	0	0
17	Place the die on the bolster	45	0	0	0
18	Move the crane towards the next die position	40	0	0	0
19	visual conformation of surface of dies	65	0	0	0
20	Lift the die from bolster	56	0	0	0
21	Move the die towards the die storage area	98	0	0	0
22	Place the die to its specified location, move crane to the next die location	40	0	0	0
23	Pick the next die and move towards the bolster	92	0	0	0
24	Place the die on the bolster	45	0	0	0
25	Move crane towards its parking area	60	0	0	0
26	Clamping bolts on moving bolsters	50	0	0	0
27	Conformation of all checks	30	0	0	0

Standard Work Combination Table

The standardized work combination sheet shows sequence operation and indicates precisely the time required for each step, a useful tool for allocating man power. The Standard Work Combination Table combines human movement and machine movement based on take time and is used as a tool to determine the range of work and work sequence for which a team member is responsible. The key notion for the elimination of waste and the effective combination of work on the shop floor is the separation of machine work and human work

Standard Work Chart

Standardized work chart is a diagram indicating the work sequence and movement of an employee.

The Process Study Sheet is used to define and record the time for work elements in a process. Before timing, observe and list the work elements required to produce one element. Then observe and define the actual time required for each individual work element

Standard Process Chart

Process chart shows the chronological sequence of all operations, inspections, time allowances, and materials used in a manufacturing or business process. The American Society of Mechanical Engineers (ASME) has established the five standard symbols are described in the Table 3.

Table 3: Standard Symbols

Symbol	Letter	Description
O	O	Operation
□	I	Inspection
→	M	Move
D	D	Delay
∇	S	Storage

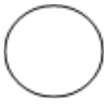
Standard symbols used for process chart are

- **Operation:** Is to change the physical or chemical characteristics of the material.
- **Inspection:** Is to check the quality or the quantity of the material.
- **Move:** Is transporting the material from one place to another.
- **Delay:** Is when material cannot go to the next activity.
- **Storage:** Is when the material is kept in a safe location.

Table 4: Activity Description

Activity	Die Changing
Chart begins	Inspection
Chart ends	Clamping the die on bolster

Table 5: Process Description

Activity	Symbol	Number	Description
Inspection		1	N2 pressure check in bolster
		2	Inspection of die storage area
Operation		1	Unclamping of all bolts from bolster
		2	Bring the crane from parking area
		3	Unbound the twisted rope
		4	Clamp the rope in die
		5	Lift the die
		6	Lowering and positioning die
		7	Unclamp the ropes
		8	Unbound the twisted rope
		9	Clamp the rope in the next die
		10	Lowering and positioning die to bolster
		11	Clamping of all dies to bolster
Move		1	Transfer the die to die storing area
		2	Move to next die position
		3	Move the crane with die to bolster area

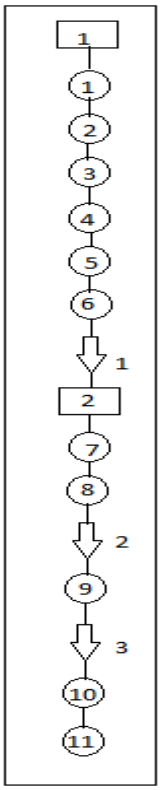


Figure 1: Standard Process Chart

Table 6: Summery of Time Study

SOTODANDURI TIME STUDY OF 22 A SERVO														
		TIME IN (SEC)												
Data	DIE SET	CLAMPING & UNCALMPING	HOLDING	LIFTING	TRANSFER	LOWERING	UNHOLDING	NEXT DIE	HOLDING DIE	LIFTING	TRANSFER	LOWERING & POSITIONING	UNHOLDING	TOTAL
13/09/13	1	72	20	35	50	24	18	65	22	20	85	45	20	476
	2		22	36	75	25	15	70	21	30	65	40	17	416
	3	98	19	36	72	26	19	65	20	30	56	46	19	506
												TOTAL		1398
												TOTAL (MIN)		23'40"
13/09/13	1	72	18	36	55	23	20	65	20	25	110	50	20	514
	2		21	33	60	25	20	62	20	25	90	45	19	420
	3	70	20	35	80	25	22	60	20	30	80	55	18	515
												TOTAL		1449
												TOTAL (MIN)		24'55"
14/09/13	1	65	18	27	60	40	15	65	22	35	70	62	25	504
	2		19	30	75	30	20	60	20	28	80	55	20	437
	3	71	20	25	70	35	18	50	20	25	75	45	20	474
												TOTAL		1415
												TOTAL (MIN)		23'58"
14/09/13	1	68	20	35	58	40	20	100	21	25	75	50	20	532
	2		19	29	85	22	18	50	22	22	60	45	18	390
	3	65	16	35	70	25	18	55	20	32	80	40	18	474
												TOTAL		1396
												TOTAL (MIN)		24'43"
16/09/13	1	70	17	35	60	24	22	56	19	30	60	40	20	453
	2		18	32	65	25	20	65	20	35	85	42	21	428
	3	68	22	35	50	28	22	80	20	30	75	40	20	490
												TOTAL		1371
												TOTAL (MIN)		23'03"
16/09/13	1	63	16	28	60	25	20	75	22	32	75	45	18	479
	2		18	25	55	28	18	55	22	30	80	40	20	391
	3	65	18	24	60	29	21	100	20	30	85	45	19	516
												TOTAL		1386
												TOTAL (MIN)		23'36"
17/09/13	1	60	20	22	80	25	22	70	22	35	65	42	20	483
	2		18	20	75	24	21	90	20	30	75	40	20	433
	3	65	18	20	60	20	20	85	20	32	80	40	18	478
												TOTAL		1394
												TOTAL (MIN)		24'58"
17/09/13	1	65	20	21	70	22	22	85	20	30	85	42	21	503
	2		22	20	55	20	22	70	21	25	70	40	20	385
	3	62	20	21	65	22	20	65	22	25	85	40	20	467
												TOTAL		1355
												TOTAL (MIN)		24'45"

ANALYSIS OF DATA

Total production time of different class of vehicles are calculated and is shown in the table 7.

Table 7: Calculation of Total Production Time

Vehicle	Annual Demand	Volume per Day	Volume per Shift	Volume per Shift with Spare	Lot Size	Extra Material Changing Time	Line Production Time	Total Production Time	Machine Idle Time
Car A	90000	324	162	121	342	6	21.3	31.3	0
Car B	20000	72	36	36	152	4.5	5.5	18	10
Car C	60000	216	108	114	436	7.5	21.5	40	0
Car D	60000	216	108	114	436	7.5	21.5	40	0
Car E	12000	44	72	24	56	3	6	13	15

Volume of production/day = Annual requirement/No of working days(1)

Lot size = no of parts produced in shift × pattern type(2)

Line production time = lot size/ Strokes per minute (SPM) (3)

Total production time = Automatic die changing time + Extra material changing

Time+ Line production time (4)

RECOMMENDATIONS TO REDUCE DIE CHANGING TIME

- Replace the manual bolt clamping by automatic clamping
- Design a frame for keeping ropes apart
- Parallel processing
- Provide the crane parking area on both side of press machine

CONCLUSIONS

Case study was performed for reducing the die changing time. Detailed work study of die changing process was conducted and found out the wastage of time during the process. Also give recommendations to reduce the process time and there by improve the production efficiency of press shop.

REFERENCES

1. Yanjing Ou, Zhang Wu, Thong NgeeGoh (2011). A new SPRT chart for monitoring process mean and variance, *International Journal of Production Economics*, 132 (2), 303-314.
2. Ulf K. Teichgräber. Maximilian de Bucourt (2012). Applying value stream mapping techniques to eliminate non-value-added waste for the procurement of endovascular stents81 (1).
3. A.R. Rahani, Muhammad al-Ashraf (2012) Production flow analysis through value stream mapping: A lean manufacturing process case study, 41, 1727–1734.