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ORIGINAL ARTICLE

PRODUCTIVITY IMPROVEMENT IN MOULDING BY CHANGES IN WORK PROCESS FLOW

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Abstract:

Foundry industry suffers from poor quality and productivity due to the large number of process parameters, combined with lower penetration of manufacturing automation and shortage of skilled workers compared to other industries. Productivity is development of an attitude of mind and constant urge to find better, cheaper, easier, quicker and safer means of doing a job, manufacturing a product and providing service. It is the certainty of being able to do better today than yesterday, and continuously.

Productivity is purely a concept of real process. It is defined as the relation ship of output to associated inputs. Real process that combines the inputs in order to make output includes practically all the activities of a company.

Improving productivity it will help the management to analyze on continuing basis. Improving productivity is nothing but the reduction in wastage of resources like men, machines, material, power, space, time etc. Productivity improvement by means of The Improve existing methods of plant operation, Improve the planning of work and the use of manpower, Increase the effectiveness of all employees.

This helps correct identification of the unwanted process. Based on this results and their interpretation the optimal values of the parameters are determined to eliminate the unwanted process. The proposed approach overcomes the problems, causes of Low productivity and it improved the productivity.

KEYWORDS:

Work Process Flow , Productivity Improvement , manufacturing automation .

1.0 INTRODUCTION

Productivity is development of an attitude of mind and constant urge to find better, cheaper, easier, Quicker and safer means of doing a job, manufacturing a product and providing service. It is the certainty of being able to do better today than yesterday, and continuously .The productivity is the reduction in wastage of resources like men, machines, material, power, space, time etc.

1.1 Productivity

Productivity is purely a concept of real process. It is defined as the relation ship of output to associated inputs. Real process that combines the inputs in order to make output includes practically all the

activities of a company.

It is usually expressed as output divided by input. Out put can be expressed in terms of units or volume (e.g. tones, liters, boxes, etc) and these units have usually been already determined for production planning purposes. In cases where outputs cannot be individually defined a monetary total can be used. Inputs are usually separated into man power, machinery and materials.

Productivity is an attitude of mind. It is mentality `of progress of the constant improvement of that which exists. It is constant adaptation of economic and social life to changing conditions, it is a continual effort to apply new techniques and methods, and it is the faith in human progress.

1.3 Work Study

Work study investigates the work done in an organization and its aims at finding the best and most efficient way of using available resources men, material, money and machinery.

1.4 Advantages Of Work Study

Work simplification: Work study aims at adopting simple and efficient method of production. Unnecessary and wasteful operations and movements are to be eliminated.
Increase in efficiency: work study raises efficiency of the factor without much financial burdens'.
Increase in production: work study co-ordinates various activities of industry in an efficient manner. This results in increase in production.
Smooth supervision: work study tells the time required to complete the work, there fore accurate production schedules can be prepared. This helps the management in exercising smooth supervision over workers.
Benefits to workers: work study tells about the production which can be achieved per day, so workers can protect themselves from over loads.
Benefit to consumer: consumer gets quality product at low and reasonable cost.
Management: Management benefits through increased efficiency and therefore increased profit.

2.0 CASTING PROCESS

Casting process is based on the property of a liquid to take up the shape of vessel containing it. Molten metal poured in to a mould flows in to the corners and fills all the voids. When metal solidifies it takes the shape of mould but not exactly the same because solid being denser there is reduction of volume. For obtaining correct dimensions, provision needs to be made for shrinkage of metal. Hollow components can be produced by inserting a core in to the cavity in the mould.

Casting is one of the most versatile from of mechanical process for producing components, because there is no limit to the size, shape and intricacy of the articles that can be produced by casting. It offers one of the cheapest methods and gives high strength and rigidity even to intricate parts, which are difficult to produce by other methods of manufacturing. One of the most attractive features of casting is its ability to form any shape in one operation. The metal with in solidification range is at mushy stage. Contraction of metal begins immediately this range is over and the metal comes in to plastic stage.

The mould in to which metal is poured is made of some heat resisting material. Sand is most often used, as it can be easily packed to any shape and is somewhat porous, and resists high temperatures. Moreover silica sand is low in cost, as long life, and is available in wide range of grain sizes and shapes. Chill to control the solidification structure of the metal, it is possible to place metal plates, Chills, in the mold. . In other metals chills may be used to promote directional solidification of the casting. Directional solidification describes solidification that occurs from farthest end of the casting and works its way towards the Sprue.

Metal casting involves pouring molten metal into a mould containing a cavity of the desired shape to produce a metal product. The casting is then removed from the mould and excess metal is removed, often using shot blasting, grinding or welding processes. The product may then undergo a range of processes such as heat treatment, polishing and surface coating or finishing.

2.1 TYPICAL SAND CASTING PROCESS

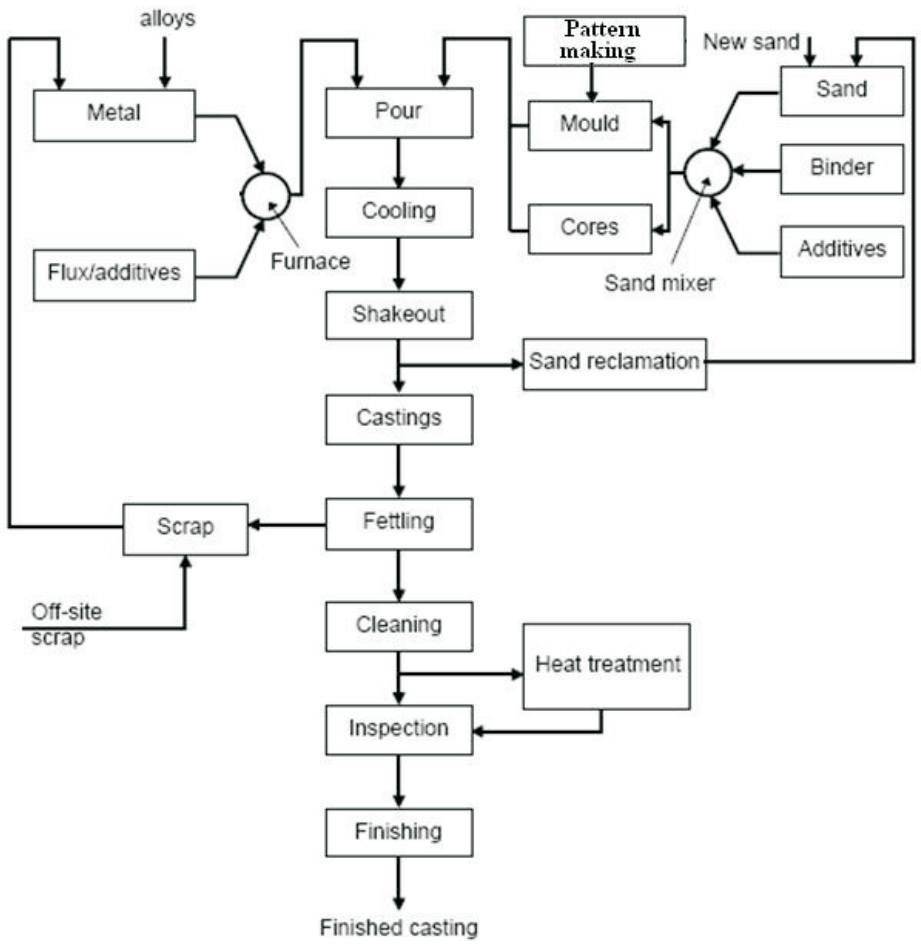


Fig .1. A typical sand casting process

3.0 PROCESS ANALAYSIS

Various steps involved in process analysis are

1.Select the process for analysis.
2.Break down the process into the operations and sub operations.
3.Construct a process chart and flow diagram.
4.Analyze the process chart and flow diagram by subjecting each and every step to questioning procedure and evolve modified method.
5.Construct a process chart and flow diagram for the modified procedure.
6.Test the proposed method for all the advantages claimed.
7.Explain new method to the workers and put it into operation.

4.0 IMPLEMENTATION

The implementation part is the most important phase of the project. In this phase, we eliminate the unwanted operation performed in the previous phase. In such a way implement the suggested ways to the process flow.

Pattern damaging

Finally proper ramming is must be done and also give the proper guidance and use proper tool to

the worker.

4.1 Improper allocation of mould box storage

There is a ideal place beside the moulding section. They are not using this place for any other means. Plant lay out also causes for low productivity. The changed plant layout is (shown in figure 2).

To allocate these ideal places for mould box storage. The time and power consumption decreases. So effectively this gives advantage that we prepare in time.

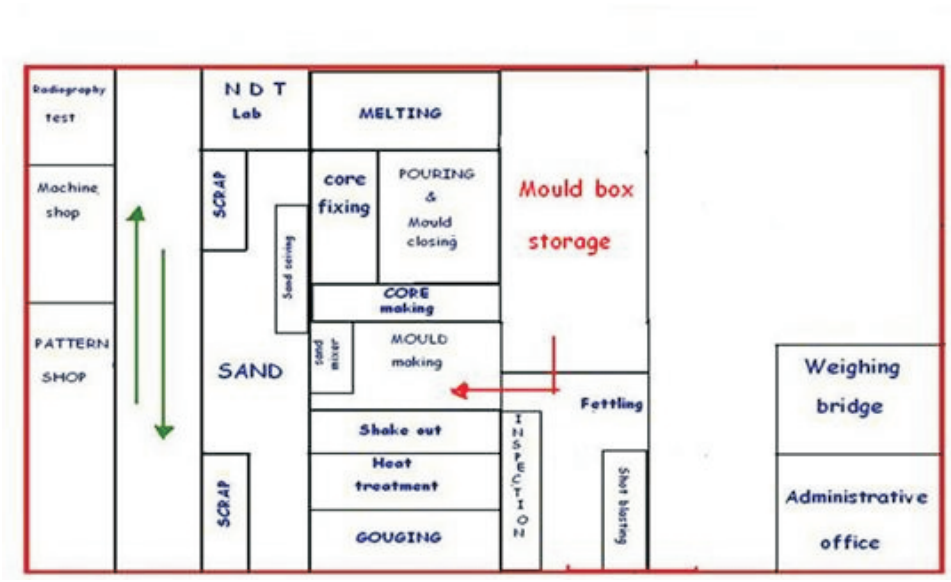


Fig.2 Plant layout

4.2 Improper transferring of Chills

Provide small trolley .To take the chills from that section moulding section the time taken and man power consumption effectively decreased.

4.3 Improper handling of grids

Use cranes only to handle grids and also grounding the grids with out any damaging. Grids are shifted with cranes with care fully. So drop the grids slowly and not drop from some height.

4.4Implementing methods to reduce the defects

i.Blow holes:

Avoid hard ramming Avoid excessive fine grains Provide proper venting to escape gases present in the mould.

ii.Sand spots:

Before closing the mould clean the mould cavity with compressed air. Avoid excess turbulence in gating system, proper moulding. By these all dust and sand particles are removed .So sand spots are reduced.

iii.Metal penetration:

We implement Avoid too coarse mould and core sand. Avoid excessive metal temperature.

iv.Pin holes:

Those avoid high moisture and gas producing material in sand.

v.Surface Cracks:

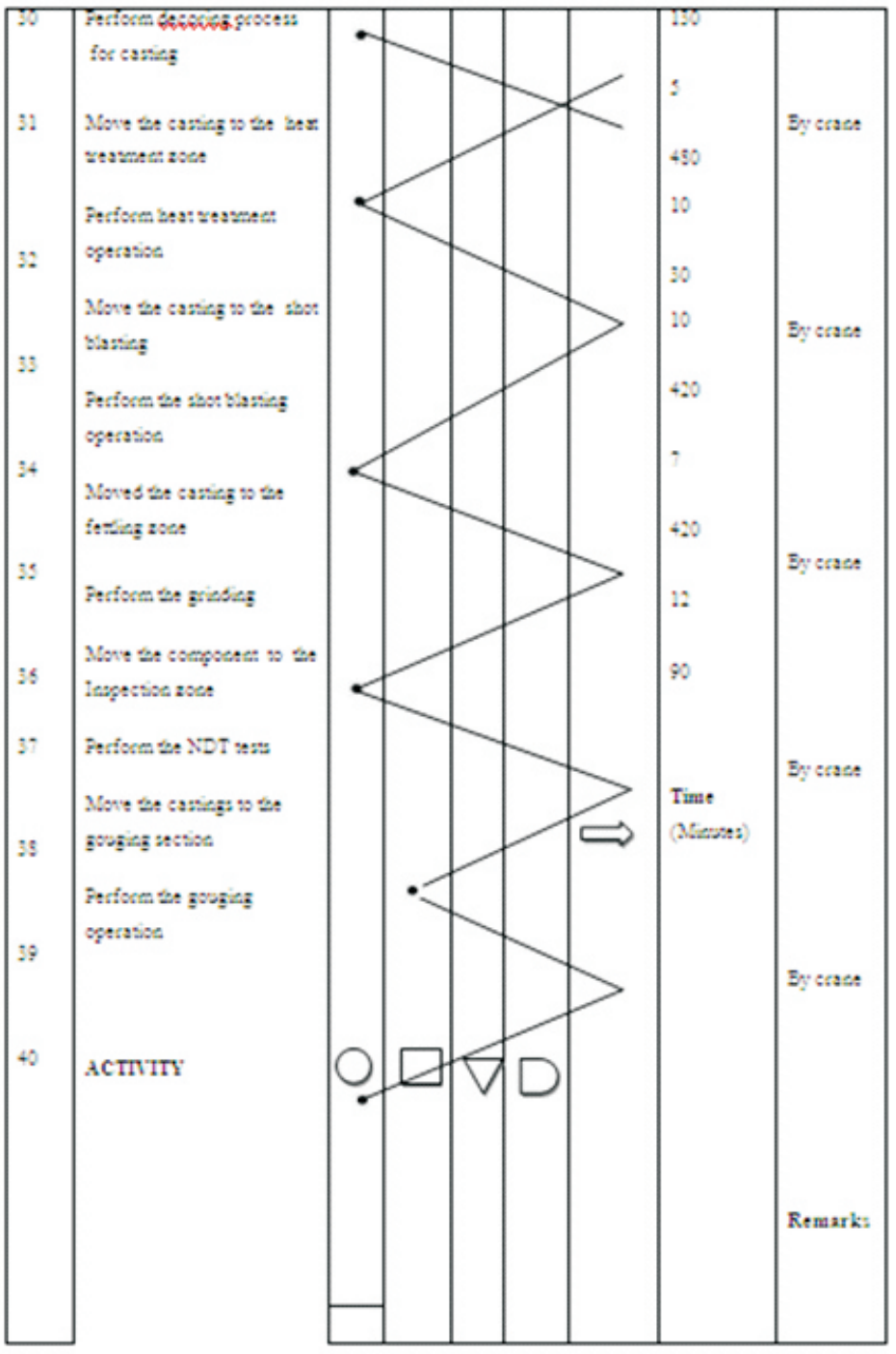
Maintain the pouring temperature of the molten metal.

5.0 RESULTS AND DISCUSSION

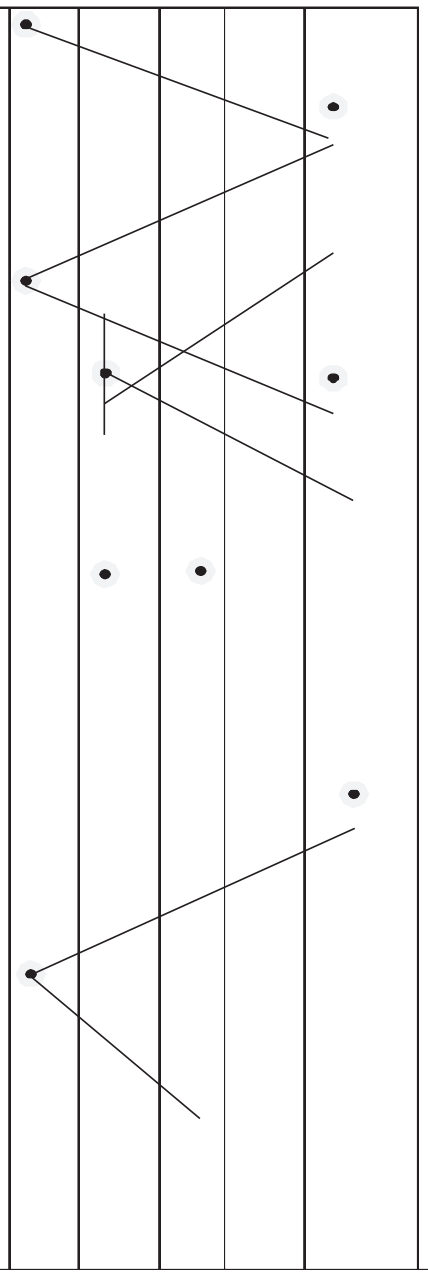
After implementing the proposed methods to the existing method, we eliminating the unnecessary elements of the process involve in existing system and construct the flow process diagram, Analyze the process chart and flow diagram by subjecting each and every step to questioning procedure and evolve modified method (i.e. process analysis). This Implement method is not only reducing the time but will also make possible to simplify the work and reduce fatigue. The flow process chart is given below.

	Activity	○	□	▽	D	⇨	Time (minutes)	Remarks
1	Pattern making						4000	
2.	Moved pattern to moulding section						10	By crane
3.	Waiting for mould boxes from mould box storage.						3	
4	Mould box is moved to moulding section						3	By trolley
								By crane
5.	Place the mould box in the pit.						5	By sand
6.	Pour the sand in the mould box						5	Mixing machine
7	Place the pattern in the mould						20	By crane
8	Pour the sand in the mould						5	
	Waiting for chills							
9	Move the chills to the						5	
10	moulding section							By man
	Place the chills in the mould						5	
11	Ramming						5	
	Wait for setting the pattern							
12	in the mould							
13	Remove the pattern from the mould.						100	
							120	
14	Move the mould boxes to core shop.						8	By crane
15	Applying coating for moulds and cores						9	By crane
16							60	

	Activity						Time (minutes)	Remarks
17	Wait for drying the coating						40	
	Fix the cores in the mould							
18							60	
	Closing the moulds							
19							20	By crane
	Move the preheating the							
20	equipment to the mould						3	By crane
	Pre heating the mould							
21							60	
	Move the scrap to the							
22	furnace						20	By crane
	Melting							
23							120	By
	Removing slag from the							furnace
24	molten metal						10	
	Move the ladle to the							
25	furnace						3	By crane
	Pour the molten metal to							
26	ladle ,from ladle to mould						2	By crane
	Solidification							
27							5760	
	Shakeout							
28							120	
	Move the component to the							
29	fettling zone						5	By crane
	Activity						**Time** (Minutes)	**Remarks**


30
Perform decoring process for casting
31
Move the casting to the heat treatment zone
Perform heat treatment operation
32
Move the casting to the shot blasting
33
Perform the shot blasting operation
34
Moved the casting to the fettling zone
35
Perform the grinding
Move the component to the Inspection zone
36
37
Perform the NDT tests
Move the castings to the gouging section
38
Perform the gouging operation
39
40
ACTIVITY
150
5
450
10
30
10
420
7
420
12
90
Time (Minutes)
By crane
By crane
By crane
By crane
Remarks

41	Pre heating the defect zone	120	
42	Move the casting to the welding zone	5	By crane
43	Perform the welding operation	300	
44	Move the casting to the inspection zone	5	By crane
45	Perform the inspection to the casting	420	
46	Check the dimensions as per drawing	240	
47	Move the casting to the machine hop	20	By crane
48	Perform machining operation	360	
49	Move the casting to the dispatch	20	By crane



6.0 PRODUCTIVITY

Using Formulas:

Productivity= ((Production/no. of work force) x 1000) ÷ no. of working hours in kg/ man-hour

Measurement of productivity: Physical output per man-hour
Production= 150 tones
Number of work force=300
Number of working hours=228
Productivity (kg per man-hour) = (Production (tones) / number of work force) ÷ Number of working hours

Calculation:

Productivity= ((150/300)X 1000) / 228
=2.1929 kg per man-hour.

COMPARISON OF PROCESS TIME IN FLOW PROCESS CHART

	Existing method	After Implementing methods
Time(Hours)	**258**	**228**

% decreasing in time by implementing methods = (258 – 228) ÷ 258
=0.116
=11.6 %

% of Improvement in Productivity:

$$\frac{\text{Productivity after implementation} \;\text{—}\; \text{Existing Productivity}}{\text{Existing productivity}} \times 100$$

= ((2.1929 -1.937) / 1.937) x 100
= 13.16 %.

Production in remaining in 30 hours

Time(hour)	Productivity(ton per man-hour)
228	150
1	0.65

Production in remaining in 30 hours = 30 X 0.65
=19.5 tons

7.0 CONCLUSION

Improving the productivity is not a single task. It is combination of different parameters and methods. We use the methods, work study, method study and process analysis. By conducting these three methods we get proper idea about the problems arising in the work process flow.After we implementing some methods to reduce these problems, and improve productivity. Finally we conclude that the productivity is improved to 13.16 %.

8.0 REFERENCES

1.W. Heinrich, M. Porsche, “Methods for Automatic X-Ray Inspection of Castings,” IFACDigital Image Processing in Industrial Applications, Espoo, Finland, 1986, pp. 41-46.
2.The American Foundry men's Society, International Atlas of Casting Defects, AFS, Deplanes, Illinois, 1974.
3. Text book of Introduction to work study by M.N. Pal, A.K. Chatterjee, S.K. mukherjee, Oxford & IBH Publishing Co. Pvt. Ltd. 2010.
4. Prof. DR S.M. sane, promod p. shewale, Manmath S. shete, “Improvement in plant layout using systematic layout planning (SLP) for increased productivity”, International Journal of Advanced Engineering Research and Studies, E- issn2249-8974, IJAERS/VOL.I/Issue III/April- June,2012 /259-261 .