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**TO IMPROVE THE PRODUCTIVITY IN A PROCESS INDUSTRY BY USING  
LABOURS****PARDEEP KUMAR**

ASSISTANT PROFESSOR IN NIILM UNIVERSITY, KAITHAL, HARYANA

**DILBAGH SINGH**

ASSISTANT PROFESSOR IN NIILM UNIVERSITY, KAITHAL, HARYANA

**ABSTRACT**

Today the world is moving from an era of separate national economies to the networked global economy. The expectations of human beings have risen tremendously. Achieving Manufacturing Excellence is the new paradigm for the industries to survive and sustain in the age of global competition and so improving productivity. I visit the process industry with a team of four persons. The purpose of my visiting was to check or improve the productivity by utilizing the labours. During my visit I found a lot of factors due to which the rate of the production was low or in other words we can say that by making some improvement in these factors we can improve our productivity. Some of these factors were: Labours, Breakdowns of machines, Continuous use of old & unrepaired machines, Ideal time taken by workers, Rate of interest in work taken by workers, Shortage of raw material

**KEYWORDS:** Productivity, Labour, Breakdowns, Idle time

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**INTRODUCTION**

As we know that there is no standard one-shot formula or prescription for raising productivity. No proven best method; no perfect solution. Human knowledge and creativity have raised productivity over thousands of years and will also continue to do so in the years to come. So on the basis of these there is five ways to improve productivity: Maintain input but increase output, Decrease input but increase output, Decrease input but maintain output, Decrease input with smaller decrease in output, Increase input but get a greater increase in output. In other words increase in output by itself is not increase in productivity. If input of resources has gone up in direct proportion to the increase in output, productivity has remained unchanged. Had resource-input risen higher in proportion to output, productivity would have, in fact, deteriorated. Improving productivity levels in industries is a necessary for survival and economy growth of any country. Productivity level s is alarmingly low in most of the industries there are multiple reasons for this serious malady. These include: Low capital investment, Low capital-Labour ratio and Low level of labour-utilization, Government regulations, Low work ethics and High energy costs. Hence improving labour utilization levels in the industries will directly influence productivity levels. Productivity is the index of economic growth and so concern at the national level to conserve scare resources and to encourage deployment or use of available resources in such a way so as to maximize the yield.

As we know that total productivity is equal to:

$$P_{\text{total}} = O_t / I_l + I_c + I_r + I_m$$

Where,  $P_{\text{total}}$  =Total productivity

$I_l$  = Labour input

$I_c$  =Capital input

$I_r$  =Raw material and finished parts inputs

$I_m$  = other miscellaneous goods and services inputs

In other words we can say that, Productivity = Output/ Input

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**METHODOLOGY**

The success of any kind of survey is more or less directly proportional to methodology adopted for it. The methodology tells us way in which whole process was carried out, right from beginning up till end. Technology used for evaluating Labour productivity is Work Sampling. It is a technique which is based on algorithm for determining utilization of labour. The discussion of various methods used to improve the same is as follows:

Identifying elements such as working idleness viz. W & X Conducting the work sampling study in pressure vessel (PV) shop-I & Weight age of all the nine idleness elements.

Observations are taking at different time estimated for 10 days.

Cumulative chart for showing idleness percentage along with cumulative time in minutes for all individual idleness of different elements (Day wise) for PV shop-I

Cumulative chart for showing idleness percentage along with cumulative time in minutes for all different sub elements (from X<sub>1</sub> to X<sub>9</sub>) for PV shop-I is prepared for analyzing capacity utilization deeply.

Finally, labour utilization is concluded along with out of total percentage of idleness for PV-I shop.

Identifying maximum weighted idleness elements.

Improving layout of domain area.

Determining improvement factor for PV-I shop in division.

**TECHNIQUE USED FOR IMPROVING PRODUCTIVITY IS WORK STUDY**

Technique used for improving productivity is Work Study.

Formula Used:

No. of Observations:

$$n = \frac{4p(1-p)}{A^2} \text{ i.e. } A=0.03$$

Preliminary survey of pressure vessel shop I on 14-2-2008

Estimate of P (Working) for PV-I =  $67/100 = 67\%$  (working)

For not working:

Estimate of P (not Working) for PV-I =  $33/100 = 33\%$  (not working)

So no. of observation =  $n = 4p(1-p)/A^2 = 4 * 0.67 * 0.33 / (0.03)^2 = 983$

Accuracy Achieved

$$A = \sqrt{4p(1-p)/n}$$

$$= \sqrt{4 * 0.67 * 0.33 / 983} = 1.76\%$$

## RESULTS

Result of preliminary survey of Pressure Vessel-I (PV-I)

No. of Workers	Estimate activity	Accuracy desired	No. of Observations	Accuracy achieved
10	67 % (working)	3 %	983	1.76 %

True value of idleness percentage:

$$P^- = 755/3200 = 0.2359 \text{ or } 23.59\%$$

Now, Upper Control Limit (UCL)

$$UCL = p^- + 3\sqrt{P(1-P^-)/n}$$

Where n = no. of observation in a day, i.e. 320

$$\text{So, } UCL = 0.2359 + 3\sqrt{0.2359 * 0.7641/320}$$

$$= 0.4184$$

$$41.84\%$$

Lower Control Limit (LCL)

$$LCL = \bar{p} - 3\sqrt{\bar{p}(1-\bar{p})/n}$$

Where n= no. of observation in a day, i.e. 320

$$\text{So, } UCL = 0.2359 - 3\sqrt{0.2359 * 0.7641/320}$$

$$= 0.1533$$

15.33 %

### Table for improvement

Sr. No.	Idleness elements	Weightage	Action Plan	Proposed Improvement
1	X1	24.68 %	By making record of entering time of every labour person by using card punching system.	Saving in work time by 8.5 % of the total time per shift.
2	X2	22.19 %	Making shop floor environment more comfortable than before. By using new type exhaust fans to extract fumes from vessels.	Saving in work time by 3.2 % of the total time per shift.
3	X3	23.12 %	Once by changing layout of PV-I shop & adjusting tool room nearby work shop.	Increase in productivity is introduced by 2.3 %.
4	X4	23.44 %	By providing refreshments to labour at their seat by canteen contractors. Making toilets & wash basins more in no. & just near shop floor.	Increase in productivity by per shift & reduction in time for personnel needs by 4.1 % & saving of man power.
5	X5	40.00 %	By making walls adjusted store room & clean. By providing fasteners to labour near their working place.	Productivity is increased up to 8 % by implementing suggested action.

6	X6	20.00 %	To qualify workers at starting of their relevant jobs by their supervisors.	Saving in working time by 2.5 % as compared to present manual working.
7	X7	21.56 %	Material required to workers is pre-checked by their supervisors & inspection staff.	Productivity is raised by implementing suggested plan to 2 %.
8	X8	15.94 %	Study was conducted once to change layout of PV-I shop, however, there was good saving.	Increase in productivity by per shift & avoidance of involvement of waiting of crane by 1.2 % & saving of man power.
9	X9	27.81 %	By providing rewards as incentives to non or less absentee labour.	Saving in working time by 3.4 % as compared to present manual working.

**Cumulative Chart for idleness % showing % of the different reasons of idleness (Day wise)**

**PV Shop-I**

Sr. No.	Date	No. of Obs.	No. of Idles	Cum. No. of Obs.	Cum. No. of Idles	Idle % Cum.	XI	Cum XI	Cum % XI
1	15/02/08	320	79	320	79	24.68 %	12	12	15.19 %
2	16/02/08	320	71	640	150	23.43 %	9	21	14.00 %
3	22/02/08	320	74	960	224	23.33 %	12	33	14.73 %
4	23/02/08	320	75	1280	299	23.35 %	8	41	17.90 %
5	29/02/08	320	128	1600	427	26.68 %	4	45	10.54 5
6	01/03/08	320	64	1920	491	25.57 %	8	53	10.79 %
7	07/03/08	320	69	2240	560	25.00 %	9	62	11.07 %
8	08/03/08	320	51	2560	611	23.86 %	10	72	11.78 %
9	14/03/08	320	89	2880	700	25.00 %	9	81	11.57 %
10	15/03/08	320	55	3200	755	23.59 %	10	91	12.05 %

**Cumulative Chart for idleness % showing % of the different reasons of idleness (Day wise)****PV Shop-I**

X2	Cum X2	Cum % X2	X3	Cum X3	Cum % X3	X4	Cum X4	Cum % X4	X5	Cum X5	Cum % X5
11	11	13.92 %	27	27	34.17 %	10	10	12.66 %	8	8	10.13 %
12	23	15.18 %	20	47	31.33 %	8	18	12.00 %	6	14	9.33 %
11	34	16.96 %	24	71	31.69 %	10	28	12.50 %	6	20	8.33 %
4	38	16.59 %	27	98	42.79 %	7	35	15.28 %	6	26	11.33 %
9	47	11.00 %	43	141	33.02 %	3	38	8.9 %	3	29	6.79 %
11	58	11.81 %	20	161	32.79 %	6	44	8.96 %	6	35	7.13 %
10	68	12.14 %	24	185	33.03 %	6	50	8.93 %	6	41	7.32 %
8	76	12.44 %	16	201	32.90 %	7	57	9.33 %	2	43	7.03 %
9	85	12.14 %	16	217	36.17 %	12	69	9.86 %	5	48	6.86 %
8	93	12.31 %	14	231	30.60 %	7	76	10.07 %	6	54	7.60 %

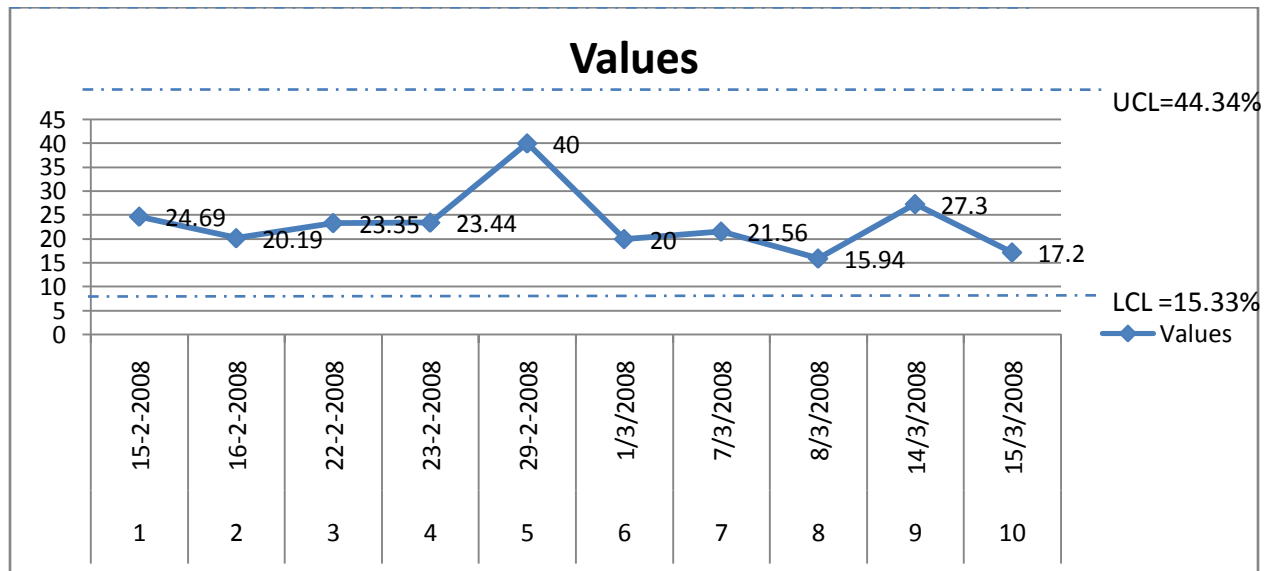
**Cumulative Chart for idleness % showing % of the different reasons of idleness (Day wise)****PV Shop-I**

X6	Cum X6	Cum % X6	X7	Cum X7	Cum % X7	X8	Cum X8	Cum % X8	X9	Cum X9	Cum % X9
4	4	5.06 %	5	5	6.33 %	7	7	8.86 %	0	0	
6	10	6.67 %	4	9	6.00 %	6	13	8.87 %	0	0	
3	13	5.80 %	5	14	6.25 %	6	19	8.48 %	0	0	
9	22	9.60 %	6	20	8.73 %	10	29	12.66 %	0	0	
21	43	10.07 %	12	32	7.50 %	17	46	10.77%	16	16	3.74 %
4	47	9.57%	3	35	7.12 %	6	52	10.59%	0	16	3.25 %
3	50	8.93 %	3	38	6.78 %	8	60	10.71%	0	16	2.85 %
2	52	8.51 %	3	41	6.71 %	3	63	10.31%	0	16	2.62 %
6	58	8.28 %	6	47	6.71 %	10	73	10.43%	32	48	6.85 %
3	61	8.08 %	4	51	6.75 %	3	75	9.93%	0	48	6.36 %

**Determination of idleness percentage (Day Wise)**

Sr. No.	Date	No. of Observation	No. of Idles	Idleness %
1	15/02/08	320	79	24.68 %
2	16/02/08	320	71	22.19 %
3	22/02/08	320	74	23.12 %
4	23/02/08	320	75	23.44 %
5	29/02/08	320	128	40.00 %
6	01/03/08	320	64	20.00 %
7	07/03/08	320	69	21.56 %
8	08/03/08	320	51	15.94 %
9	14/03/08	320	89	27.81 %
10	15/03/08	320	55	17.18 %
		3200	755	

Graph for control chart of PV-I (Day wise)



## RESULTS & DISCUSSION

### For pressure vessel shop-I:

Out of 320 observations made on 10-02-2008 the total no. of idles (X) =79

Out of 320 observations made on 16-02-2008 the total no. of idles (X) =74



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Out of 320 observations made on 22-02-2008 the total no. of idles (X) =71

Out of 320 observations made on 23-02-2008 the total no. of idles (X) =75

Out of 320 observations made on 29-02-2008 the total no. of idles (X) =128

Out of 320 observations made on 02-03-2008 the total no. of idles (X) =64

Out of 320 observations made on 07-03-2008 the total no. of idles (X) =69

Out of 320 observations made on 08-03-2008 the total no. of idles (X) =51

Out of 320 observations made on 14-03-2008 the total no. of idles (X) =89

Out of 320 observations made on 15-03-2008 the total no. of idles (X) =55

## CONCLUSTIONS

### Causes & remedies:

#### Causes: Late starting & early ending (X1 & X2)

**Remedies:** There should be some fine or restrictions for entry time & exit time.

Extra time should be given to workers for changing their shop dresses rather than the working time on the shop floor.

#### Causes: Visit more time to Tool Room/Store etc (X3)

**Remedies:** There should be good connection between tool room & shop.

#### Causes: Personal needs (X4)

**Remedies:** If workers remains frequently absent from his place due to his personal needs then supervisor must be very strict against him.

#### Causes: Idleness because of misplanning of material in store room (X5)

**Remedies:** The schedule charts must be prepared & should then be passed to the purchasing department, so as to make them able to provide the necessary material.

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