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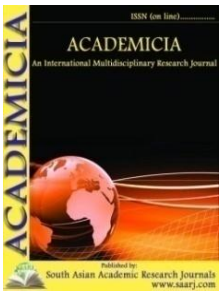

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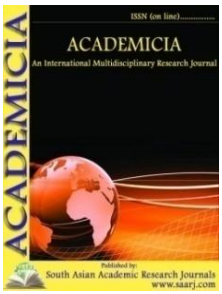

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REDUCING OPERATIONAL CYCLE TIME USING SMED TECHNIQUE

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ABSTRACT

This paper focuses on how SMED Technique helps an organization to save time of their operational cycle. It shows that parallel working along with SMED technique gives an effective result. It presents the findings of the work carried out at TATA STEEL GLOBAL WIRES at Tarapur production plant during the period of June, 2011 – July, 2011. A Project entitled "TIME SAVING & COST REDUCTION USING SMED TECHNIQUE "was undertaken during this tenure. In this span, all the Changeovers and related processes were studied for the period of 2 months; also cost saving through raw material consumption was done. The main objective of the initiative was to reduce the changeover time i.e. to reduce operational cycle time.
The main objective of the project is Time saving and suggest measures to control the cost through raw material handling.

KEY WORDS: *Single-Minute Exchange of Die), Material Handling, Cost Saving.*

APPROACH:

I. Selection of machine on which it is approximately observed that the raw material wastage is more.
II. Analyzing the data of past two months i.e. of APRIL11 & MAY 11.
III. Analyzing & observing the machine design and handling habits.

- To start the study, observation of changeover time on two machines which are wire drawing machine, named 102 & 104.

- Selecting one machine
- Total die-changes happened during this tenure & total changeover times are calculated.
- Prepared list of all activities which are used to happened in all the changeovers.
- Pareto analysis has been conducted to prioritize the critical activity which is consuming large time in changeover process.
- Executing SMED technique for reducing the changeover time.
- Streamlining the whole process.

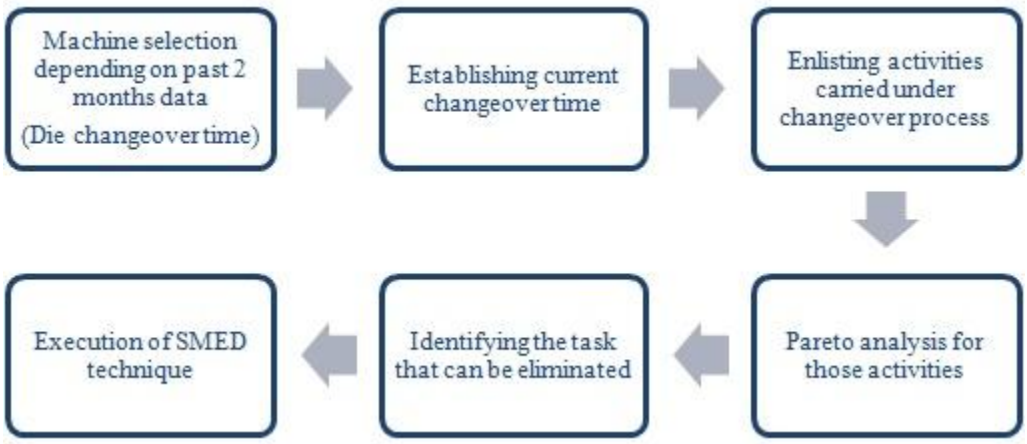


Figure: Approach of research

INTRODUCTION:

- Wire drawing is metal working process used to reduce the cross section area of wire by pulling the wire through many dices.
- Firstly the wire is get fitted through the die then It is pulled through the die as the wire is pulled through the die its volume remains the same, so as the diameter get decreases & the length increases.

ORGANIZATION FEATURES:

- TSGW has fully integrated manufacturing processes, from sourcing of raw materials to in-house steel making and wire rod rolling facilities.
- It has a combined annual manufacturing capacity of 670,000 MT and employs over 2000 people worldwide.
- The Wire Section has been the only supplier of pre-stressed concrete strings used in the construction of precast sector for the 4.7 kms, 8-lane- cable-stayed Bandra-Worli Sea Link at Mumbai, India.

MANUFACTURING PROCESS AT TATA STEEL GLOBAL WIRES LTD

Wire drawing is a metal working process used to reduce the cross section area of the wire.
Once end of the wire is reduced and passed through the opening of the die, gripped and pulled to reduce its diameter

- small diameter wire is generally draw on drawing machines which consists of a series of dies ,each held in the water cooled die block.
- Each die reduces the cross section by little amount so as to avoid the unnecessary stress in the wire.
- Drawing machines are a series of machines in which the smaller diameter wire will be drawn.
- Diameter will be compressed in no. of stages.
- Cooling arrangement is there for avoiding thermal breakdown in the wire.
- It is performed in no of steps .in order to avoid failure of wire.
- First of all there will be a starting stock in spiral form then it goes to the box containing lubricant powder where its lubrication has been done and then it passed through the die.
- One of the opening phase of the die will fix on how much reduction will be there & then after it goes to draw wire.
- The rotating draw block will provide a continuous pull on the incoming wire.
- There are some processes which have to be done before actual drawing process for steel drawing these are neutralization & cleaning.
- Proper powder lubrication is essential in order to improve die life, forces, improve surface finish, reduce heat, and to reduce drawing.
- These can be of three types
  - ✓ Wet drawing lubrication
  - ✓ Dry drawing lubrication
  - ✓ Coating

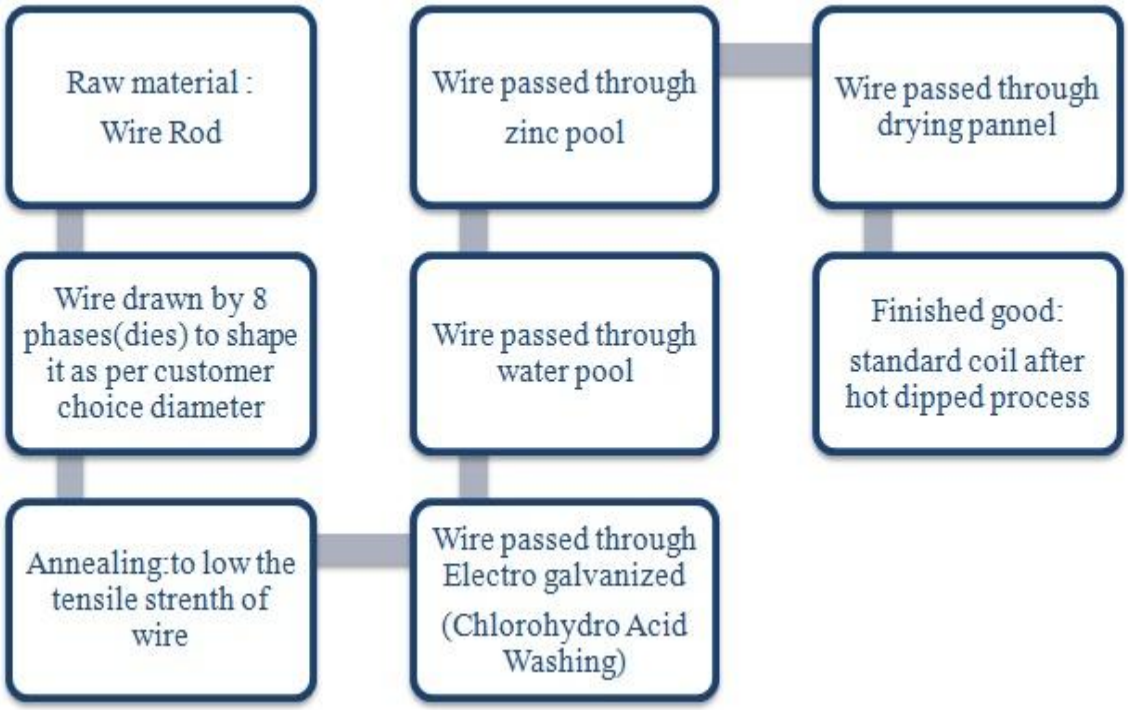


FIGURE: Wire Drawing Process

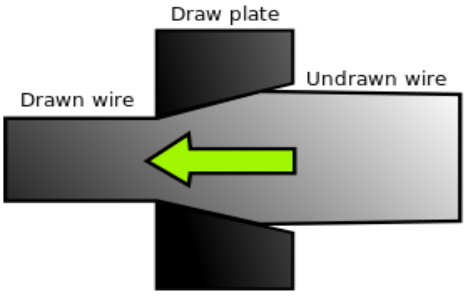


FIGURE: Wire drawing concept

LITERATURE REVIEW:

TIME

- **Time** is a part of the measuring system used to sequence events, to compare the durations of events and the intervals between them, and to quantify rates of change such as the motions of objects.
- An operational definition of time, wherein one says that observing a certain number of repetitions of one or another standard repeated event constitutes one standard unit such as the second, is useful in the conduct of both advanced experiments and everyday affairs of life.

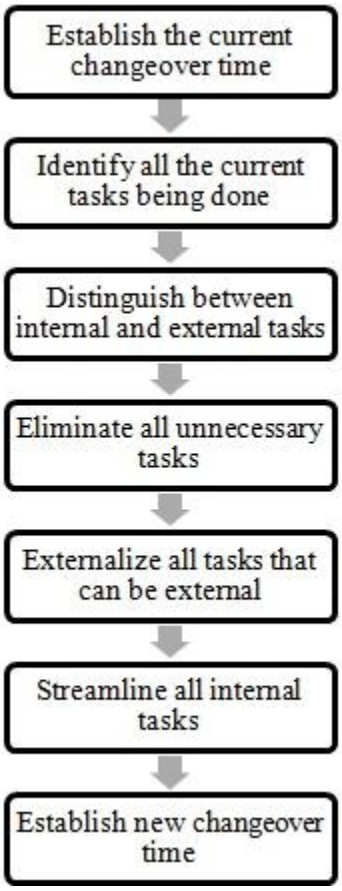
TIME MANAGEMENT

- **Time management** is the act or process of implementing control over the amount of time spent on specific activities, especially to increase effectiveness or productivity.
- Time management may be assisted by a range of skills, tools, and techniques used to manage time when completing specific tasks, projects and goals.
- This set includes a wide extent of activities, and these include planning, allocating, setting goals, analysis of time spent, monitoring, organizing, scheduling, and prioritizing.
- Time management strategies are often related with the commendation to set personal goals. These goals are documented and may be assembled into a project, an action plan.
- A **task list** is a list of tasks to be accomplished, such as steps toward finishing a project. It is an inventory tool which provides as an alternative to remembrance.
- When one of the items on a task list is completed, the task is *verified*. The traditional method is to note down these on a piece of paper with a pen or pencil.
- **Operational cycle time:** The operational cycle time is the targeted rate at which a part or product comes off the line to match customer demand

SMED (SINGLE-MINUTE EXCHANGE OF DIE)

- It is a technique that was developed to speed up press tool changeovers but is equally applicable to a whole range of manufacturing processes
- Whilst changeover times of less than a minute may be out of reach. The technique and its steps will reduce set up times by a long margin.
- SMED uses a 7 step process to measure the current changeover time, set a realistic target and then analyse the process for improvement.
- This concept was first placed in a book by Shigeo Shingo in 1985 called "A revolution in manufacturing: the SMED system" (published by Productivity press).
- **Single-Minute Exchange of Die** (**SMED**) is one of method from many the lean production methods which are for reducing waste in a manufacturing process. It gives a speedy and competent way of renovating a manufacturing process from running the current product to running the next product. This quick changeover is a key to reducing production lot sizes and as a result improving process stream.
- The phrase "single minute" does not mean that all die change processes and resumes should take only *one* minute, but that they should take less than 10 minutes.
- **SMED** is a planned methodology.
- The goal of SMED is to changeover/turnaround in the MINIMUM TIME possible but never compromise safety of workers or quality of product.
- Changeover means all the work and time involved between making the last good product, batch or part to the next product, batch or part at normal efficiency/speed.

THE SMED PROCESS



- **TASK DEFINITIONS :**

A. External task: Tasks that could be done when the machine or line was running.

B. Internal task: Tasks that must be done when the machine or line is stopped.

- **THE SMED METHODOLOGY STEPS**

SMED or Quick Changeovers can be conducted according to the following steps:

1. considering the process and its constraints identify a process area that is a constraint and consider how beneficial SMED might be for the whole system's performance.
2. Select a certain machine area or work area for setup or changeover time reduction activities.
3. Form the setup reduction team.
4. Conduct training and education if needed.
5. Study and document the activity and duration of the current changeover or setup process (e.g., use video tape). Use this as the starting benchmark
6. Classify setup operations into waste, internal setups, and external setups.

a. Waste – Operations or actions, which do not add values to the setup.

b. Internal Setups - Operations that can only be performed while the machine is shut down.

c. External Setups - Operations that can be performed without shutting down the machine.

7. Eliminate the waste.
8. Convert as many internal setups as possible to external setups.
9. Improve internal setups (include adjustment).

a. Use specially designed cart to organize tools.
b. Use quick-release fasteners instead of bolts and nuts.
c. Use stoppers to quickly position the jigs.
d. Use rolling bolsters instead of cranes.
e. Use overhang mechanisms to handle heavy jigs.
f. Use locating pins and holes (socket) to eliminate the adjustment.
g. Use standardized die height.
h. Standardize bolt types and sizes, screw types and sizes, etc.

10. Improve external setups.

a. Apply visual control principles.
b. Use checklist to avoid omission.
c. Use specially designed cart to help organize tools.
d. Organize workplace (5S) to reduce search.

11. Develop the standard operating procedure (SOP).
12. Conduct training and education if needed.
13. Study and evaluate the performance of the new setup or changeover process.
14. Prepare for the next setup reduction project.

- People in SMED team need team working and skills and structures as follows:

1. A clear goal
2. A plan with objectives and milestones to convert the goal into reality
3. Clear team roles
4. Excellent communications
5. Agreed team behavior
6. Good decision making processes based on facts
7. Balanced participation and complementary interpersonal skills
8. Logical approach to solving problems
9. Access to technical capability(if not in the team)

- **ADVANTAGES :**
- Combining setup operations reduce the number of set-ups, increase the work rate, and increase productivity proportionately.
- Inventory serves as a cushion, alleviating problems when defects show up or Machinery breaks down
- Inventory can be used to fill rush orders.

RESEARCH METHODOLOGY:

Research methodology is a systematic approach towards the research work that is to be done. Research in simple words means obtaining information through observation, data collection and to develop propositions and research out a conclusion. As we have finalized to reduce the cost by making some changes in material handling habits and in machines. It is very important to identify such parts or area of the machines where the raw material gets wasted.

Experimentation research design is also opted for project work as during project various experiments are carrying out for process improvements and based on results of same actual implementation will take place.

SAMPLING DESIGN:

Sampling design includes following points.

a. Sampling frame: TATA STEEL Ltd, Tarapur.
b. Sampling unit: Questionnaire filled by 5 operators.

SOURCES OF DATA:

I. PRIMARY DATA:

a) Worker's work practice: It is considered because there is a need to improve the habits by making good and efficient changes in their habits. Sequential process is observed. Time taken by each process is noted repeatedly so it will be easy to get average reading. Difficulties or hurdles faced by operator or workers are noted through questionnaire.

b) Weight: The waste powder which can be used again is weighted daily & report for the powder wastage is made.

c) Supply of raw material/equipments as per need:

- A separate stock of powder for each machine is available near to the machine OR not?
- Is there problem of die shortage, spanners shortage, hand gloves flexibility, air circulation, and dust pollution?

II. SECONDARY DATA:

The secondary data is available and assembled data from proved statements, reports, etc. the data can be acquired from published or non-published material. Secondary data means the data which have already been composed and scrutinized by someone else. When the researcher exploits secondary data, then he/she has to glance into various sources from he/she can achieved them.

1) Analyzing the data of past two months i.e. of April & May 11:

The secondary data required for selection of the machine on which powder wastage is more & the machine on which frequency of program getting changed is more. The daily delay report gives the information about program change for die-set.

2) Analyzing the past data of machine and selecting the machines on quantitative basis i.e.

Selecting machine number-104 for implementing SMED technique & machine number-101 for eliminating the powder consumption problem.

3) Updated data on TATA STEEL INTRANET.

PROBLEM STATEMENT:

Time saving & Cost reduction through

1. By using SMED technique.
2. Raw material handling and saving by making some changes in handling habits & machines.
3. By reducing the wastage & using the wasted raw material again.

RESEARCH QUESTIONS:

1. Does reducing changeover time help the organization to improve its operational cycle time?
2. What factors that an organization should take into consideration to develop an effective changeover process?

OBJECTIVES OF STUDY:

The main objective of the project is to study and suggest measures to control the cost through raw material handling.

PRIMARY OBJECTIVES:

1. To suggest the ways to minimize the cost.
2. To recommend for optimize the utilization of raw material.
3. To make time efficient working schedule for changeover period & to increase the productivity.

SECONDARY OBJECTIVES:

1. To minimize the material handling.
2. To achieve cost effectiveness.
3. To save the time of cleaning the area nearby machines.

4. To improve the orderliness, cleanliness, standardization & increase the safety in the workplace.

SAMPLING DESIGN:

Sampling design includes following points.

a. Sampling frame: TATA STEEL Ltd, Tarapur.

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RESEARCH METHODOLOGY:

Research in simple words means obtaining information through observation, data collection and to develop propositions and research out a conclusion. As we have finalized to reduce the cost by making some changes in material handling habits and in machines. It is very important to identify such parts or area of the machines where the raw material gets wasted.

Experimentation research design is opted for project work as during project various experiments are carrying out for process improvements and based on results of same actual implementation will take place.

TIME SAVING USING SMED TECHNIQUE

Analyzing the past two months data of machine and selecting the machines on quantitative basis:

Monthly Machine wise Report -Time taken for die changing (Mins) (Table C)		
M/C No. / **Date**	**102**	**104**
01-Apr-11	-	-
02-Apr-11	62	44
03-Apr-11	-	40
04-Apr-11	142	244
05-Apr-11	40	88
06-Apr-11	210	40
07-Apr-11	35	310
08-Apr-11	215	138
09-Apr-11	-	90
10-Apr-11	30	369
11-Apr-11	30	45
12-Apr-11	-	101
13-Apr-11	-	135
14-Apr-11	-	719

15-Apr-11	54	197
16-Apr-11	349	568
17-Apr-11	-	115
18-Apr-11	-	187
19-Apr-11	45	249
20-Apr-11	15	334
21-Apr-11	-	264
22-Apr-11	-	218
23-Apr-11	125	191
24-Apr-11	334	417
25-Apr-11	70	51
26-Apr-11	60	44
27-Apr-11	-	48
28-Apr-11	60	180
29-Apr-11	113	79
30-Apr-11	184	134
TOTAL(Mins)	2173	5639
TOTAL(Hrs)	36.22	93.98

Monthly Machine wise Report -Time taken for die changing (Mins) (Table: D)

M/C No. / **Date**	**102**	**104**
01-May-11	210	-
02-May-11	-	442
03-May-11	40	-
04-May-11	286	376
05-May-11	60	56
06-May-11	30	56
07-May-11	60	103
08-May-11	-	410
09-May-11	315	-
10-May-11	90	500
11-May-11	33	-
12-May-11	30	66
13-May-11	-	-
14-May-11	30	334
15-May-11	-	168

16-May-11	30	160
17-May-11	150	54
18-May-11	100	225
19-May-11	51	224
20-May-11	-	325
21-May-11	65	-
22-May-11	25	62
23-May-11	66	-
24-May-11	195	87
25-May-11	-	260
26-May-11	30	60
27-May-11	30	-
28-May-11	88	-
29-May-11	120	-
30-May-11	30	99
31-May-11	312	190
TOTAL(Mins)	2164	4067
TOTAL(Hrs)	36.07	67.78

- From Table C & D it was seen that frequency of die-change/program change is more on M/c No.104.

Machine No.	**Speed(m/Sec)**
102	5
104	8

TABLE E: SPEED OF MACHINES

- There is one condition for program change on both these machines i.e. after 180 T production die-set must changed.
- So, from above two tables it is observed that on M/c No.104 time taken for changeover process is more which ultimately affects the production.

  So, to reduce the intensity of this time consumption problem SMED (Single Minute Exchange of Dies) technique is used.
- SMED is a structural methodology.
- The goal of SMED is "To changeover/turnaround in the MINIMUM TIME possible!"& "No compromise with safety or quality".

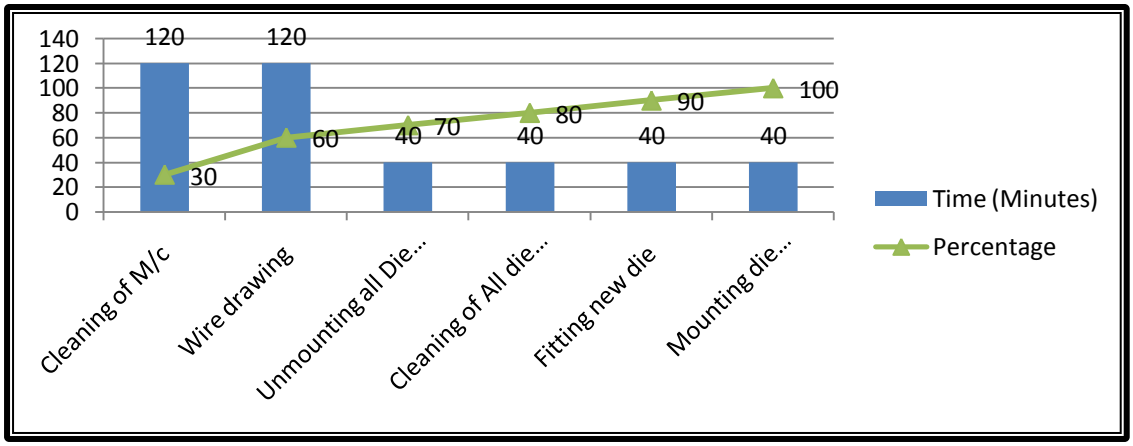
DATA ANALYSIS:

STEP 1: ESTABLISHING CURRENT CHANGEOVER TIME AND IDENTIFYING ALL THE CURRENT TASKS BEING DONE.

To find out the reasons of this time consumption, changeover process is observed. After three observations for changeover process the average readings are taken as follows:

Sequence	Process	Time (Mins)-Avg
1	Cleaning of M/c	120
2	Un-mounting all Die assembly	40
3	Cleaning of All die holder	40
4	Fitting new die	40
5	Mounting die assembly	40
6	Wire drawing	120
TOTAL		400

TABLE F: TIME CONSUMPTION BY EACH PROCESS



GRAPH A: PARETO CHART OF CHANGEOVER PROCESS

From Table F and above graph A, the process of cleaning the whole machine and wire drawing through all passes of machine took maximum time so it needs more attention. Approximately the changeover process took 6hrs 40mins, it means loss of 240 T in downtime by referring Table E.

Speed	Production/Hr
High speed	36 T
Low speed	15 T

TABLE G: PRODUCTION AS PER THE SPEED

STEP 2: IDENTIFYING THE TASK THAT CAN BE ELIMINATED

- Adjusting the fan for circulation of air.
- Waiting for welder in any emergency work of weld.
- Wearing and removing the hand-gloves.
- Reducing travelling time from machine to vice table.

STEP 3: DISTINGUISH BETWEEN INTERNAL & EXTERNAL TASKS

Internal Activities
Cleaning of M/c
Die-set ready on desk
Un-mounting all Die assembly
Cleaning of All die holder
Fitting new die
Mounting die assembly
Wire pointing
Wire drawing

TABLE H: ALL INTERNAL ACTIVITIES

STEP 4: CONVERTING (WHERE-EVER POSSIBLE) INTERNAL ACTIVITIES INTO EXTERNAL ONES

External Activities	**Internal Activities**
Die-set ready on desk	Cleaning of M/c
	Un-mounting all Die assembly
	Cleaning of All die holder
Wire pointing	Fitting new die
	Mounting die assembly
	Wire drawing

TABLE I: CONVERSION OF INTERNAL ACTIVITIES TO EXTERNAL ACTIVITIES

STEP 5: STREAMLINING THE REMAINING INTERNAL ACTIVITIES, BY SIMPLIFYING THEM

- The work is divided in between the operators and cleaners, executed simultaneously.
- Availability of all the items required during cleaning and fitting are cross checked through check list, at least half an hour before stopping the machine.

Sr.No.	**Particulars**	**YES**	**NO**
1	New die –Set ready		

2	Packing Rubber		
3	Packing paper		
4	Taplon		
5	Cloth for cleaning		

- By considering all these steps and assuring the availability of all the items from the checklist streamlining of external activities can be achieved.

a) <u>SOLUTION PLAN – I</u>

ASSUMPTIONS: No. of cleaner = 2

No. of spanners (Tool to un-mount the assembly) = 3

Efficiency and ability of all workers is same.

NOTE 1:

Operator	Cleaner	Machine Pass (Phases)	Un-mounting	Cleaning	Fitting of new die	Mounting
OP1,OP2,OP3	I,II	A,B,C,D,E,F,G,H	UNM	CLN	FIT	M

Cleaning of pass	**Un-mounting the assembly**	**Cleaning of assembly**	**Fitting new die in die-holder**	**Mounting new Assembly**	**Wire Drawing**	**Time Slot (Mins)**
	A-OP 1					5
	B-OP2					
	C-OP3					
A - I B - II	D-OP1					5
	E-OP2					
	F-OP3					
	G-OP3	A-OP1				5
		B-OP2				
	H-OP3		A-OP1			5
			B-OP2			
C – I D-II		C-OP1				5
		D-OP2				
		G-OP3				
			C-OP1			5
			D-OP2			
			G-OP3			
		F-OP2				
		H-OP3				

			E-OP1			5
			F-OP2			
			H-OP3			
E - I F-II				A-OP1		5
				B-OP2		
				C-OP3		
				D-OP1	OP3 – A	5
				E-OP2		
					OP1	5
					OP2 -A	
					OP3	
G - I H-II					OP1	5
					OP2 -A	
					OP3	
					OP1	5
					OP2 -B	
					OP3	
				F-OP3	OP1	5
					OP2 – B	
				G-OP3	OP1	5
					OP2 – B	
				H-OP3	OP1	5
					OP2 – C	
					TO DRAW	90
					WIRE TILL	
					LAST	
					TOTAL	170

TABLE J: SOLUTION PLAN - J

According to solution plan – I the time can be reduced by 57.5% of current process time span.

Note: Variance of 20 -25 minutes in case of any emergency work like welding, leakage etc.

b) <u>SOLUTION PLAN – II</u>

Assumptions: No. of cleaner = 4

No. of spanners = 3

Efficiency and ability of all workers is same.

NOTE 1:

Operator	Cleaner	Machine Pass (Phases)	Un-mounting	Cleaning	Fitting of new die	Mounting
OP1,OP2,OP3	I,II,III,IV	A,B,C,D,E,F,G,H	UNM	CLN	FIT	M

Cleaning of pass	**Un-mounting the assembly**	**Cleaning of assembly**	**Fitting new die in die-holder**	**Mounting new Assembly**	**Wire Drawing**	**Time Slot (Mins)**
AE - I BF - II CG- III DH - IV						30
	A-OP1 B-OP2 C-OP3					5
	D-OP3	A-OP1 B-OP2				5
		D-OP3	A-OP1 B-OP2			5
			D-OP3	A-OP1 B-OP2		5
	E-OP1 F-OP2			D-OP3		5
	G-OP3	E-OP1 F-OP2				5
		G-OP3	E-OP1 F-OP2			5
			G-OP3	E-OP1 F-OP2		5
				G-OP3	OP1-A OP2 - A	5
	H-OP3				OP1-A OP2 – A	5
		H-OP3			OP1-A OP2 - A	5
			H-OP3		OP1-B	5

					OP2 - B	
				H-OP3	OP1-B	5
					OP2 - B	
					TO DRAW	50
					WIRE TILL	
					LAST	
Total						140

TABLE K: SOLUTION PLAN - II

According to solution plan – I the time can be reduced by 65% of current process time span.

Note: Variance of 20 -25 minutes in case of any emergency work like welding, leakage etc.

C) SOLUTION PLAN – III

Assumptions: No. of cleaner = 4

No. of spanners = 3

Efficiency and ability of all workers is same.

NOTE 1:

Operator	Cleaner	Machine Pass (Phases)	Un-mounting	Cleaning	Fitting of new die	Mounting
OP1,OP2,OP3	I,II,III,IV	A,B,C,D,E,F,G,H	UNM	CLN	FIT	M

- Cleaning of all die-holder assembly and fitting new die in that, these two operations can be externalize.
- Externalization of these two activities: New die set is fitted in another assembly and keep ready on vice table.
- After cleaning of whole machine only un-mounting of old assembly and mounting newly fitted assembly has to do.

Cleaner I	**Cleaner II**	**Cleaner III**	**Cleaner IV**	**Time (Mins)**
A	B	C	D	15
E	F	G	H	15
Operator I	Operator II	Operator III		5
A- UNM	B -UNM	C -UNM		5
D -UNM	E -UNM	F -UNM		5
G -UNM	H -UNM	A- M		5
B -M	C -M	D- M		5
E- M	F -M	G -M		5
H- M	A-WD	B-WD		5

TO DRAW THE WIRE TILL LAST PASS	110
TOTAL	175

TABLE L: SOLUTION PLAN III

As a result of these two solutions the production loss is reduced as follows:

Speed	**Production/Hr**	**Production loss for 400 minutes (downtime)**	**Solution plan - I Production loss for 170 minutes (down-time)**	**Solution plan - II Production loss for 140 minutes (downtime)**	**Solution plan - III Production loss for 175 minutes (downtime)**
High	36 T	240 T	102 T	84 T	105T
Low	15 T	100 T	42.5 T	35 T	43.75T
Production Loss is reduced by			57.50%	65%	43.75%

TABLE M: PRODUCTION LOSS AS PER THREE SOLUTIONS

- In both the solution, there is no extra cost is included, just planning and scheduling of available resource is done.
- In Table D we have seen that the largest time is taken by process of cleaning of m/c and the process of wire drawing through all the passes i.e. 120 minutes.
- It is not an easy task to reduce the time for the process of wire drawing through all the passes. Because this process requires high efficiency and accuracy.
- But there is a scope to reduce the time taken for cleaning the M/c as follows:

A) By using the vacuum cleaner but this will increase the cost through the purchasing of vacuum cleaner as well as through the power consumption.

B) We can reduce the cleaning time by reducing the waste/dust.

- So, to implement the Scope B some changes in M/c need to be done as follows:
- The powder TR41 B is used as a lubricant to reduce the friction between die and wire.

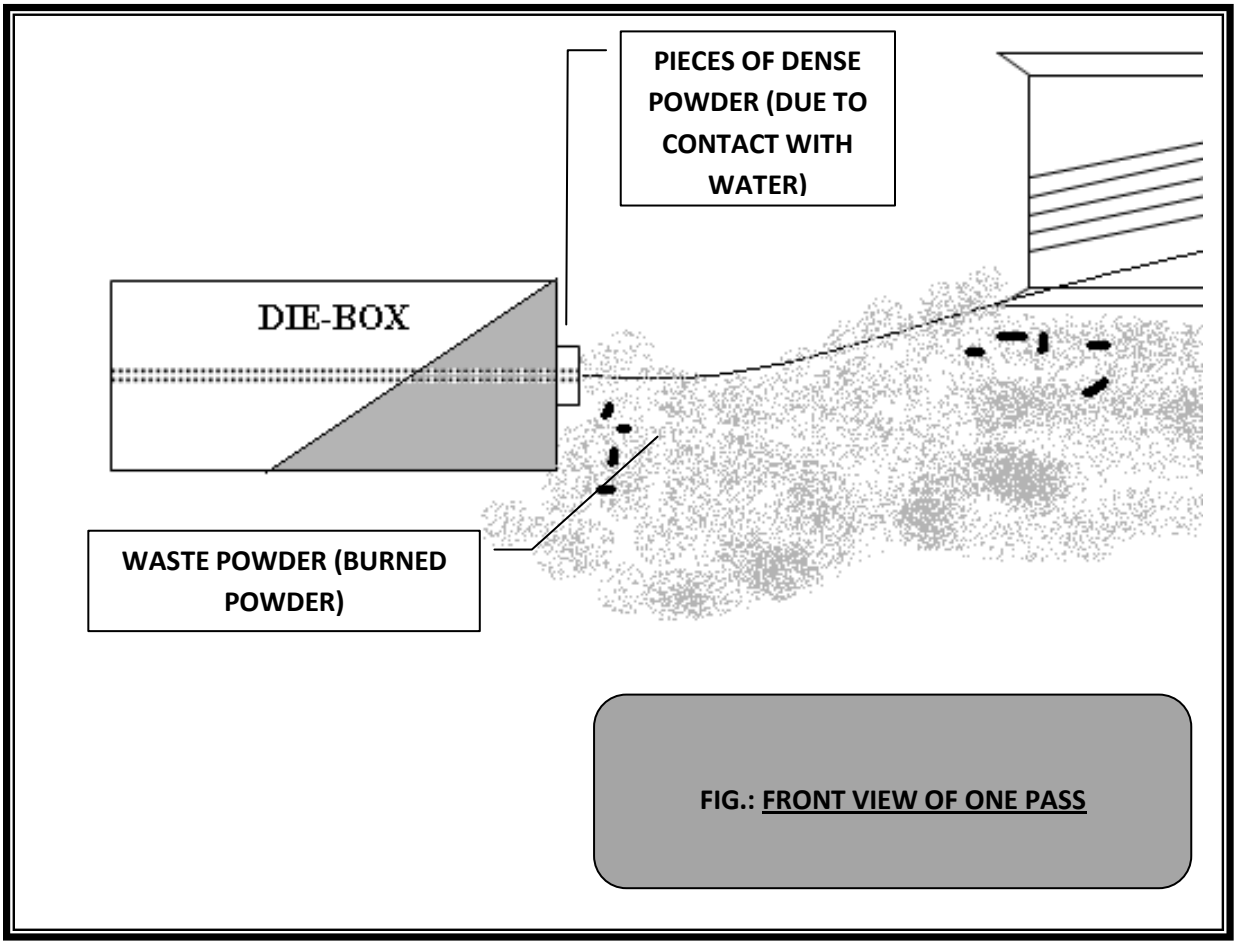


FIGURE 1: FRONT VIEW OF ONE PASS

- Due to this burned powder the machine gets dusty.
- And it very time consuming to clean the pass due to many parts, attachments are there.
- As per the observations, new attachments are suggested which will definitely reduce the waste and also ultimately reduce the cleaning time in changeover process AND FURTHER REDUCE THE TIME OF CLEANING IN SOLUTION I, II, III.
- New attachments are shown in the Figure 2 and Figure 3.

- **NEW SUGGESTED ATTACHMENTS:**

FIGURE 2: RIGHT SIDE V

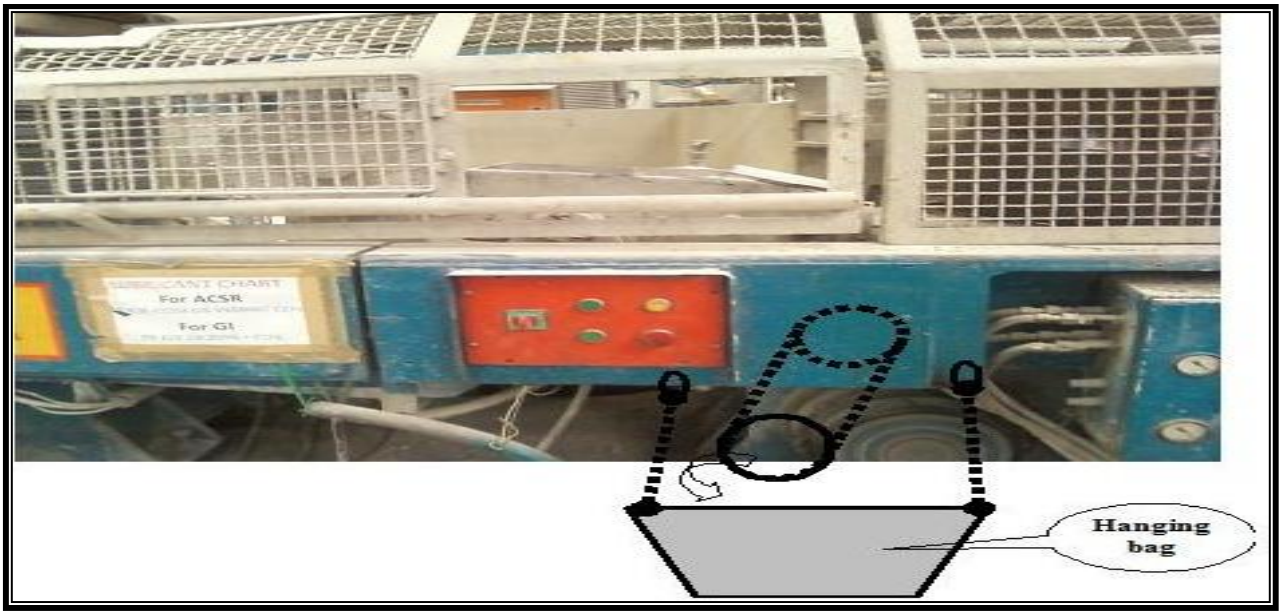


FIGURE 3: FRONT VIEW

- In figure 2 new attachment contains one half cavity shape container and one pipe attached to it which comes out from the pass as shown in the figure 3
- One hanging bag is attached below that pipe.
- When the bag is full with of waste is removed and make empty.

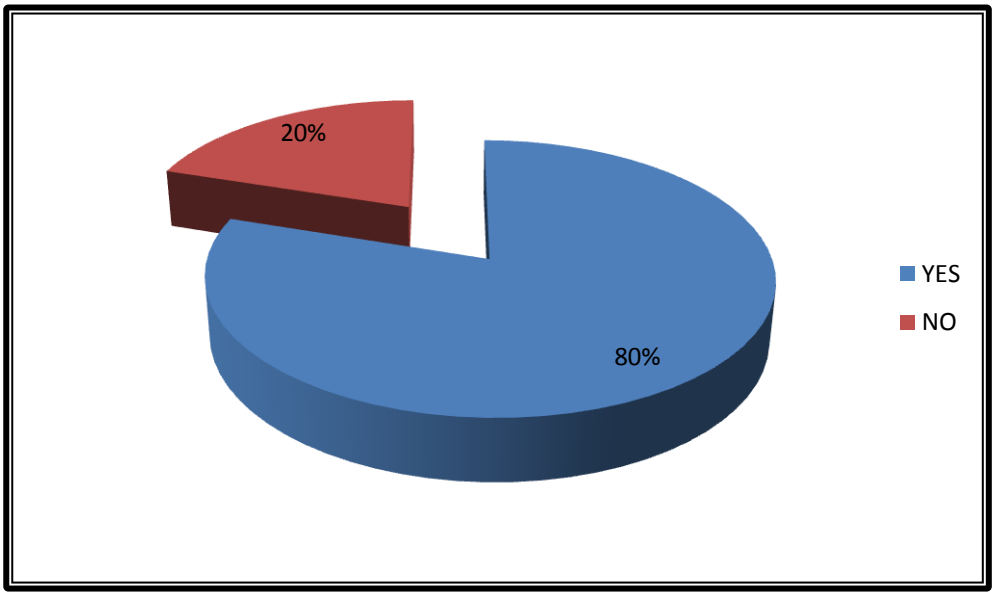
COST REDUCTION:

a) Data related die-box is collected from the operator of all machine through the questionnaire as follows:

Questionnaire is distributed to four operators of four wire drawing machine.

1. **Do You Think Any Extra Attachments To The Machines To Collect The Emitted Powder Will Help To Reduce Emission Of Powder?**

YES	NO
4	1



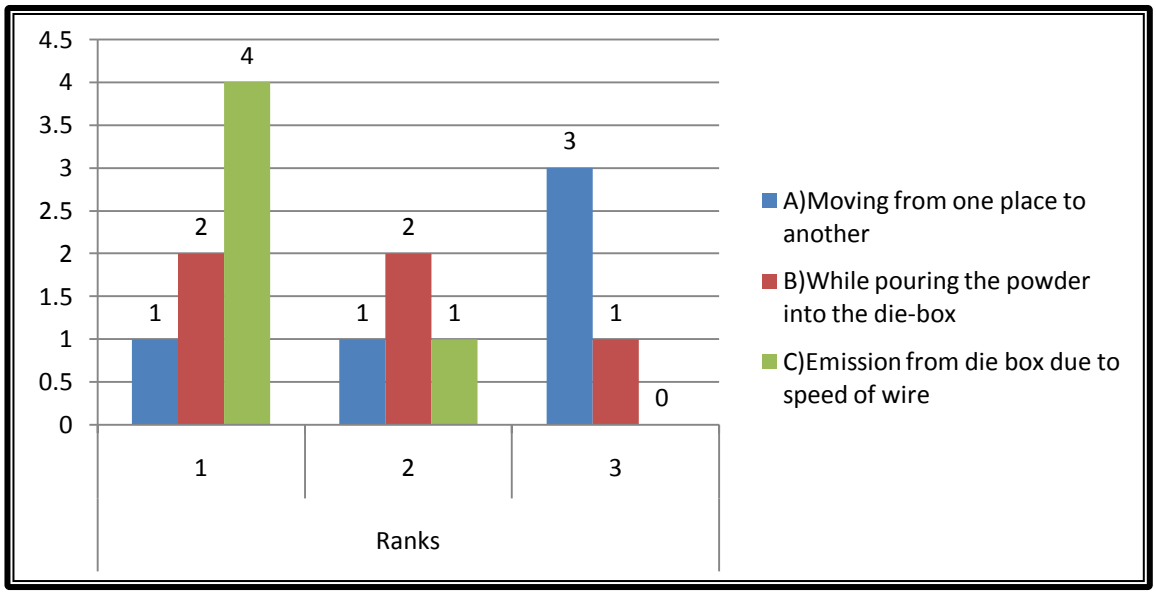
Graph B

INTERPRETATION:

Most of the of the emploeeys thinks that there shoud be extra attachments to remove the waste which will further reduce the disturbance in their work.

2. **GIVE THE PRIORITY WHERE POWDER GET WASTED MAXIMUM AND RANK THE REASONS OF THE POWDER WASTAGE LIKE RANK 1 FOR HIGHEST PRIORITY AND RANK 3 FOR LEAST PRIORITY.**

Reasons	**Ranks**		
	1	2	3
A)Moving from one place to another	1	1	3
B)While pouring the powder into the die-box	2	2	1
C)Emission from die box due to speed of wire	4	1	0



GRAPH C

INTERPRETATION:

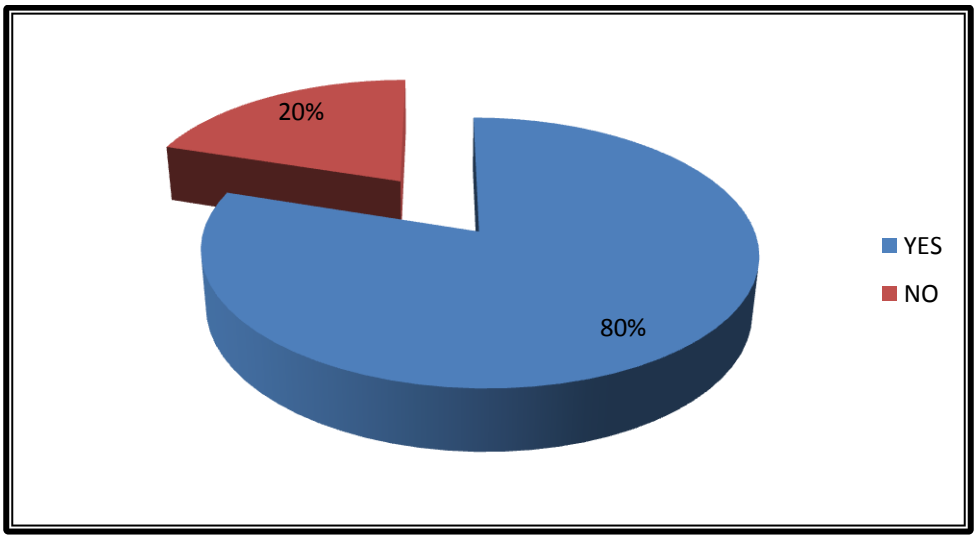
From above graph it is clear that the problem of powder emission from die-box is prioritized than pouring and moving of powder.

3. DO YOU NEED DIFFERENT SIZE OF MUG LIKE

1)Mug/container to pour powder from main drum to small container

2)Mug/container to pour powder from small container to die-box

YES	NO
4	1



GRAPH D

INTERPRETATION:

From above graph it is clear that most of operators are agree on the reason of powder wastage due to pouring process and they need mugs of different sizes as per the requirement.

Questionnare helps to improve the handling habits of operator need of changes in machines.

- Problem is related to the lubricant wastage and the cost involved in it is near about Rs. 1188000/-
- There are five machines in wire drawing section i.e.101, 103,136,140,141 etc.
- As per the line head old machine 101 is selected in whose the die-box size is large & an observation is done by selecting 'A' pass of that machine, readings are taken as follows:

POWDER WASTAGE REPORT: M/c No.101 "A"-pass

- The powder which falls at the entry point of the die-box can be reused.
  - Due to speed through the slot.
  - While pouring.

Date	Loss (kg)
25/06/2011	4.8
26/06/2011	4.9
27/06/2011	7.2
28/06/2011	5.00
29/06/2011	5.3
30/06/2011	4.5
01/07/2011	5.4
02/07/2011	4.8
03/07/2011	4.9
04/07/2011	4.8
Average	5.16

TABLE N: POWDER WASTAGE REPORT OF 10 DAYS

- **LOSS DUE TO POWDER CONSUMPTION :**
  - Cost of TR41B(Dry lubricant used on M/c 101) per Kg is Rs. 110
  - M/C No.101 A-Pass

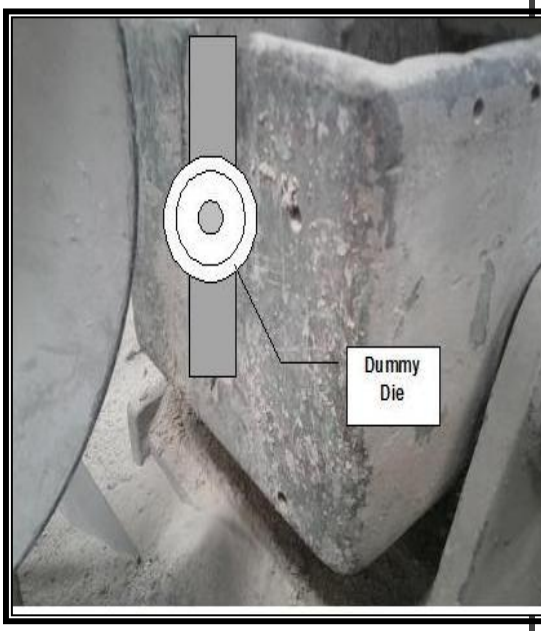
Powder Waste	RS.
Per pass waste	550

All pass waste	3300
Per month waste	99000
Per year waste	1188000

TABLE O: POWDER WASTE CALCULATION

- So to reduce the powder wastage some attachments to the die-box are suggested without disturbing the current assembly as follows:

b) SOLUTION I

Problem	**Solution**
There is a big slot to pass wire in die-box. 	A dummy die can be used so that there is no opening through which powder can escape. 
Left side view of die-box	
c) Solution II	
Another solution	

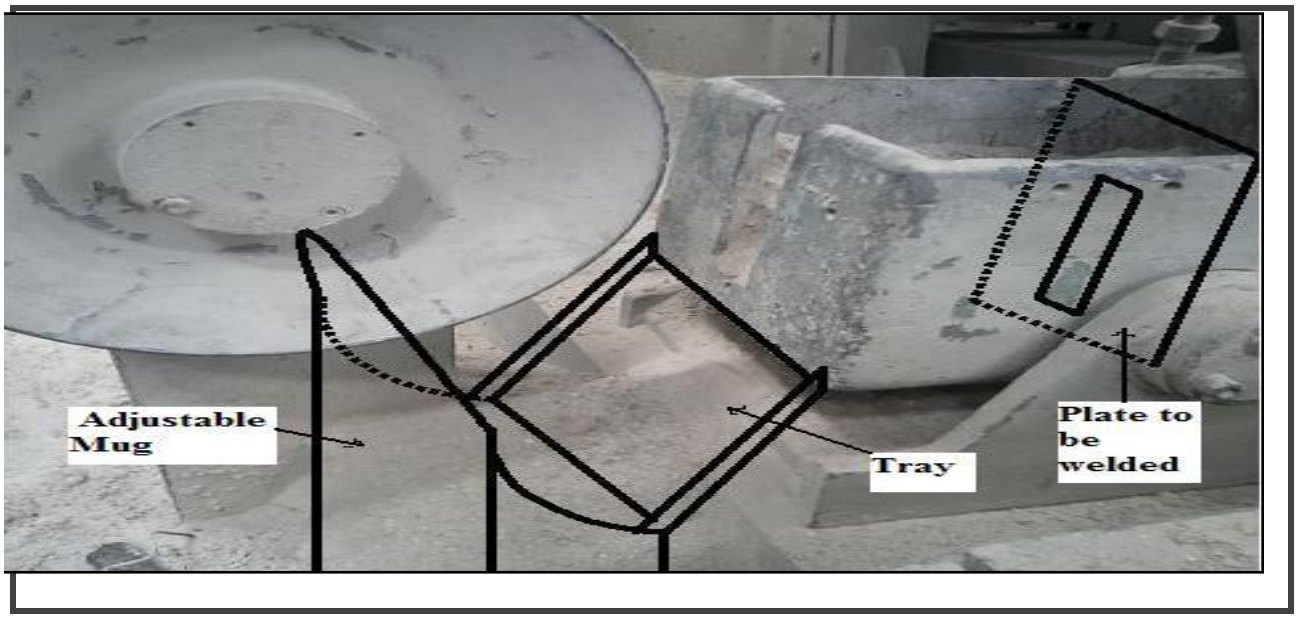


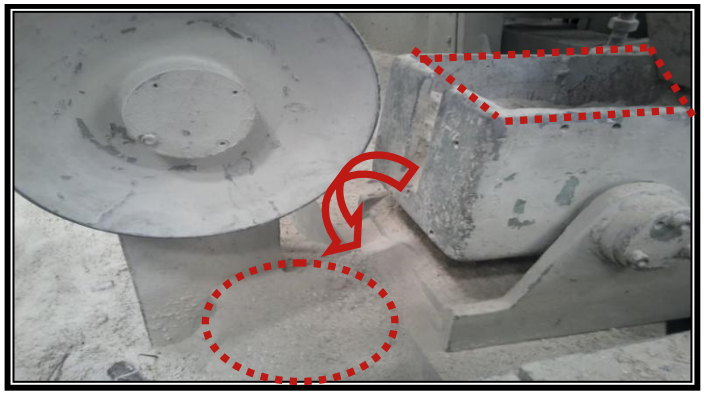
FIG 5: NEWLY SUGGESTED ATTACHMENTS

DESCRIPTION OF THE ABOVE FIGURE IS AS FOLLOWS:

A tray is welded at the wire inlet and a removable mug is adjusted below the tray. One more plate is welded in the die-box to avoid the excess use of powder.

PROBLEM

- Lid is not there on die-box.
- While adding powder to the die-box, by helmet, it spreads /falls down in the nearby area.
- Operator/worker has to open the lid (on sum die-box lid is present) again & again to check the soap powder level.



D) SOLUTION III

- Lid with: **1**. Lock-Will reduce/remove the gap between die-box and lid.
  2. Funnel-It will reduce the wastage of powder while pouring.

3. Transparent glass-to checks the level of powder in the die-box.

FIG 6: FRONT VIEW OF SUGGESTED DIE-BOX

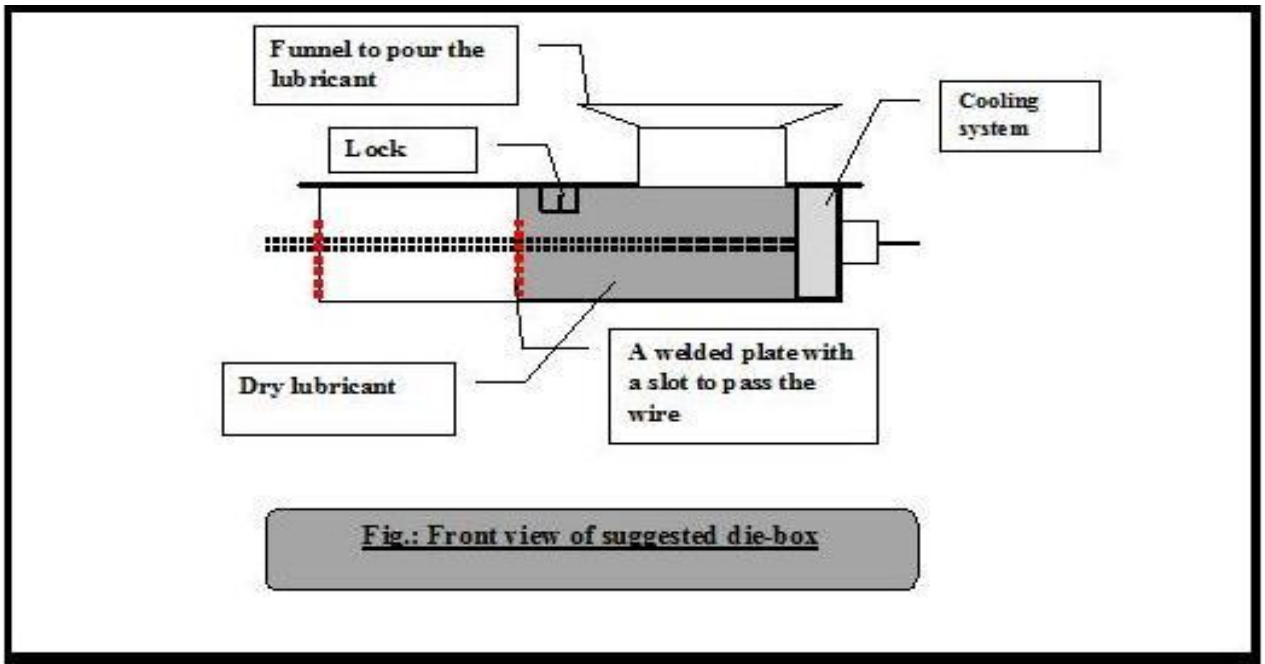


Fig.: Front view of suggested die-box

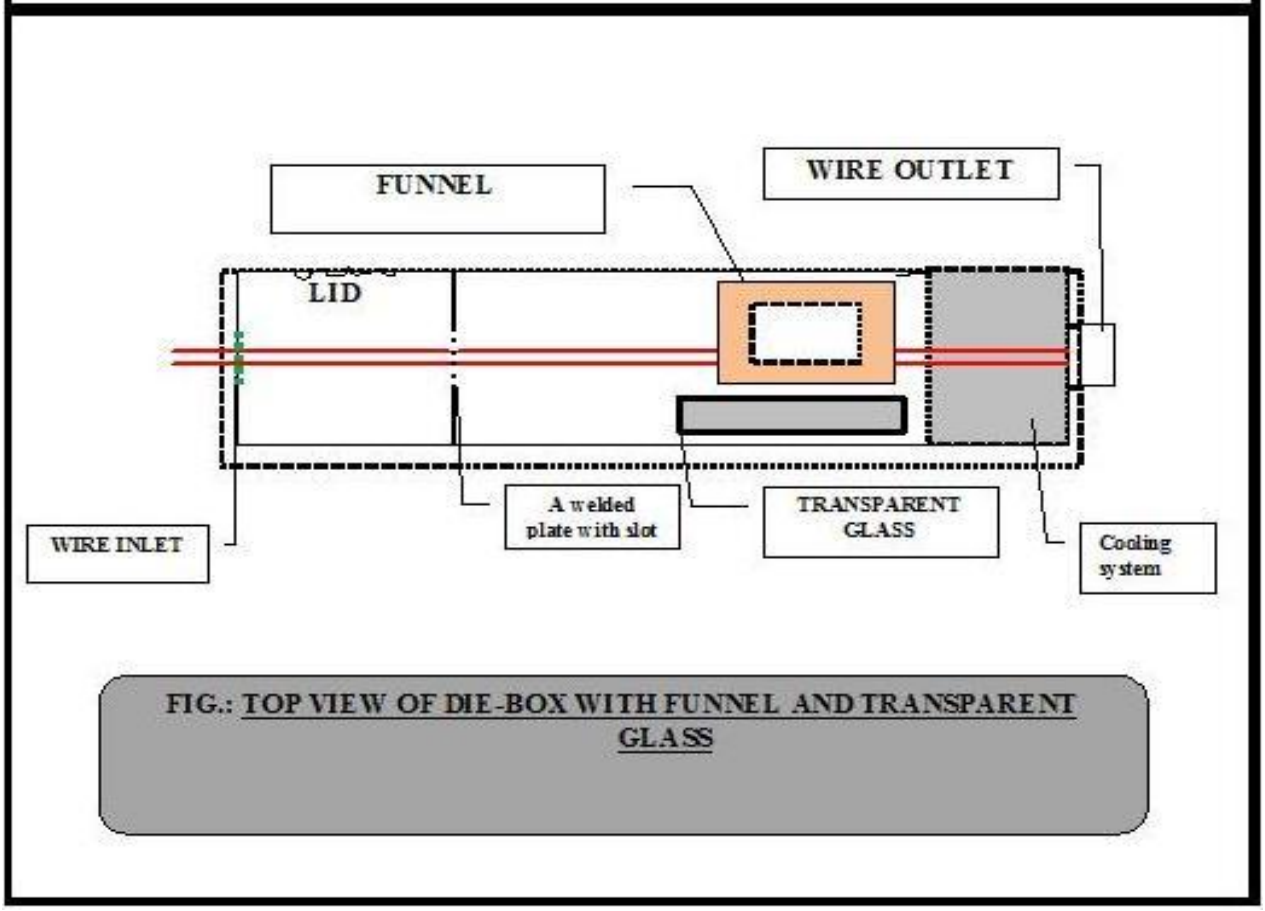


FIG.: TOP VIEW OF DIE-BOX WITH FUNNEL AND TRANSPARENT GLASS

5.3 IMPROVEMENT IN HANDLING HABITS OF OPERATOR/WORKER:

- Provision of equal quantity of dry lubricant to all machines.
- There should be small trolleys to carry small drum of powder from main powder stock towards machine.

- **THERE SHOULD BE PROPER MUG TO POUR THE POWDER FROM**

PROBLEM-

SOLUTION

- Main drum to small drum – Large size mug
- Small drum to die-box – Small size mug

SUMMARY AND CONCLUSION:

It has been observed that in TATA STEEL (TWP-II) that time consumption on LR line & lubricant consumption on wire drawing line is more.
So to reduce these two problems SMED techniques can be used & some changes in machines can be done.
In order to achieve this goal various methods are selected:

A) Analyzing the data of past two months i.e. of April & May 2011
B) Analyzing the past data of machine on quantitative basis
C) Updated data on TATA STEEL Intranet

Using 2nd method machine no. 104 and 101 are selected.

MAJOR FINDINGS:

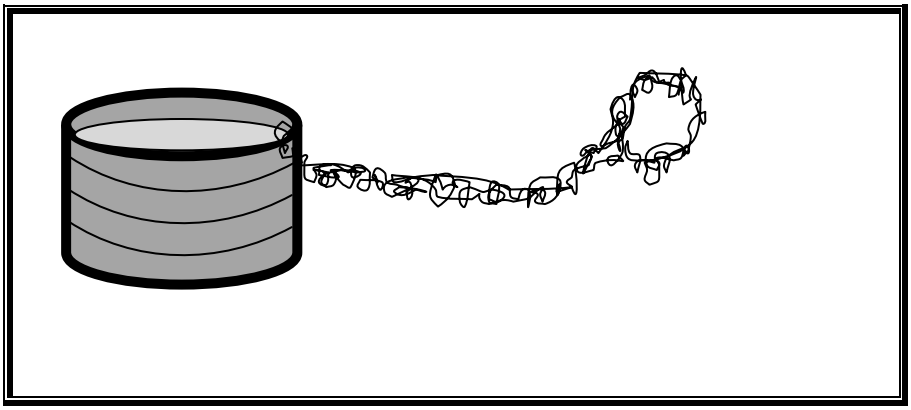
- While doing the project it is told by line-heads that time reduction and cost reduction should be achieved with the help of available resources no extra resources will be added.
- No parallel working while the die-set gets change, due to which lot of time gets wasted.
- Due to lack of some attachments to the machine to remove the waste, lot of time is consumed in cleaning, Drawbacks of die-box design as shown below:

- There is a problem of die assembly .Assembly gets jammed & took lot of energy as well as time for un-mounting.
- To overcome the issues of optimum utilization of time, 3 solutions were suggested for time reductions which were approved and one of them was implemented.
- For cost reduction purpose more 3 solutions were suggested, all were appreciated but due to internal issues and procedures listed below they were not implemented but looking forward to implement them in future.

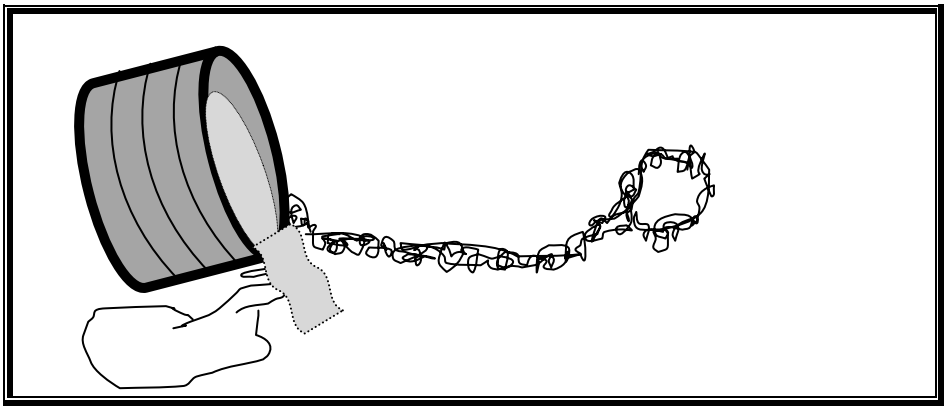
  Viz. 1) Approval from higher authority was a tedious process

  2) The fabricator and draftsman could not implement the suggested solutions till the line-head authority approves.
- There is no trolley for the transportation of dry lubricant. Currently workers are using the half cut plastic drinking water container which is tied with one thread and then they drag that container towards the machine, but sometimes due to scrap in the way of that container, it gets fall.

CONTAINER USED FOR MOVING POWDER TO EACH MACHINE:



WHILE DRAGGING:



CONCLUSIONS:

There is saying "Time is money". This saying really means a lot to everyone in today's competitive world. It is not possible to plan every second in each process in industry because, even if we know the daily process sequence is same but we can't assure that process can be hurdle free.

There can be hurdles like preventive maintenance, power failure, no man power & many more.

We can't remove these hurdles completely but we can plan the alternative activities on such hurdles well before so time to solve such hurdles gets reduced.

The small scale organizations would not always be as financially strong as big companies, but the basic principles of SMED is to reduce the time. In this project the importance of setup time reduction was presented using SMED methodologies. After implementing the SMED methodology, it is possible to secure that simple process-based innovations, as the parting of internal from external operations & the translation of internal to external operations, are among the key drivers to productivity enhancement.

An important aspect that was not unambiguously addressed was organizational innovation, which was always fixed in the process innovation. Thus, future work desires to highlight the suppleness of the SMED teams, the need to use a knowledge-based loom to properly distribute the SMED methodology within the company.

SUGGESTIONS & RECOMMENDATIONS:

- Time saving can be achieved if the work practice for operator in changeover time is as follows:

- NOTE 1:
  A. Operator 1,2,3
  B. Cleaner I, II
  C. Pass A, B, C, D, E, F, and G, H.]
- NOTE 2:
  UNM- Un-mounting CLN- Cleaning
  FIT- Fitting of new die M- Mounting

- FOR **SOLUTION I**

5	**A(UNM)**	**B(UNM)**	**C(UNM)**
5	**D(UNM)**	**E(UNM)**	**F(UNM)**
5	**A(CLN)**	**B(CLN)**	**G(UNM)**

5	A(FIT)	B(FIT)	H(UNM)
5	C(CLN)	D(CLN)	G(UNM)
5	C(FIT)	D(FIT)	G(FIT)
5	E(CLN)	F(CLN)	H(CLN)
5	E(FIT)	F(FIT)	H(FIT)
5	A(M)	B(M)	C(M)
5	D(M)	E(M)	A(DRAW)
5	DRAWING A	DRAWING A	DRAWING A
5	DRAWING A	DRAWING A	DRAWING A
5	DRAWING A	DRAWING A	DRAWING A
5	DRAWING B	DRAWING B	DRAWING B
5	F(M)	G(M)	H(M)

- **FOR SOLUTION II**

5	A(UNM)	B(UNM)	C(UNM)
5	A(CLN)	B(CLN)	D(UNM)
5	A(FIT)	B(FIT)	D(CLN)
5	A(M)	B(M)	D(FIT)
5	E(UNM)	F(UNM)	D(M)
5	E(CLN)	F(CLN)	G(UNM)
5	E(FIT)	F(FIT)	G(CLN)
5	E(M)	F(M)	G(FIT)
5	DRAWING A	DRAWING A	G(M)
5	DRAWING A	DRAWING A	H(UNM)
5	DRAWING A	DRAWING A	H(CLN)
5	DRAWING B	DRAWING B	H(FIT)
5	DRAWING B	DRAWING B	H(M)
5	DRAWING B	DRAWING B	DRAWING B

- **FOR SOLUTION III**

A	**B**	**C**	**D**	**15**
E	**F**	**G**	**H**	**15**
				5
A- UNM	**B -UNM**	**C –UNM**		**5**
D -UNM	**E -UNM**	**F –UNM**		**5**
G -UNM	**H -UNM**	**A- M**		**5**
B -M	**C -M**	**D- M**		**5**
E- M	**F -M**	**G –M**		**5**
H- M	**A-WD**	**B-WD**		**5**

In **Solution III** as mentioned in data analysis,

- Cleaning of all die-holder assembly and fitting new die in that, these two operations can be externalize.
- Externalization of these two activities: New die set is fitted in another assembly and keep ready on vice table.
- When all assemblies are un-mounted after that, to avoid the confusion all assemblies are kept on table which is tagged as per the pass name by LETTERS (A, B, C, D, E, F, G, H, I) etc.

PICTURE: NEWLY DESIGN TABLE TO AVOID CONFUSION

SUGGESTIONS FOR SAVI NG THE POWDER(FROM WORKER/OPERATOR):

1) Provision of equal quantity of powder to all machines.

2) There should be small trolley to carry small powder container from main powder stock towards machines.

3) In die-box at the entry point of wire, some machines contain the brush from one side and some from both sides.

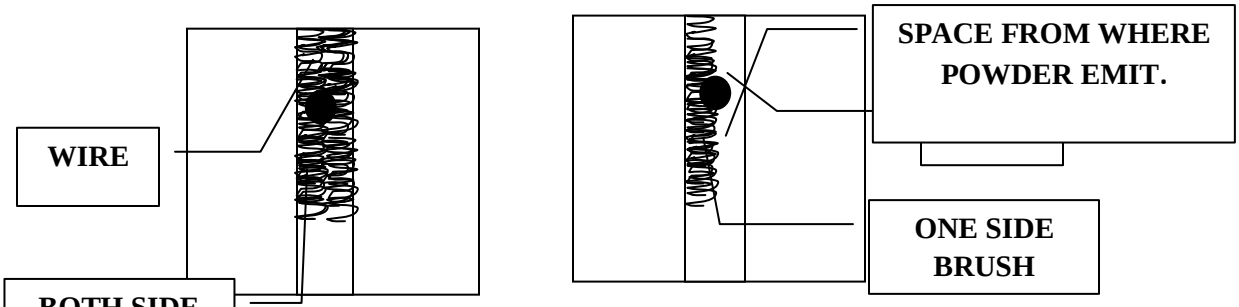


FIG.: LEFT SIDE VIEW OF DIE-BOX

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VIBHUTI ADITYA SAVE

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The scholarly paper provided invaluable insights on the topic. It gives me immense pleasure in conveying to your good self that our Editorial Board has highly appreciated your esteemed piece of work.

We look forward to receive your other articles/research work for publication in the ensuing issues of our journal and hope to make our association everlasting.

Thanking you once again
With Best Regards

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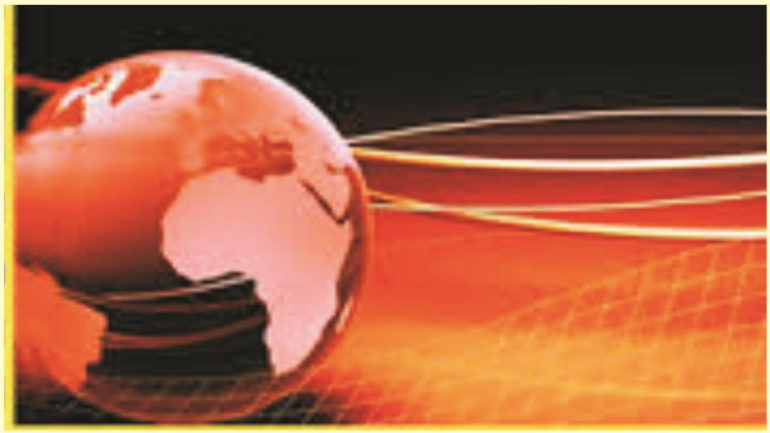

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