REPORT

ON

WORK TERM-NO. 1.

(JAN. 88 TO JUNE 88)

FOR

BACHELOR OF INDUSTRIAL ENGINEERING

AT

HERO CYCLES PVT. LTD.
LUDHIANA

Placement & Coordination Deptt.
No .....
Date 17-8-88
T.I.E.T. PATIALA

By

VIVEK JINDAL

THAPAR INSTITUTE OF ENGINEERING & TECHNOLOGY,
PATIALA

ACKNOWLEDGEMENTS

I am deeply indebted and grateful to the following persons for making my training stint with the Hero Cycles Pvt.Ltd., Ludhiana, really useful and memorable:

First of all, I thank Mr. S.N.Munjal, Managing Director (Works), a highly respectable figure in this part of the state, for accepting me as a trainee for a stint of six months. I have always found in him a real Karam Yogi, a saint and a scholar.

I am also grateful to Mr. M.L. Anand, Principal, Arya College, Ludhiana, a father figure to me, who inspired me to join the Hero Group and who through his affectionate guidance, always goaded me on to produce excellent results during my stay with the Heroes.

Mr. S.K. Rai, Director(Works), the Chief Coordinator of my training, is in every way responsible for making my training a grand success. I have no hesitation in frankly stating that my every meeting with Mr.Rai was an education in itself. He allotted to me quite a few challenging projects and always maintained a proper track of my activities. I'll always be thankful to him for his very useful and affectionate guidance.

Mr. S.L.Nanda, Deputy General Manager(Personnel) was always there to help me whenever there was a problem or a bottleneck . But for his benevolent guidance, I would not have completed the work so successfully.

Mr. S.K.Bhandari, Deputy General Manager(Production) is a very dynamic personality. He was ever responsive and eager to help me whenever I approached him.

Mr. G.S. Dhillon, Assistant General Manager(Production), controls the backbone of the factory - the Tubular Unit. He has the knack of playing cool under all situations. His expert advice and guidance helped me a lot in the lay out and time-study projects of the Tubular Unit.

Mr. R.K.Sehgal, the head of all the stores, suppled me with all the details of the stores and helped me in bringing into focus many flaws which had gone unnoticed before.

Mr. Daljit Singh, Mr. Hakam Singh and Mr.Paramjit Singh in design office were always cooperative in preparing drawings and getting the blue prints. I'm highly thankful to them for helping me in the preparation of layouts, sketches etc.

Mr.Deepak, Deputy Manager(Personnel) was kind and helping. He catered to my needs in the time office whenever required.

Mr.Ravinder Kumar Garg is the only industrial engineer in the plant. He is a genius, who always readily came out with new proposals and thought-provoking ideas. All through my training, he had been lending a helping hand in almost all my projects. As a colleague with progressive ideas, his ability and calibre have gone a long way in orienting my work during the entire period of my stay.

I must thank my parents, my dear brothers, Vikas and Satish and my friend Fang, who had always been a source of inspiration for me. They constantly goaded me into working hard and putting in all my efforts in the most organized way. They encouraged me a lot during my training here.

I thank the almighty God, who through His Moving Finger, has already destined my fate.

Last, I thank the workers, supervisors, managers, assistant managers in the plant and office who had constantly been helping me in one way or the other.

Vivek Jinde

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(1.1.88 - 30.6.88)

ON HERO CYCLES PVT. LTD. - A PROFILE

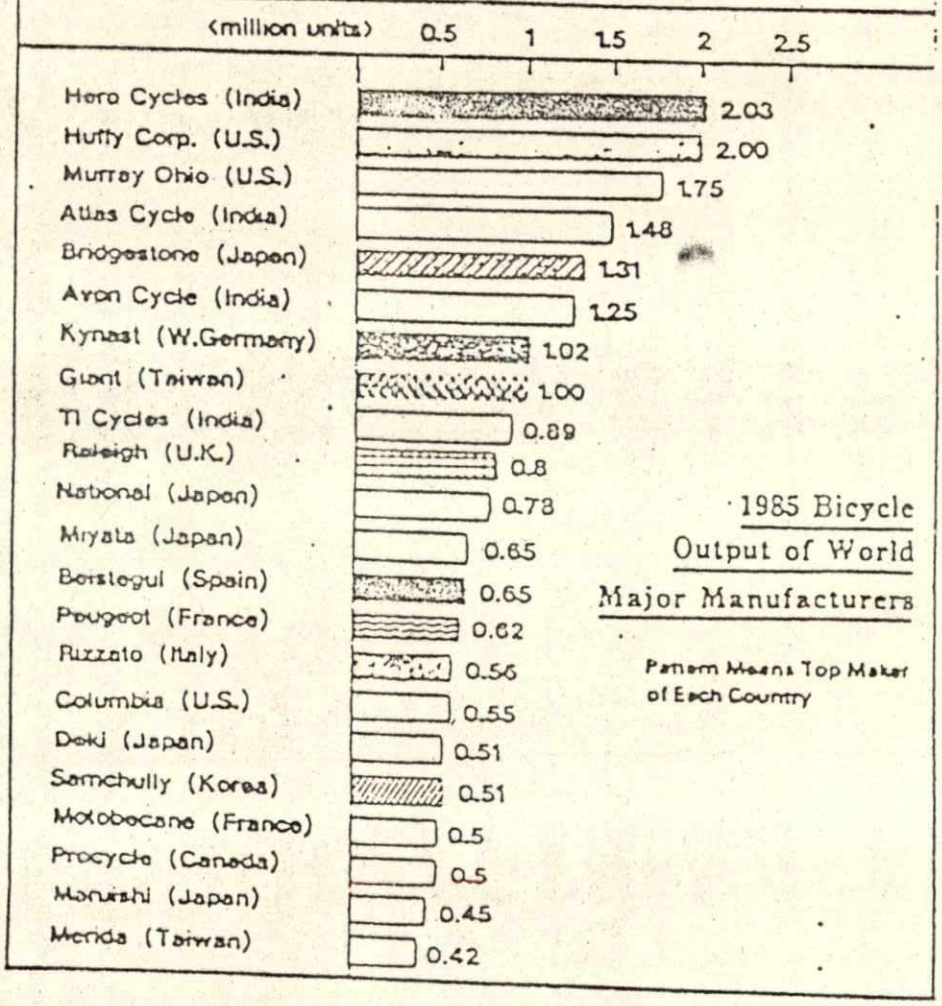
The idea and spirit enshrined in this adage are reflected more eloquently in the style of functioning at HERO where the span of 30 years of its emergence on the industrial scene has been one of continuous growth and development of new ideas, concepts, innovations and diversifications rather than of self-complacency, both in the sphere of Production and Marketing. It is located on the outskirts of Ludhiana, the Manchester of India.

Started with a modest production of 7500 Bicycles a year in 1956, Hero Cycles Pvt.Ltd., has stridden to 8000 Bicycles per day to-day. Not only on domestic front, but also in international area, HERO is an established name exporting its products to approximately 65 countries of the world. Today Hero has the proud privilege and distinction of being not only the largest bicycle manufacturer in the country alone but in the world also. To support and substantiate my claim that Hero is No.1 in the world today, I reproduce the world Bicycle Production Graph from the Cycle Press International No.25 (Quarterly) August,1986-(C) Japan Cycle Press - 1986:

This achievement has solely been possible with the foresight and vision of enterprising Munjal Brothers, dedication and hard work of Hero Workers, Staff and vast

World Bicycle Production

CyclePress JAPAN



galaxy of dealers. It is quite heartening to learn that during the year 1986, Hero has produced 22,00,000 Bicycles which is again an enviable feat in the International Bicycle scenario. Besides being instrumental in the growth and development of about 200 ancillaries, Hero's diversification endeavour is reflected in the successive formation of the following companies:

1. ROCKMAN CYCLE INDUSTRIES PVT.LIMITED(1961)

   Manufacturing
   Chains (3.7 million) and Hubs (6.3 million)

2. MUNJAL GASES(1963)

   Producing

   - Oxygen
   - Nitrogen
   - Acetylene

3. HIGHWAY CYCLE INDUSTRIES LIMITED (1971)

   Manufacturing

   - Single Speed Freewheels
   - Multi Speed Freewheels(5.8 million)

4. MAJESTIC AUTO LIMITED(1978)

   Item of Production

   - Mopeds and Parts

   Majestic Auto Limited have recently signed tie-up arrangement with Steyr-Daimler-PUCH of Austria for the manufacture of their latest light-weight Motorcycles and Mopeds.

5. MUNJAL CASTINGS(1979)

   Manufacture gravity and pressure die casting alloy components.

6. HERO FIBRES LIMITED (1980)

   Produces -Cotton Yarn
   -Synthetic Yarn
   -Acrylic Yarn
   -Tyre Cord

7. MUNJAL STEELS(1982)

Manufacture cold forgedcomponents for Bicyclces & Mopeds.

8. HERO HONDA MOTORS LIMITED(1984)

Manufacture 100 cc Motorcycles in technical collaboration with world renowned HONDA MOTORS CO.LTD. JAPAN.

9. MUNJAL SHOWA LIMITED (1986)

To start production of shock-absorbers for Mopeds and Motorcycles in technical collaboration with SHOWA MANUFACTURING CO. LIMITED, JAPAN.

The whole edifice of HERO PARIWAR is sustained by the solid base of human relationship, rapport and understanding in their dealings with customers, dealers, workers and staff who constitute an integral part in their journey towards progress and prosperity.

Hero Cycles Pvt.Ltd. is a multinational concefn running a big name in the cycle industries of the world.An undertaking of the MUNJAL TRIO, Mr. Satyanand Munjal, Mr.Brijmohan Mohan and Mr. Om Parkash Munjal, the industry began with a small shed and was started by (Late) Sh.Bahadur Chand Munjal as 'Highway Cycles'which was later carried to new heights of glory by the junior Munjals.

Hero Cycles has maintained its target at 10000 bikes per day within coming years and they're planning it accordingly.

Mr.S.K.Rai, their Director(Works) is leaving no stone unturned to take the Hero Cycles Pvt.Ltd. to new and new pinnacles of glory in terms of quantity as well as quality (The factory is already producing around 24 different varieties of bicycle).

Their D.G.M.(Personnel), Mr.S.L.Nanda, is a very efficient man and he welcomes everyone with a very cordial smile and pounces upon any suggestion for the betterment of the Company.

Hero Cycles have a wide ranging variety. The entire plant works on a piece rate basis which implies that contract for a worker at a particular m/c is fixed. In a period of eight hours, he is to provide the requisite amount agreed to in the contract. Basically the entire factory is divideditto ten main units:

1. Tubular Unit
2. Rim Plant
3. Mudguard Unit
4. Paint Shop
5. Packing and Finishing
6. Assly. Lines - Pedal, Handle, Seat, Brake
7. Tool Room
8. Polishing(Crank,Handle)
9. Cycle Fitting Shop
10. Press Shop

For exporting, they maintain an altogether separate shed where only export quality is brought in and packed.

They've stores starting from R&D(Receipt & Despatch).

1. F.G. Store
2. Raw Material Store
3. Elect. Store

4. Saddle Store
5. Rim Store
6. Pipe Store
7. Chem. Store
8. Strip Store
9. Packing Material Store
10. Bank Store
11. Main Store
12. C.P.Store
13. Tool Store

Additionally, the factory has a swaging plant and a water purifying plant. In the swaging plant, the pipes are swaged(i.e. diameter of one side is so reduced that it gives a tapered appearance). In the water purifying plant, the entire water passing out is sent free of any impurities. They've a unit manufacturing the Honda and Moped Rims. Hero Cycles maintains its own computer centre.

At Hero Cycles Pvt.Ltd., I was welcomed by Mr.S.L.Nanda, their Deputy General Manager(Personnel), on Jan.Ist,1988. I was taken to Mr.S.K.Rai, Director(Works) and he asked me what I could do and my understanding of Industrial Engineering. I satisfied his queries with my humble replies.

CHAPTER I TIME DURATION: Jan.Ist to Jan.15th,1988

TITLE: TIME STUDY OF TUBULAR UNIT

1.1 Introduction

I was told to begin with 'Time Study' of the Tubular Unit and go around various processes. To begin with, I was placed under Mr.Dhillon, the shop manager. I was told to go around the floor on my own. I started with the pipe store, came to degreasing section but then couldn't keep a track of things going on. The next day I was called in by Mr.Rai and introduced to Mr.Sondhi. Mr.Sondhi was told to give me the details of each and every step going on the floor starting from A to Z.

Mr.Sondhi told me that after degreasing, the tubular unit is divided broadly into two sections, one was the Frame Section and other was the Fork Section. He began with the fork section.

TUBULAR UNIT: BACKBONE OF THE INDUSTRY

1.2 Existing Details

1.2.1 Fork Section (For Hero Jet)

a. Fork column champhering

b. Fork column bush fitting

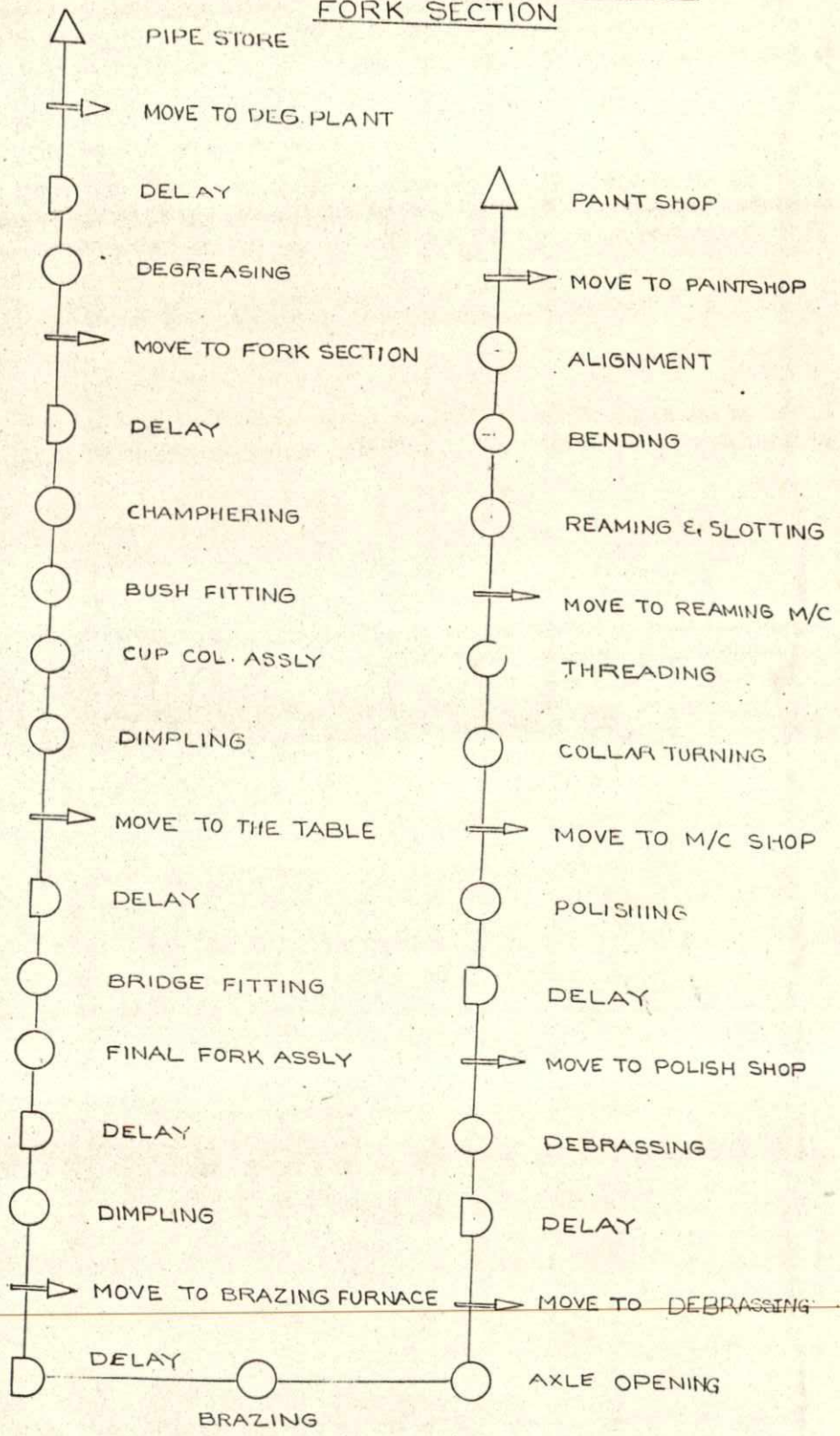
c. Column cup assembly

d. Column cup dimpling

e. Blade bush fitting

f. Blade Axle Fitting

FLOW PROCESS CHART (MATERIAL)
FORK SECTION



g. Cup column Mataka fitting

h. Fork assembly

i. Fork cup closing and dimpling

j. Fork brazing and hot setting

k. Fork axle opening

l. Fork movement for debrassing

m. Fork debrassing

n. Fork polishing

o. Fork collar turning

p. Fork threading

q. Fork reaming and slotting

r. Fork bending

s. Fork drilling(20 No.)

t. Fork alignment

u. Fork transfer to paint shop

For Royal Type (R/T) and S.L.R.

1.2.2 Fork Fitting: i) Normally no.col. champhering

ii) No Mataka Fitting

iii) Nailing operation (Instead of Dimpling)

1.2.3 Fork Machining: Eye Lug Reaming

Alongwith the above stated operations in fork section we've a pressline.

1.2.4. Pressline

a. D-Pressing

b. Mitering

c. Liner Fitting table & M/c

d. End Pressing & Slotting

OUTLINE PROCESS CHART

JOB :- FITTING OF SLR FRAME

1. DEGREASING
- [1] INSPECTION
2. B.B. SHELL NOTCHING
3. TOP MITERING
4. TOP BUSH FITTING
5. SEAT PUNCHING
6. BOTTOM MITERING
7. BOTTOM BUSH FITTING
8. HEAD PUNCHING
9. QUADRANT FITTING
- [2] INSPECTION
10. BRAZING OF HEAD TUBE
11. BRAZING OF SEAT LUG
12. ASSLY & WELDING OF FRAME
- [3] INSPECTION
13. BRAZING OF B.B SHELL

Pressed blades are then taken to racks from where the blades are taken to blade bush fitting table.

1.2.5. Frame Section

In the frame section, there are four main types of pipes coming in.

a. Top Pipe

b. Bottom Pipe

c. Seat Pipe

d. Head Pipe

1.2.6. For Quadrant Fitting

i. Top pipe mitered on both sides and bush fitted

ii. Bottom pipe mitered on one side & bush fitted.

iii. Seat pipe slotted and B.B shell fitted.

iv. Head pipe slotted on both sides and fixing of top and bottom lugs.

v. Seat pipe fitted to bottom, pipe through B.B shell

vi. Top pipe joined to head Pipe

vii. Final Assembly taking place

viii. Dimpling of Assembly

ix. Head Tube Brazing

x Seat Tube Brazing

xi Assembly of chain stay(C/s) and seat stat(s/s) in B.B shell

xii B.B Shell brazing

xiii Debrassing

xiv Frame machining

FLOW PROCESS CHART (MATERIAL)

S.L.R FRAME SECTION (TUBULAR UNIT.)

- HEAD TUBE STORAGE TO DEGREASING
- DELAY
- DEGREASING
- MOVEMENT OF HEAD TUBE TO FITTIG SHOP
- DELAY
- HEAD PUNCHING
- INSPECTION
- MOVE TO FITTING SHOP
- DELAY
- FITTING LUG IN H/T
- PRESSING OF LUGS
- TOP TUBE FITTED IN H/T
- DELAY
- FINAL FITTING OF QUADRANT
- DRILLING & NAILING
- INSPECTION
- MOVE TO BRAZING SHOP
- BRAZING OF H/T
- BRAZING OF SEAT LUG
- MOVE TO WELDING SHOP
- DELAY
- ASSLY AND WELDING OF FRAME
- INSPECTION
- B.B. SHELL BRAZING
- MOVE TO BRAZING SHOP
- INSPECTION
- FINAL WELDING OF FRAME
- FINAL WELDING OF C/S
- DEBRASSING
- MACHINING
- POLISHING & FILLING
- ALIGNMENT
- TO PAINT SHOP

xv. Polishing(Inspecting)

xvi. Filling

xvii Frame Alignment

Carried to Paint Shop

1.2.7. For Chain Stay & Seat Stay

We have press shop for C/s and S/s

a. For Chain Stay

i. C/s Bending press

ii. C/s vertical slotting press

iii. C/s Liner Fitting M/c

iv. C/s end pressing & slotting

v. C/s spot welding m/c

b. For Seat Stay

i. S/S Bending Press

ii. S/s liner fitting M/c

iii. S/s end pressing press

iv. S/s hole piercing & slotting press

Additionally, we have C/s and S/s bridge welding stands and assembly M/cs.

1.2.8. Frame machining includes

i. Head tube reaming M/c

ii. Seat cutter

iii. Seat reamer

iv. Drilling operation

1.29 Debrassing

Debrassing serves in basically removing brass from the fork as well as frame. In all, we have seventeen tanks:

KEROSENE OIL	4
CLEANER	3
CLEANER	3
CLEANER	3
WATER	2
NEUTRALIZER	1
LOADING / UNLOADING	0

DEGREASING PLANT

EXISTING SEQUENCE

0 → 4 → 2 → 3 → 2 → 1 → 0

PROPSED SEQUENCE

0 → 4 → 3 → 2 → 1 → 0

i. 4 pickling tanks

ii. 1 water tank(Rinsing)

iii. 10 debrassing tanks

iv. 1 water tank(rinsing)

v. 1 neutralizer tank

1.2.10. Pickling section(or Degreasing section)

This involves degreasing of pipes before being sent to fork and frame sections. It basically comprises:

a. Neutralizer Tank

b. Water tank(rinsing)

c. 3 cleaning tanks

d. Kerosene oil tank

In degreasing the sequence of working was:

Loading - Kerosene oil - Water tank - Cleaner Tank - Water - Neutralizer - Unloading

1.3 PROJECT WORK

On the very first day, I was directed to do the 'Time Study of the complete plant'

I completed the time study of the degreasing plant and fork section by the end of the first week. I submitted an interim report on my observations and they receivedquite a good response.

1.3.1. DATA (On Time study undertaken with a stop watch)

(1) Head Tube Punching

Quantity	Time taken(secs)
10	26
20	25
10	25
10	24
10	25

Average 2.5 secs/piece

(2) B.B.Shelling Notching

Quantity	Time taken(secs)
10	22
10	25
10	26
10	23
10	22

Av. 2.3 per piece

3. Top Tube Mitering

Quantity	Time(Sec.)
5	20
5	200
5	21
5	21
5	22

Av. 4.2 secs/pc

4. Top Bush Fitting

10	31
10	29
10	33
10	32
10	31

Av. 3 secs/pc

5. Seat Tube Punching

10	21
10	22
10	23
10	21
10	21

Av: 2.1 secs/pc

6. Bottom Tube Mitering

10	22
10	23
10	21
10	22
10	21

Av: 2.2 secs/pc

7. Bottom Bush Fitting

10	27
10	28
10	26
10	27
10	27

Av: 2.7 secs./pcs

8. Fitting of lugs in head tube

5	23
5	24
5	23
5	25
5	24

Av: 4.6 secs/pc

9. Pressing of Lugs in H/Tube

Quantity	Time(Sec.)
10	29
10	30
10	27
10	31
10	29

Av: 2.9 secs/pc

10. Fitting of top tube in Top lug & drilling, nailing

5	76
5	81
5	83
5	79
5	81

Av. 16 secs/pc

11. Fitting of BB Shell, Seat lug in seat tube and punching

5	43
5	44
5	42
5	41
5	43

Av: 8.5 secs/pc

12. Fitting of bottom tube in BB shell & Punching

5	63
5	62
5	64
5	61
5	63

Av. 12.7 secs/pc

13. Final fitting of quadrant

1	21
1	22
1	18
1	23
1	21

Av: 21 secs/pc

14. Drilling and Nailing

Quantity	Time(Sec.)
5	74
5	76
5	75
5	79
5	74

Ave:15.2 secs/pc

15. Brazing of Head Tube

5	76
5	73
5	75
5	77
5	76

Av: 15.2 secs/pc

16. Brazing of eat lug

10	72
10	73
10	71
10	72
10	73

Av: 7.2 secs/pc

17. Welding of liner & Chain Stay

25	373
25	381
25	390
25	365
25	375

Av: 15 secs/pc

18. Welding of bridge with Seat Stay

10	156
10	148
10	161
10	142
10	151

Av: 15 secs/pc.

19. Welding of Frame Assly

Quantity	Time(Sec.)
1	70
1	76
1	64
1	73
1	77

Avg.70secs/pc

20. Final welding of chain Stay Bridge

3	37
3	41
3	34
3	36
3	34

Av:12.6 secs/pc

21. Final welding of frame

1	46
1	40
1	51
1	43
1	45

Av: 45 secs/pc

22. Brazing of BB shell

1	81
1	79
1	83
1	70
1	68

Av: 16 secs/pc

1.3.2 DATA

For Fork Section : Time in Seconds

1. Fork Column Champering (Qty - 5)

Time : 32, 28, 31, 30, 29 Av = 6 sec/piece

2. Col. Bush Fitting (Qty. 5)

Time : 28,26, 31, 29, 27,Av. 5.6 sec/piece

3. Fork Cup Col.Assly.(5)

Time: 33, 36, 29, 32, 31, Av. = 6.4 secs/pc

4. Cup-Col. Dimpling (20)

Time: 61, 63, 59,58, 60, Av = 3. secs/pc

5. Mataka Fitting (5)

Time: 45, 42,43, 40, 44, Av. 8.6 secs/pc

6. Blade D-Pressing(5)

Time: 18,17,20,19,17, Av. = 3.6 secs/pc

7. Mitering (5)

Time: 19,17,18,20,18. Av = 3.7 secs/pc

8. Limer Fitting(5)

Time: 16,17,19,15,17, Av.= 3.2 secs/pc

9. End Pressing & Slotting(5)

17,19,20,18,17, Av. 3.5 secs/pc

10. Blade Bush Fitting(5)

33, 29, 32, 31, 30 , Av. = 6.2 secs/pc

11. Blade Axle Fitting(5)

72,73,71,69,75, Av.14.4 secs/pc

12. Fork cup-col. 7 blade assly(5)

36,39, 34, 35, 37 , Av.7.2 secs/pc

13. Dimpling (5)

Time: 37,38,35,36, 35, Av. = 7 secs/pc

REPORT SUBMITTED

1.3.3. General Observations

(i) Input reaching the fork and frame unit comes in majority from the degreasing plant.

(ii) The supply is often delayed owing to a longer time taken in degreasing.

(iii) The process sequence existing in degreasing plant is Loading - Kerosene oil - Water - Cleaner Tank - Water Tank Neutralizer -- Unloading

(iv) In the first hour of their duty the workers are normally busy settling down, cleaning the m/c etc. etc.

(v) Again the workers are involved in packing up atleast half an hour in advance of their 8 hours duty.

(vi) The above stated factors no doubt do not make any impact on the overall production (production being on piece rate basis), but it does imply that our piece raters have quite a loose time.

(vii) The production from three assembly lines is roughly at 8000-9000

(viii) In the material movement of fork, the conveyor is seldom used, it is rather put to use for storage purposes.

1.3.4. PROPOSAL

(i) On the basis of aforesaid observations, I propose that the raw material should be supplied to the workers quite in advance.

(ii) The delay from degreasing plant may be avoided by changing the process sequence

Loading - Kerosene oil Cleaner tank - water tank - Neutralizer - Unloading

(iii) On the basis of time study, I proposed that the contract may be increased to 3500 forks per line as the workers have quite loose time.

(iv) I proposed the use of conveyor for material movement and for that they needed a chute from conveyor station point to the point of loading on debrassing plant.

1.35. CONCLUSIONS

(i) The change in the sequence of degreasing plant was accepted and implemented.

(ii) The proposal for increasing the contract was implemented only for three operations i.e. fork column champhering, column bush fitting and cup-column assembly.

(iii) The chute was ordered and the material movement through conveyor was pressed into use.

CHAPTER - 2 Time duration:(Jan.16th-Feb.20th)

TITLE: LAYOUT FOR SHIFTING OF THE EXISTING TUBULAR UNIT TO A NEW SITE

2.1 INTRODUCTION

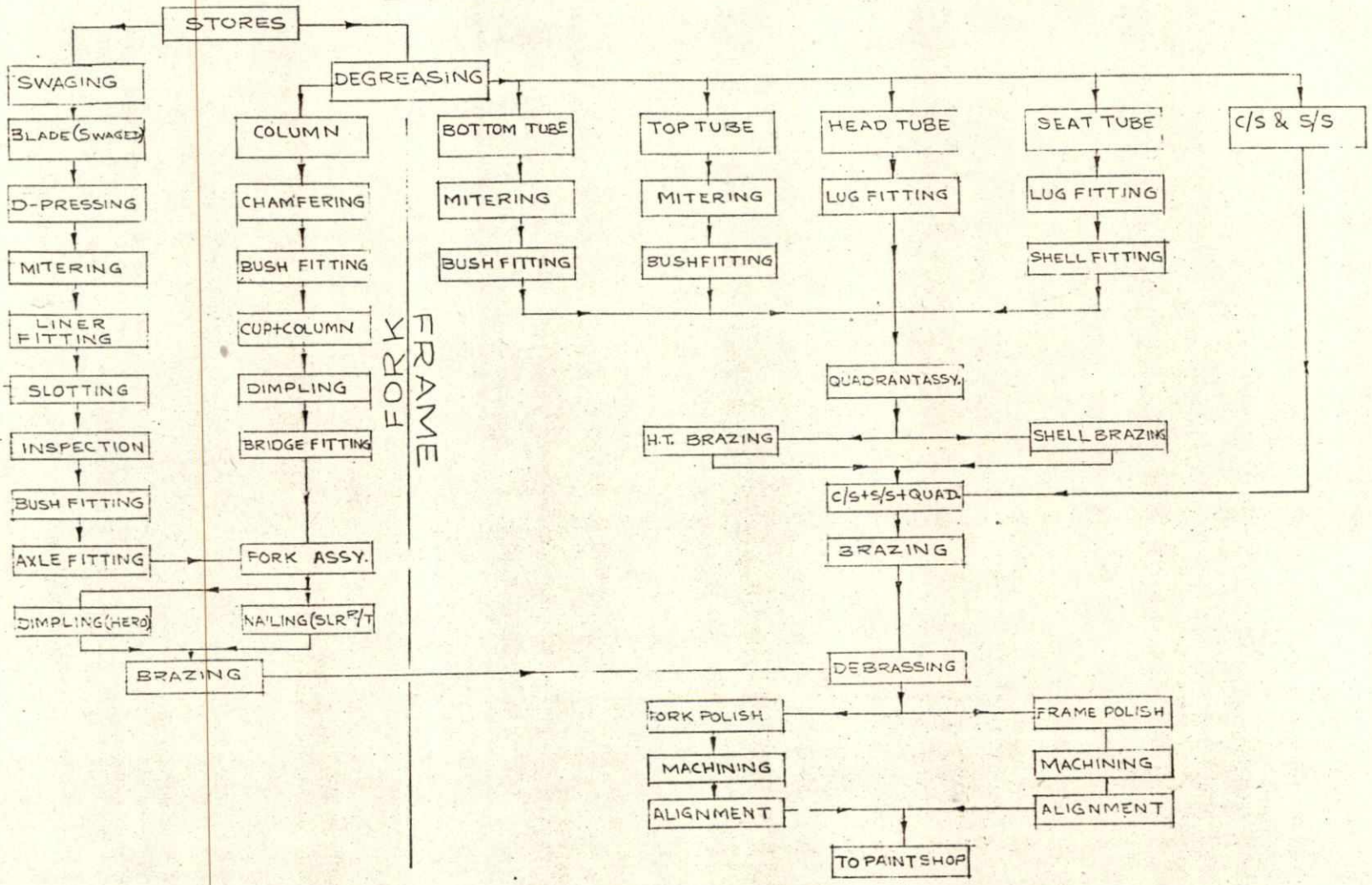
Hero management had called upon a consultant company from Delhi to work on the change in layout to a new site. But the proposal which they sent was not meeting their (managements') requirements anyway. As per directions of the management, I prepared the layout. I worked on this project very indigenously. First of all, I prepared a flow chart of the whole process taking into account every small step. Then I prepared five proposals. The representatives of the Chawla Consultant Company came for discussions. We had a discussion session of nearly 2-3 hours. We then took them around the plant and provided them with the process sequence. The decision was then, finalised in favour of proposal-2(Later discussed). The details are given in the ongoing paragraphs.

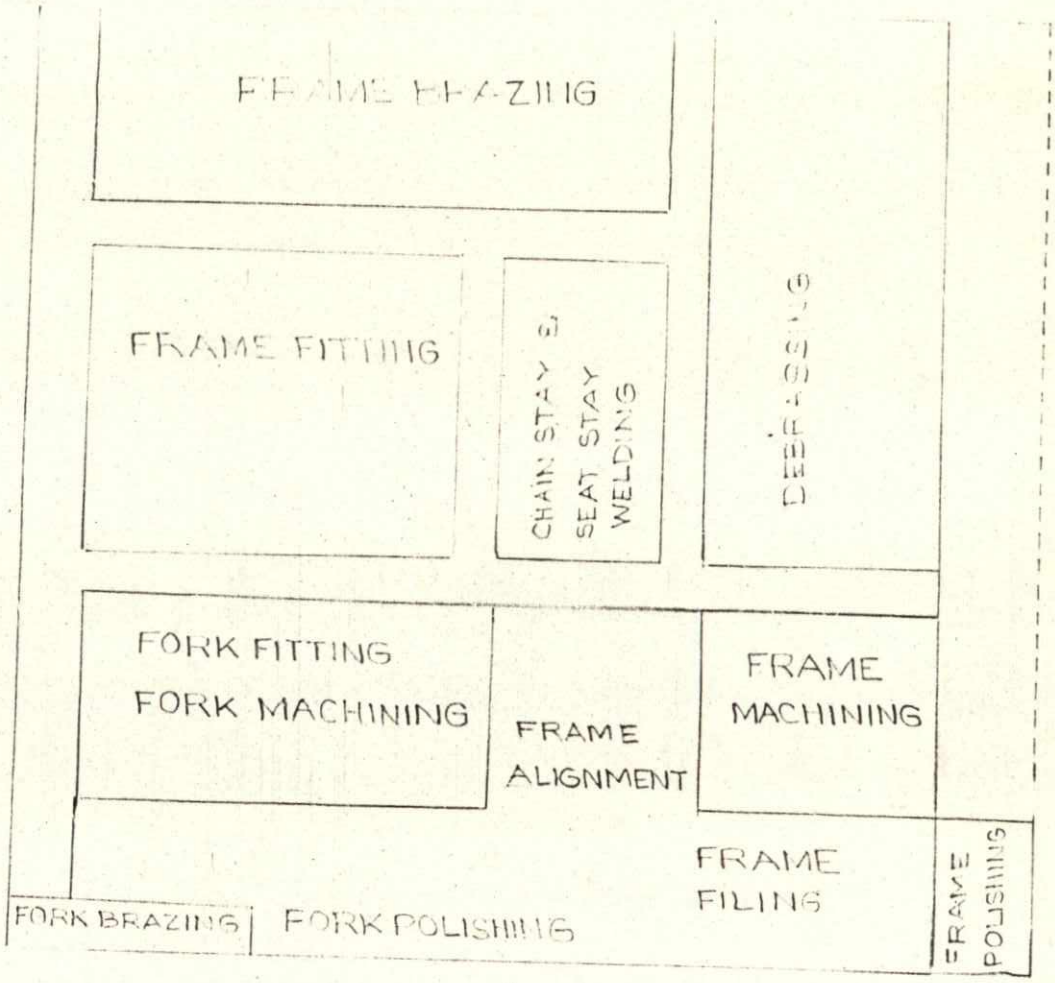
2.2 STUDY UNDERTAKEN

With the help of the factory Assistant Engineer Mr.Ravinder Garg, I prepared five proposals keeping in view the sequential and synchronized working, minimum possible man-material movement and ensuring maximum output. The target was fixed at 10,000 forks and frames per day. Points which had to be kept in mind before the initiation of the making of proposals:

T.I.E.T.

SEQUENCE OF OPERATIONS IN PRESENT TUBULAR UNIT





EXISTING LAYOUT OF TUBULAR

a. The working to be synchronized and sequential

b. Man-material movements to be reduced to minimum possible

c. Working conditions to be improved

d. Bottle-necks to be avoided

e. Material inflow and outflow to be smooth

f. Proper supervision facilities to be provided

g. Water and toilet facilities to be in quite abundance

h. Straight and free pathways for free movements to be provided.

Flaws which exist in present Tubular Unit

i. There is no synchronized pattern of working

ii. Unnecessary man-material movement is quite evident

iii. There are too many bottlenecks

iv. The furnaces are on both the sides of tubular making, the conditions of tubular miserable in summers

v. The manpower is much more than is actually required.

vi. There is no proper accounting system

vii. The conveyor working is quite erratic.

I started making the proposals taking care of the area distribution and sequential working.

a. The total area available was 180'x300'

b. Pipe store, strip store and degreasing plant were to be separated from tubular unit.

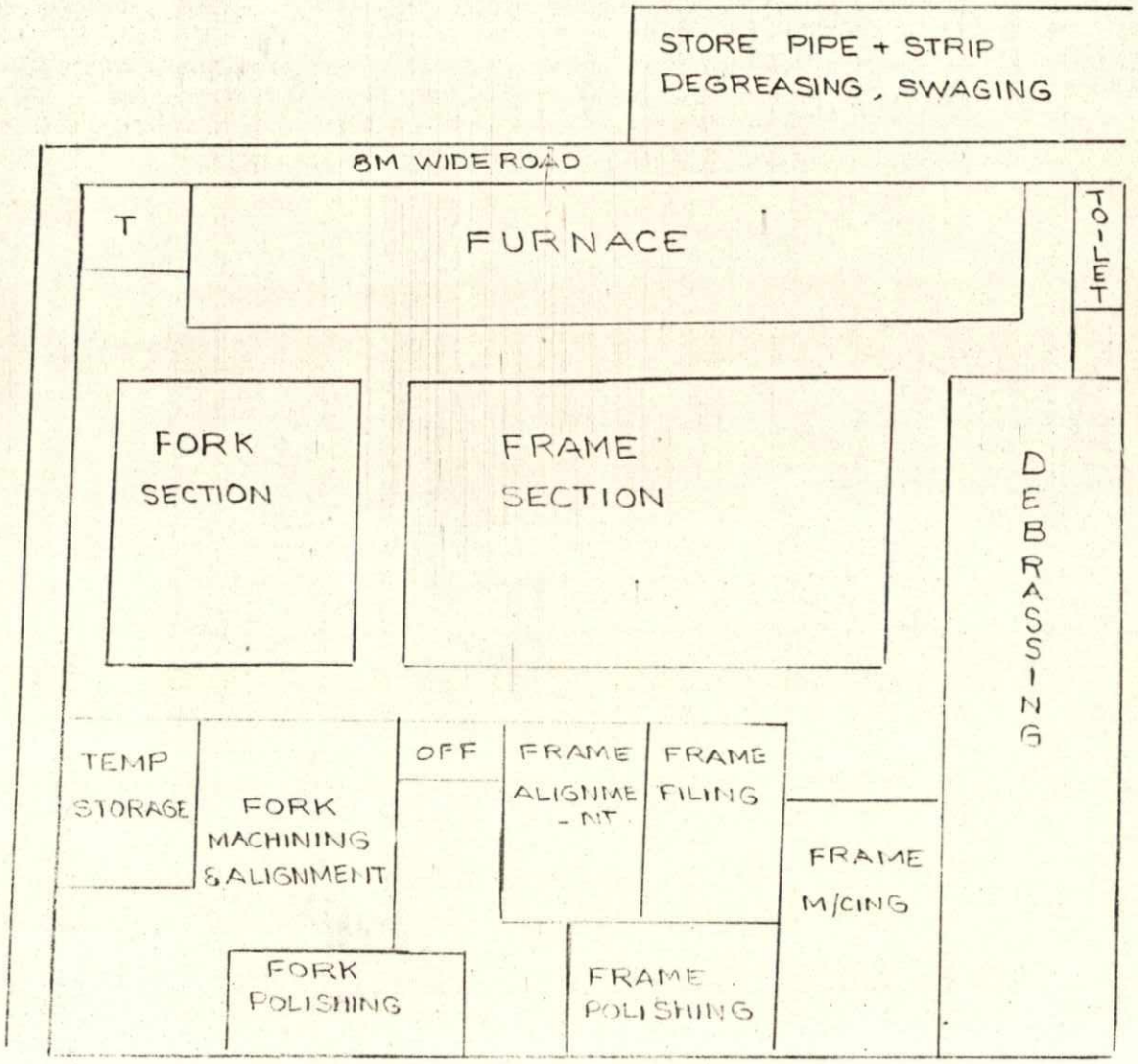
c. The furnaces preferably on one side.

d. Production target was fixed at 10,000

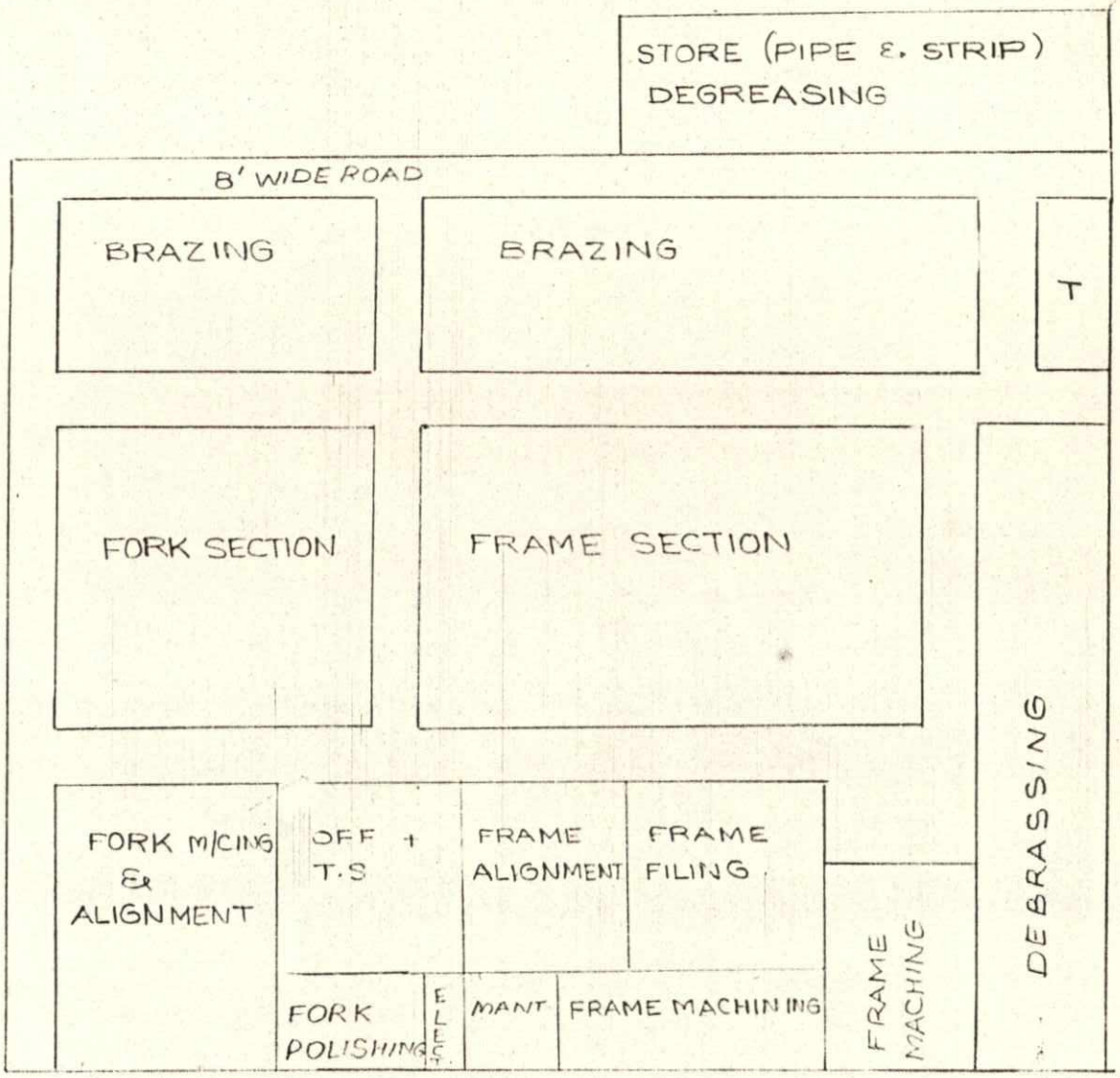
2.3 SELF ASSESSMENT

2.3.1. Proposal No.1

i. We had put up furnaces measuring 20' in length (each on 300' side) (upperside)



PROPOSAL NO - 1



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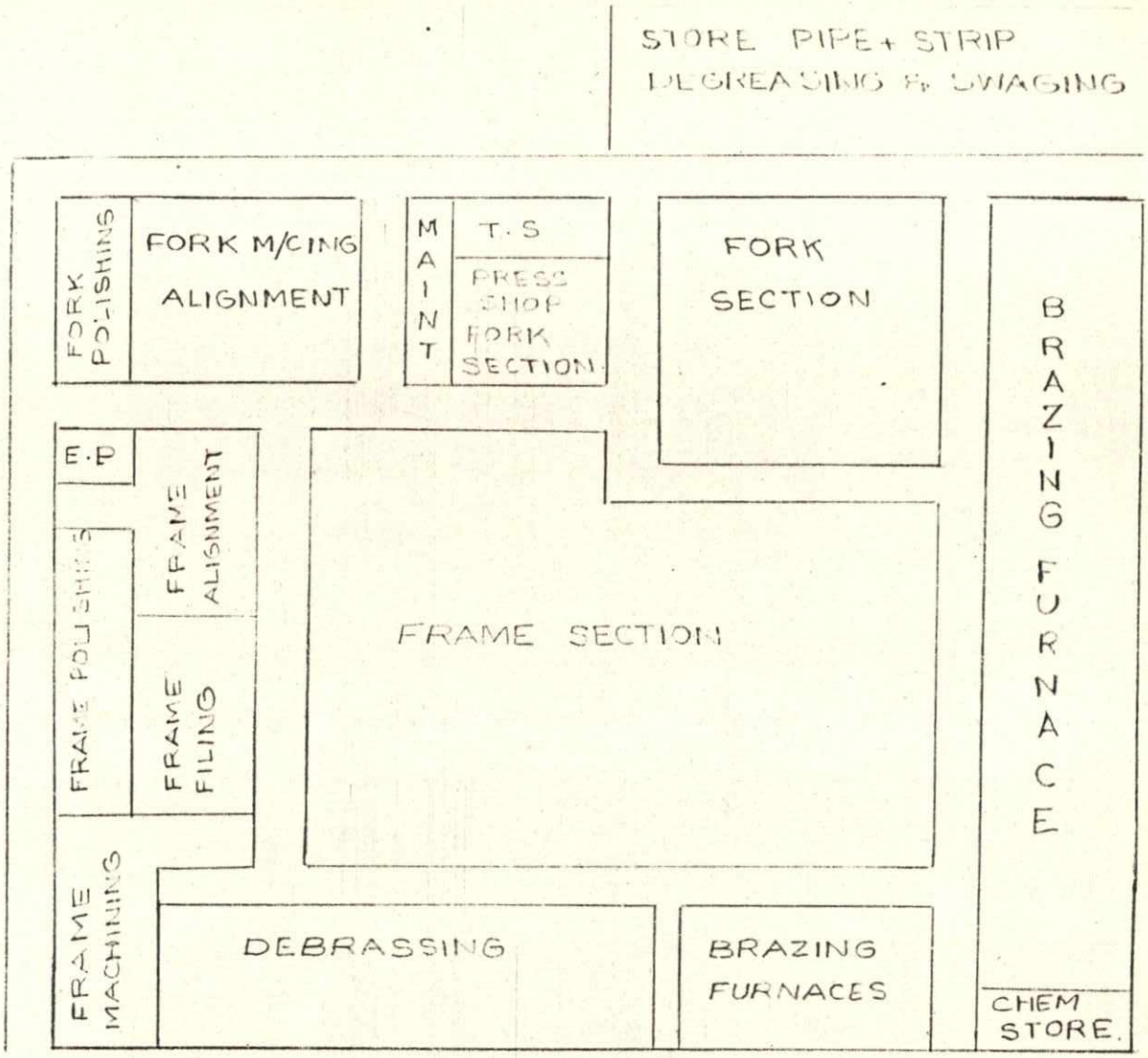


PROPOSAL NO - 4

ii. The fork and frame section in the middle

iii. The debrassing on the right side corner

iv. The machining and alignment on the lower side

Flaws:

a. There is unnecessary material flow from stores to fork and frame sections.

b. There are no straight roads

c. There is no proper inlet for material.

d. There are no proper vigil points and water facilities

e. The distance of FG to Paint Shop is also quite long.

2.3.2. Proposal No.2

It will be discussed later on as it stands approved.

2.3.3 Proposal No.3

Flaws:

i. There exists a gap between brazing furnaces which is objectionable as it separates fork and frame brazing part and the fork brazing parts quite reduced.

ii. Again the problem of material flow i.e. raw material to be supplied at a lower point.

iii. There are no proper supervision and water facilities.

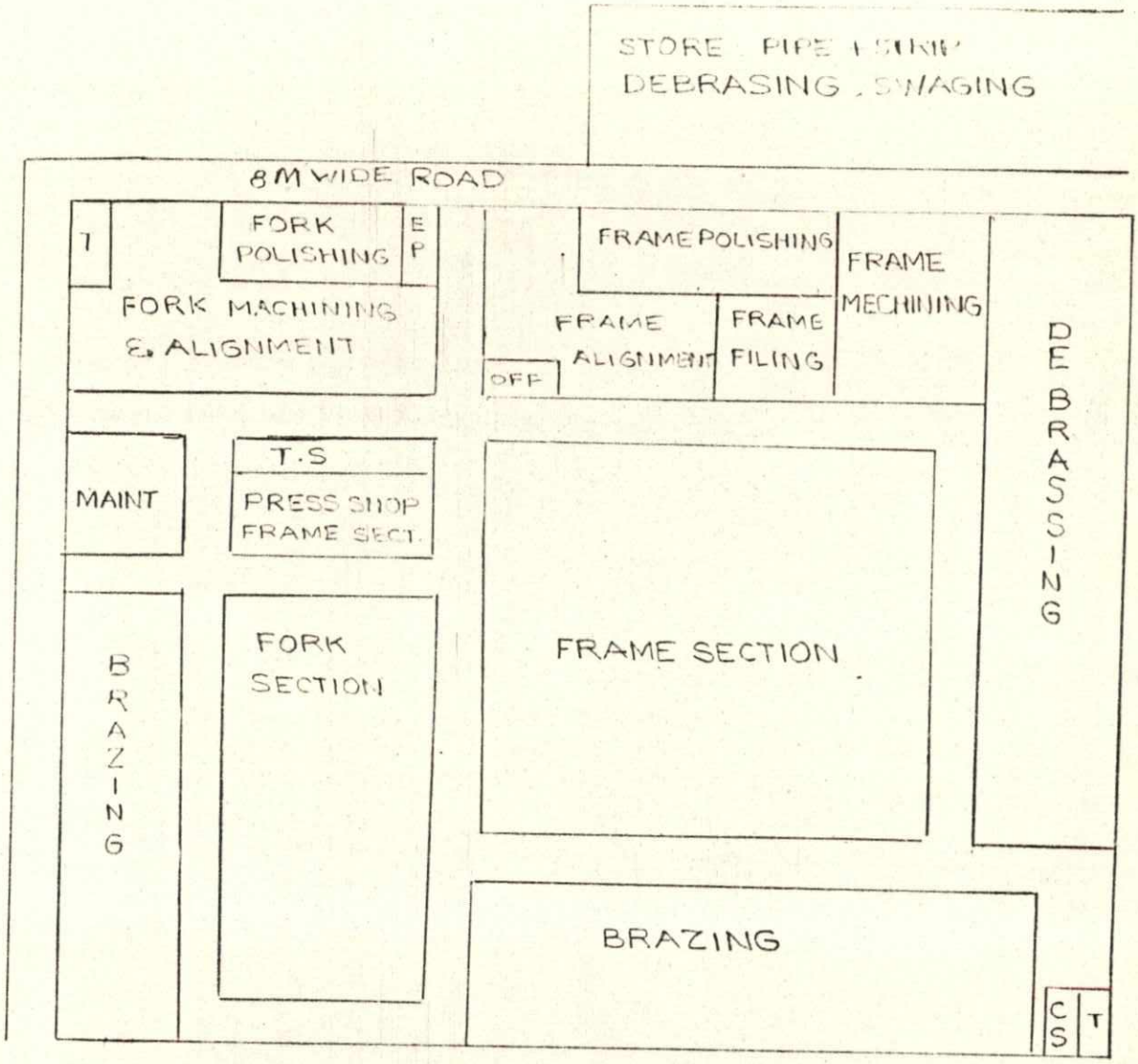
2.3.4 Proposal No.4.

Flaws

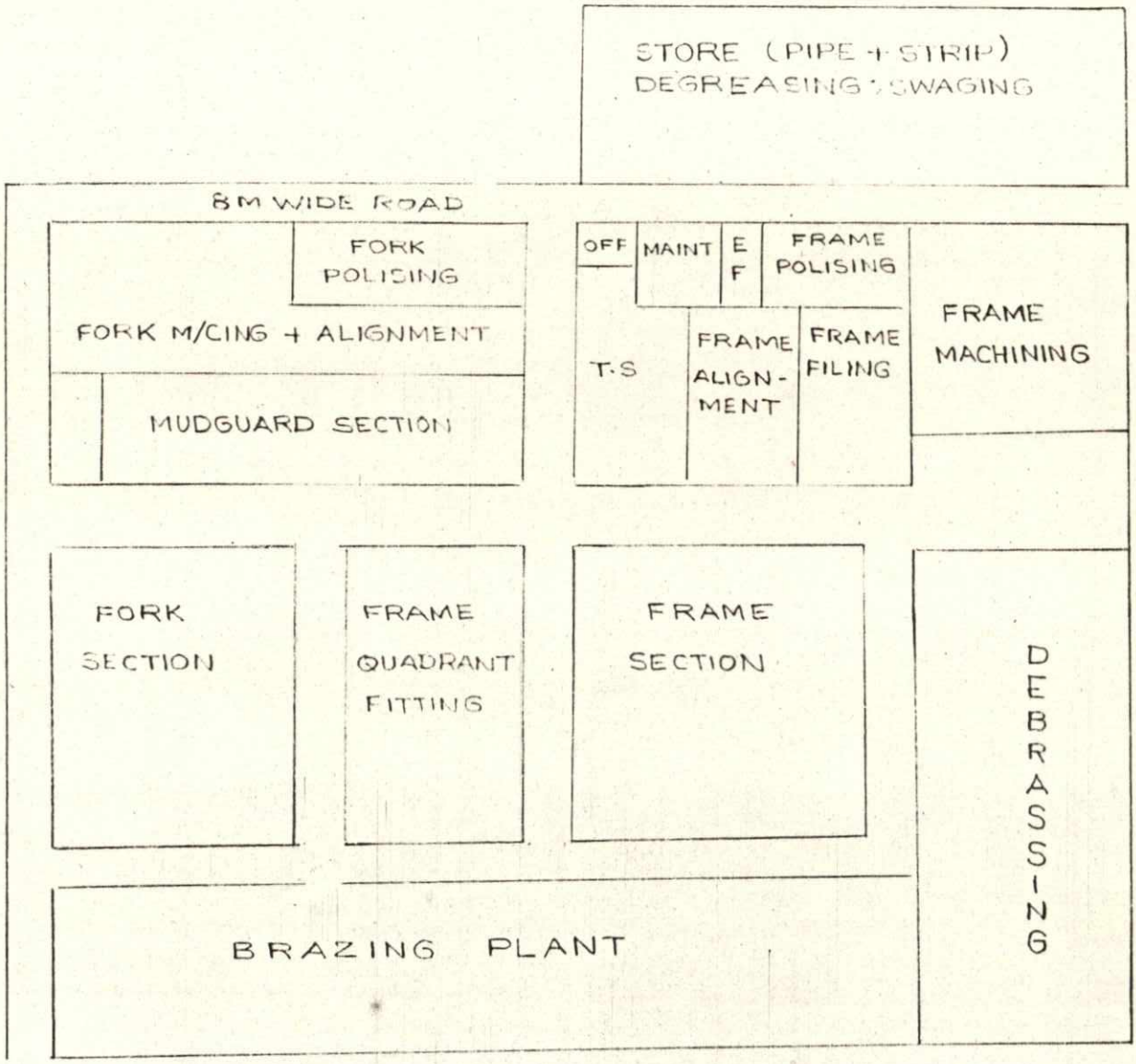
a. The brazing furnaces in an L pattern with its bigger leg on 180' side and smaller leg on 300' side.

b. There was again a problem on how to supply material to fork and frame sections.

c. There are no straight roads.



PROPOSAL NO - 5



PROPOSAL NO - 2

2.3.5. Proposal No.5

Flaws:

i. In this case the brazing furnaces aren't placed in a line and the furnaces placed in for frame section are not sufficient.

ii. Material flow from fork section to brazing and brazing to debrassing (for fork) will be a problem.

iii. There are no straight roads. It is more of a maze formation.

iv. The maintenance is cornered.

v. There are no water facilities.

2.4. Proposal -2

Which finally stands approved.

2.4.1. Favourable points

a. The process here is sequential

b. The material flow is uniform involving no bottlenecks.

c. The chemical storage is quite near the brazing.

d. The maintenance is exactly in the middle favouring access to all departments uniformly.

e. The brazing plant is placed on one side and favours good working conditions in the tubular.

The next problem was setting up of shed and the pillars. The first distribution was placed at 60' by 25' but that stood in the way of debrassing tanks. Then we suggested to have the pillars at 60' by 35'.

I was told to fill in the details of each shop in tubular unit. With cooperation of the factory assistant

Engineer Mr.Ravinder Garg and the Draftsman Mr.Diljeet Singh. I rested only after I completed the detailed layout. I was directed to place mudguard unit in the tubular unit, and I did my job to the complete satisfaction of Mr.Rai(our Director)(W). I then, put up the conveyors and carriages etc. in the detailed layout.

2.5 CONCLUSIONS

Ultimately the floor layout proposal No.2 stood approved. Then came the job of placing grids. We received a set of proposals again from Chawla Consultant Company. I was called upon to give my comments on all the proposals. I studied each proposal meticulously and ultimately the grid structure 50'x50' stood approved as it suited the structure best. Care was taken that shed be properly ventilated and properly lit by natural light. I put forward my proposals to Mr.Rai for his comments on it.

Annexture :- PROPOSED LAYOUT OF TUBULAR UNIT (attached at the back).

CHAPTER 3

Time duration: Feb.20th-March 5th 1988

TITLE: PROJECT ON INCOMING MATERIAL HANDLING IN STORES

3.1 Introduction

'Material Handling' involves the flow of raw material to stores, placement in the stores and the flow of finished goods to the respective positions of utilization or distributing agencies.

In Hero Cycles Pvt. Ltd. there are a variety of products which are purchased from outside. There are more than hundred companies from whom we purchase various items. These items are brought in and a sample is taken to R & D centre. Sample is put to a test by the inspectors there only. The approved items are taken to respective stores. I have already enlisted the stores which are about 12. in number.

3.2 List of Stores

In C P Store, there are in all 134 items, being purchased.

In packing material store there are 97 items which are being purchased:

F G Store I

F G Store II

R M Store I

R M Store II

Bank Store

Saddle store

Main store

Handlestore (inspection of polished handles)

Pipe store

3.3. Existing pattern of working

At present, the raw material etc., brought in from outside is taken to respective stores by the workers of outside companies.

One worker of R & D accompanies it for keeping a close vigil and for counting etc.

I was directed to find out the manpower and implements required to replace outside manpower by our own manpower.

Our Director Mr. Rai told us that in no company in the world a worker of outside company is let in the factory. But, inHero every outside worker coming with goods is free to go inside the factory. So he wanted that in order to avoid this intrusion we should employ our own workers.

3.4 Time study of the incoming material

I, alongwith the factory industrial Engineer Mr.Ravinder Garg set on the job. We began our project with detailed observation. In that we prepared a list of items coming in. Alongwith that we noted down the quantity of items brought in, the name of the company, frequency of his trips in a day, conveyance employed for the same, vehicle No.(if any) no. of persons accompanying the item and the time taken by them in unloading the things and taking them to the respective stores and the number of carriages employed for the same. We continued this for nearly two weeks. Then we had a list of items of the things going in the stores.

The problem facing us was that the raw material or the finished goods brought in by the outside ancillary units

could not be set to clock. As in most of the cases they are manufacturing the item in the morning and disposing it off the same day in the evening. Again, another problem was that Hero Cycles is not maintaining any inventory. So material/items cannot be brought in advance. We then prepared a chart bearing following columns:

a. Material or item

b. Frequency of Trips/day

c. Quantity

d. Party's Name

e. Mode of Transportation(with vehicle No.)

f. Workers

g. To which store

h. Movement of carriage (No.of carriages)
(No. of rounds per carriage)

i. Initial Time

j. Final Time

k. Total time taken.

3.5 Interim Report

We talked to our Director about the problems facing us and enquired if we could not change the system. We submitted a report in the form of Annexure 1.

But Mr.Rai told us to concentrate only on study of manpower required. He said we couldn't time them according to our own convenience and we were again put to a good effort.

before we submitted a list of manpower and the modus operandi to be implemented(for material movement). He again directed us to take into consideration only those stores which lie within the shed i.e. F GStore (Main) C P Store and R M Store I

3.6 Conclusions

We then on the basis of our studies ordered two more workers for F G store and one more worker in C P store. About R M store most of the items come to R & D store, only Crank and handle (for polishing) are directly delivered and two workers are already on the job to handle them. Alongwith this we ordered a hooktype electric jumbo, which is going to serve for other stores as well. The advantage of hook type jumbo over existing jumbo is that a hook type jumbo won't remain engaged while the workers are unloading the respective items. It can transport the carriage to the respective store and return to R & D centre. Our project got approved and Mr. Rai told us to fill in the indent for the jumbo the same day. We filled in the indent and he ordered the same.

ANNEXURE I

AT PRESENT

1. The parties send the items randomly.

2. As a result there is no fixed time of the incoming items.

3. Most of the parties appear after 1 p.m.

4. It creates a lot of hotch-potch near R & D leaving absolutely no privacy.

5. Moreover, owing to the pressure built in by the incoming guffaws of parties, the R & D staff are not able to inspect the items properly.

6. The trucks-both incoming and outgoing follow one route ; and that creates a lot of problem. If the entry and exit points are specified it will smoothen the material flow.

7. The inspection tables need to be increased to accommodate properly atleast the present 10 inspectors.

8. Parties complain they have to wait for 2-3 hours before they're able to deliver the items (owing to the rush at the inspection table).

9. One worker from R & D accompanies the incoming material to different stores.

ABOUT THE CHANGE

1. Can we time the incoming parties in order of their significance and our material need?

2. Can we enforce the time on the parties?

3. If we utilize our present labour of R &D(21) we don't need to send a man from R & D after once counting has been done.

Annexure I(contd..)

STORE	Present workers	Addl. proposed workers	Modus operandi for material movement
F G Store(Main)	20	2	1 Jumbo (Hook type)(No. A)
Saddle(FG brand)store	2	1	Same Jumbo(Hook type)(No. A)
Bank store		2	Fork Lifter(X)
Packing material store	2	1	Same Jumbo(Hook type)(No. A) Fork Lifter(X)
C P store	12	2	1 Jumbo (Hook type(No. B)
R M Store-1	7	2	1 Jumbo(same as present ones) (No. C)
R M Store-2	3	2	Same No.-C
Main Store	5	2	No.C Jumbo(If needed)
Handle store(Inspection of polished handles)	1	1	Not required
	Total	14-1 -13	3 Jumbos with drivers

Labour to be added is 16.

At present there are 21 workers in R & D. They're used to being sent alongwith the parties coming (in the respective stores). Out of these 21 we can easily allocate the responsibility of counting to the workers and utilize around 8 workers. We need to have, in that case, just 8 new workers.

Present No.of workers in R & D	21
Labour(manpower)needed	16
Mechanized carriages	3(Jumbos)
Manpower in R&D which can be utilized	8
New manpower needed	8

March 5th, 1988

Format of the request for Jumboelectric Tugger

Dear Sir,

We're in for a jumboelectric Tugger. We need the same for transporting the present carriages(containing items coming from outside) into respective stores. Included in the same project, we would like to add 2 more workers in F G store and one worker in CP store. The details about Jumboelectric Tugger are as follows:-

	Model	Jet G
1	Towing capacity in Kg	2000
2	Motor H P (30 VDC)	2.3
3	Speed unladen km/hr	10
4.	Gradient unladen	1:10
5.	Gradient laden	1:5
6.	From wheel(one No.) mm	435x125 solid rubber tyres
7.	Rear wheel (Two Nos)mm	250x125 " " "
8.	Overall Ht mm	1170
9.	Overall width mm	864
10.	Overall length mm	1496
11.	Wheel track mm(±25)	736
12.	Wheel Base mm(±25)	875
13	Turning Radius (±25)	1305
14	Battery	30 vt 80 AHor 282 AH
15	Changer	Single phase or three phase
16	Brakes-Foot & Parking	Mechanical type on two rear wheels
17	Tailing bracket	Provided

CHAPTER 4 Time duration: March 10 to March 2

TITLE: REPORT ON PROPER ALLOCATION OF OPERATIONS TURNING AND THREADING

4.1 Introduction

In fork machining section, there are collar turning machines and a threading machine. Collar turning involves the turning operation of the collar of the fork (i.e. at the joint of the blades with the fork column). Threading operation involves the threading on the front part of the column. There are 9 combinations wherein each collar turning machine in combination with a threading machine are placed at the disposal of one worker. My project was to work out a system to improve the productivity by varying the combination of number of turning or threading or both machines at the disposal of one worker. I did time study of one of the 9 combinations. On that very basis, I prepared man machine charts which bore loading, machining and unloading for different combinations beginning with two collar turning machines, two threading machines and similarly 3 machines on the disposal of one worker. We calculated the utilization % factor respectively for machines and men.

I presented the Report to the Director. He brought to my notice a practical problem i.e. the worker must be taking some time to relax or in moving from one machine to another. He told me to take into consideration the therbligs(micromotion movements) and then prepare man machine charts.

Man machine chart for the existing collar turning and threading operation was quite erratic and so could not be prepared in a very uniform pattern. However, other combinations were quite symmetrical. I prepared the man machine chart taking into consideration the 'Therbligs' for two machines both at the disposal of one worker each and similarly for 3 machines each again at the disposal of one worker. I submitted the report alongwith man machine charts to Mr. Rai. I was called upon to explain the details to Mr. Dhillon and Mr. Sondhi. Listening to the details, they were quite satisfied. I answered all their queries. Mr.Rai informed me of the new threading machine they had been planning to be brought in (now already installed). It claimed to produce 2000 threaded forks per day. But, for the production of 2000 threaded fork, they needed a good (quantitative) input. They thought it, quite satisfying to put three collar turning machines at the disposal of one worker.

REPORT

TOPIC: ALLOCATING PROPER MAN POWER TO FORK COLLAR TURNING AND THREADING OPERATIONS

4.2. General Observations(As they exist)

a. There are 9 collar turning machines and 9 threading machines.

b. They're adjusted in a pair (in all 9 pairs) each.

c. We've 9 workers working on them.

d. The machines are arranged very haphazardly and prove quite a bottleneck in material flow.

e. The two operations have not been timed in any.way

f. We've lot many moments when either the operator is free (IDLE) or the either of the machines is free(IDLE)

g. The worker working on t he respective collar turning and threading machine is supposed to bring his own carriage loaded with forks.

h. Worker after every 25 pcs or so inspects the fork which has been turned and threaded.

i. The utilization percentage has been calculated but here the therbligs have been taken into account. So every idle movement has been taken care of.

j. They've a contract of 1000 forks off one pair(collar turned and threaded).

4.3 Proposed (With benefits)

i. We'are planning to place 3 machines of the same operation at the disposal of one worker.(instead of 2 of different operations

ii. By adopting this method barring a smooth material flow, we'll also be saving manpower by having 3 machines combinations(per operation). We need 6 combinations and 6 workers. Saving of manpower - 3

iii. In orderto avoid burden on man working on 3 machines, an additional worker may be provided to make raw material available from fork polishing and again to move the finished fork on to next operation.

iv. The duty of the inspection should be(in totality) assigned to the inspectors already existing.

v. The utilization percentage is already indicated to be more as compared to the existing method.

vi. Regarding contract, we can fix the contract at 1000 off each machine

Check:	In 1 cycle(collar turning)	3 Forks(20 secs)
	In 1 mt.	9 Forks
	In 1 hr	540 forks
	In 7 hrs(1 hr relaxation)	3780 forks(capacity)

Proposed - 3000/3 machines

For Threading

4.4 Regarding Timings

a. The problem isthat machiningtimings of different machines differ and the charts have been drawn on an average basis.

b. For collar turning: machining timings vary from 7,8,13,14,15sec.

For Threading: Machining timings vary from 15,16...20 sec.

c. For a joint chart I have considered the upper limits.

d. For independent charts I have taken the average values.

Considered machining time for only collar turning : -14 secs.
Considered machining time for only threading : -19 secs.

Cycle time for collar turning : - 19.5 sec.
Threading : 27 sec.(roughly 2700-2800 forks/7 hrs)

On this basiswe need to purchase just one more threading machine which is worth going for.

In increasing the contract of a particular operation straight from 1000 to 3000 some incentive may be provided so as to facilitate an easy change.

COLLAR TURNING -Cycle time (with 3m/cs)-19.5 sec(machining time 14sec)

THREADING - Cycle time 24 sec.(with machining time 16 sec.)
(3000/6.6 hrs)

1. We need to have machining time of collar turning uniform at 14 secs. and threading (machining time) at 16 secs.

CHART No-1

MAN M/c PROCESS CHART

SUBJECT CHARTED :- SINGLE OPERATOR ON 1 Collar TURNING & 1 THREADING M/c

METHOD :- PRESENT

CHART BEGINS :- LOADING ON M/c-1

CHARTED BY :- VIVEK JINDAL & RAVINDER GARG.

CHART ENDS :- UNLOADING FROM M/c-1

DATE :- 14.3.88.

MAN			MACHINE - 1		MACHINE-2.	
ELEMENT	DESCRIPTION	TIME (in secs)	ELEMENT DESCRIPTION	TIME (in secs)	ELEMENT DESCRIPTION	TIME (in secs).
LOADING M/c-1 (one)	Search FIND SELECT GRASP HOLD	1.5	IDLE	1.5	IDLE (CONTD)	4
	TRANSPORT LOAD POSITION & 'ON'	1	BEING LOADED	1		
MOVE TO M/c-2	(IDLE)	1.5				
UNLOADING M/c-2.	GRASP OFF UNLOAD REMOVE	2.5	COLLAR TURNING ON		BEING UNLOADED	2.5
M/c-2.	INSPECT & Release Load.	1.5		14	IDLE	1.5
LOADING M/c-2	SR (already F Propositioned) B G H	2			IDLE	2
	T.L	(5)				(5)
	POSITION Set 'ON' & PP the next	3			BEING LOADED	3
MOVE TO M/c-1	(IDLE)	1.5 sec				
IDLE		(3)				
IDLE		1.5 sec				
UNLOADING M/c-1	G OFF UL R	1.5	BEING UNLOADED	1.5		
	H RL PP (on next)	1	IDLE	1		20
LOADING M/c-1	SR F G H	1.5	IDLE	1.5	THREADING	
	TL L ON	1	BEING LOADED	1		
MOVE TO M/c-2.		1.5				
IDLE		10.5	COLLAR TURNING	14		

UNLOADING M/c-2.	G (OFF) UL REMOVE	2.5				BEING UNLOADED	2.5
	INSPECT & RL	1.5	IDLE			IDLE	1.5
LOADING M/c-2	SR F S G H	2				~~BEING LOADED~~ IDLE	2
	T.L P ON PP (next)	3		8.5		BEING LOADED	3
MOVE TO M/c-1		1.5					
UNLOADING M/c-1	G (OFF) UL Remove	1.5	BEING UNLOADED	1.5			
	T RL PP	1	IDLE	1			
LOADING M/c-1	SR F S G H	1.5	IDLE.	1.5			
	TL L P (ON)	1	BEING LOADED.	1			
~~MOVE TO M/c-2.~~ IDLE		14	COLLAR TURNING	14		THREADING	20
IDLE							
UNLOADING M/c-1	S UL R	1.5	BEING UNLOADED	1.5		IDLE	3
	T RL PP (to be next)	1	IDLE	1			

CHART No-2

MAN-MACHINE PROCESS CHART

SUBJECT CHARTED :- SINGLE OPERATOR WITH 3 COLLAR TURNING M/cs. METHOD :- PROPOSED

CHART BEGINS :- LOADING ON M/c -1.

CHARTED BY :- VIVEK JINDAL & RAVINDER GARG.

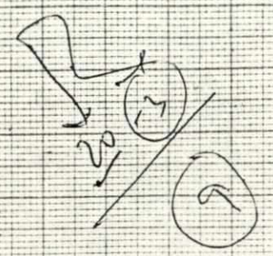
CHART ENDS :- UNLOADING FROM M/c-1.

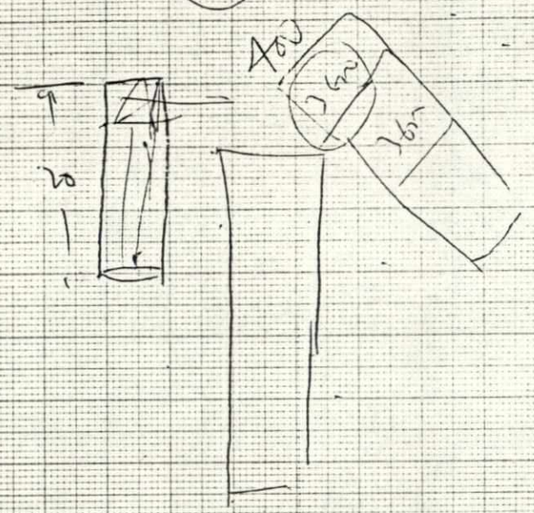
DATE :- 12.3.88.

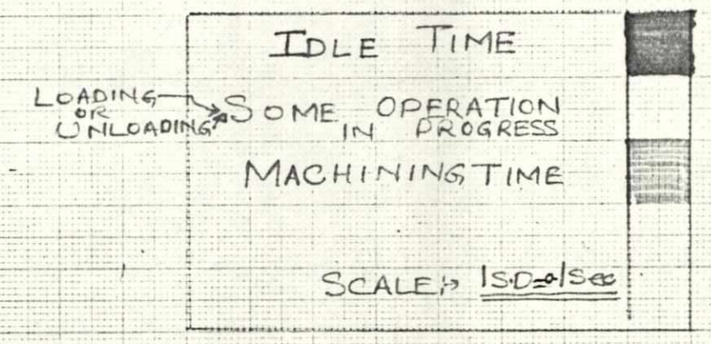
MAN			MACHINE-1		MACHINE-2		MACHINE-3	
ELEMENT DESCRIPTION		TIME (in Secs)	ELEMENT DESCRIPTION	TIME (in Secs)	ELEMENT DESCRIPTION	TIME (in Secs)	ELEMENT DESCRIPTION	TIME (in Secs)
LOADING M/c1	SEARCH FIND SELECT GRASP	1.5	M/c-1 → IDLE	1.5	COLLAR TURNING ON M/c-2	3.5	COLLAR TURNING ON M/c-3	
	HOLD TRANSPORT LOAD POSITION & SET ON	1	BEING LOADED	1				
MOVE TO M/c-2.		1.5	COLLAR TURNING ON M/c-1 IN PROGRESS	14	M/c-2 IDLE	0.5		
UNLOADING M/c-2.	GRASP UNLOAD TRANSPORT LOAD	1.5			BEING UNLOADED.	1.5		10
	INSPECT & RELEASE LOAD.	1			M/c-2 IDLE	1		
LOADING M/c-2	SR F St G	1.5			M/c-2 IDLE	1.5		
	H TL P 'ON'	1			BEING LOADED	1		
MOVE TO M/c-3		1.5			COLLAR TURNING ON M/c-2 IN PROGRESS	10.5		
LOADING M/c-3	G UL T.L	1.5					M/c-2 IDLE	0.5
	I RL	1					BEING UNLOADED	1.5
LOADING M/c-3	SR F St. G	1.5					M/c-2 IDLE	1
	H TL P 'ON'	1					M/c-2 IDLE.	1.5
MOVE TO M/c-1		1.5					BEING LOADED	1
UNLOADING M/c-1	G UL T.L	1.5	M/c-1 IDLE	0.5			COLLAR TURNING ON M/c-3 IN PROGRESS	4
	I RL	1	BEING UNLOADED	1.5				
			M/c-1 IDLE	1				

SUMMARY

	MAN	M/c-1	M/c-2	M/c-3
IDLE TIME (in Secs)	4.5 (Moving)	3	3	3
WORK TIME (in Secs)	15.0	16.5	16.5	16.5
CYCLE TIME (in Secs)	19.5	19.5	19.5	19.5
UTILIZATION %	76	85	85	85
PRODN. Can be →		1000	1000	1000 in 8 hrs.







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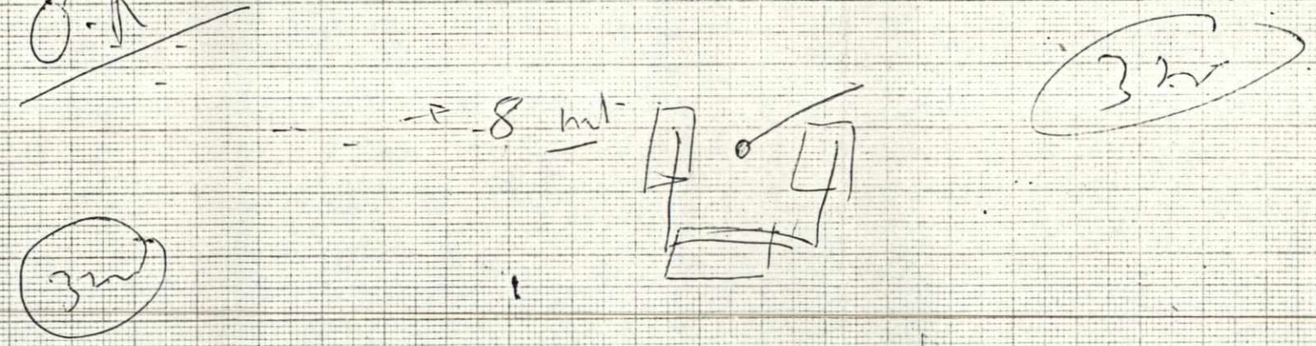


CHART No-3

MAN- M/c PROCESS CHART

SUBJECT CHARTED:- SINGLE OPERATOR ON 3 THREADING M/c.

METHOD:- PROPOSED

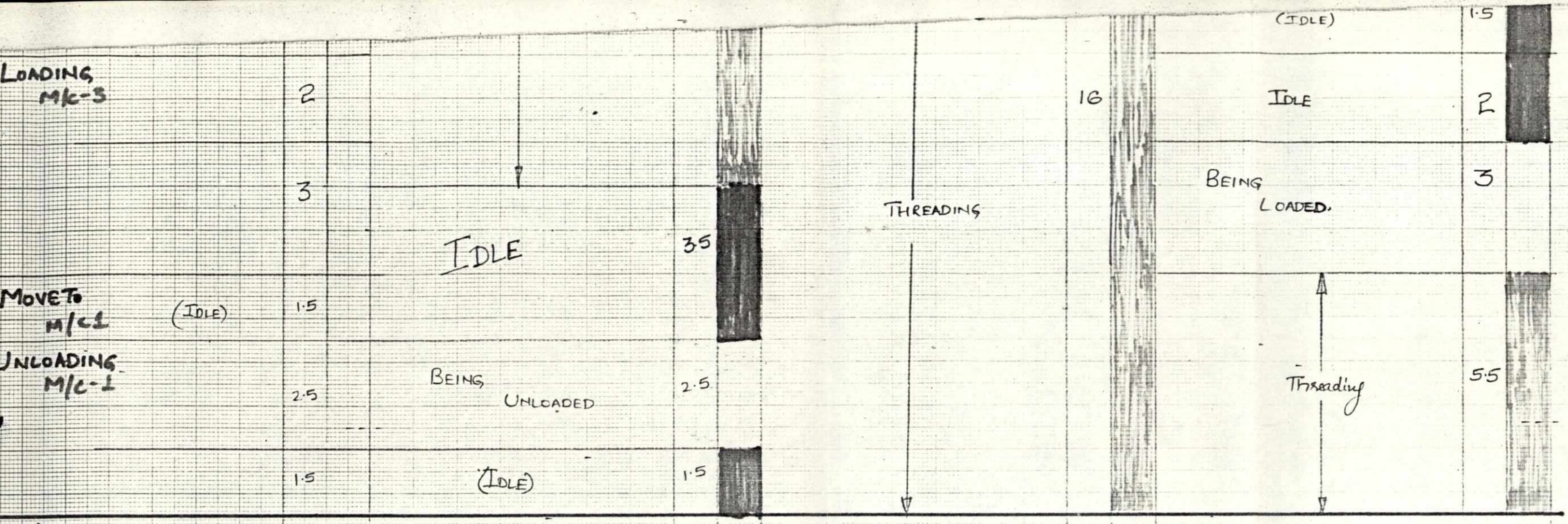
CHART BEGINS:- LOADING ON M/c-1

CHARTED BY:- VIVEK JINDAL & RAVINDER GARG

CHART ENDS:- UNLOADING FROM M/c-1

DATE:- 14.3.88.

MAN		MACHINE-1		MACHINE-2		MACHINE-3	
ELEMENT DESCRIPTION	TIME (in secs)	ELEMENT DESCRIPTION	TIME (in secs)	ELEMENT DESCRIPTION	TIME (in secs)	ELEMENT DESCRIPTION	TIME (in secs)
LOADING M/c-1 (Prepositioned) Search, Find, Select, Grasp, Hold.	2	(IDLE)	2	THREADING (Contd.)	3	Threading	13.5
TRANSPORT LOAD, LOAD POSITION & ON	3	BEING LOADED.	3	IDLE	3.5		
MOVE TO M/c-2. (IDLE)	1.5			BEING UNLOADED	2.5		
LOADING M/c-2.	2.5			(IDLE)	1.5		
	1.5			(IDLE)	2		
LOADING M/c-2.	2	THREADING IN PROGRESS.	19	BEING LOADED.	3		
	3					IDLE	3.5
MOVE TO M/c-3 (IDLE)	1.5					BEING UNLOADED	2.5
UNLOADING M/c-3	2.5						
	1.5						



SUMMARY

	1 MAN	M/c-1	M/c-2	M/c-3.
IDLE TIME (in secs)	4.5 (Moving)	7	7	7
WORK TIME (in secs)	22.5	20	20	20.
CYCLE TIME (in secs)	27	27	27	27
UTILIZATION %	83.3 %	74 %	74	74

CHART No- 4

MAN- M/C PROCESS CHART

SUBJECT CHARTED:- SINGLE OPERATOR ON ONE THREADING & 2 COLLAR TURNING m/cs

METHOD:- PROPOSED

CHART BEGINS:- LOADING ON m/c-1

CHARTED BY:- VIVEK JINDAL & RAVINDER GARG

DATE:- 14.3.88.

CHART ENDS:- UNLOADING FROM m/c-2.

MAN		MACHINE-1		MACHINE-2		MACHINE-3	
ELEMENT DESCRIPTION	TIME (in secs)	ELEMENT DESCRIPTION	TIME (in secs)	ELEMENT DESCRIPTION	TIME (in secs)	ELEMENT DESCRIPTION	TIME (in secs)
LOADING ON m/c-1.	2	(IDLE)	2				
	3	BEING LOADED	3	IDLE	6.5	COLLAR TURNING.	4
MOVE TO m/c-2.	1.5						
UNLOADING m/c-2	1.5			BEING UNLOADED	1.5	IDLE	9
	1			(IDLE)	1		
LOADING m/c-2.	1.5			(IDLE)	1.5		
	1			BEING LOADED.			
MOVE TO m/c-3.	1.5		19				

UNLOADING m/c3	1.5		THREADING				BEING UNLOADED	1.5
	1						(IDLE)	1
LOADING m/c3	1.5						(IDLE)	1.5
	1					14	BEING LOADED	1
Move to m/c-1	1.5				COLLAR TURNING			
(IDLE)	4.5							10
							COLLAR TURNING	
UNLOADING m/c-1	2.5		BEING UNLOADED	2.5				
	1.5		(IDLE)	1.5	IDLE	2.5		

SUMMARY

	MAN	M/c-1	M/c-2	M/c-3
IDLE TIME (in Secs)	4.5 (moving) + 4.5 (idle) = 9	3.5	11.5	11.5
WORK TIME (in Secs)	19	24.5	16.5	16.5
CYCLE TIME (in Secs)	28	28	28	28
UTILIZATION %	68 %	87 %	58 %	58 %

CHAPTER 5 (March 25 - April 11, 1988)

TITLE: PROJECT ON CHANGING EXISTING FORK FITTING LAYOUT

5.1 Introduction

Fork fitting section is a part of tubular unit which involves the assembly of a fork. In this section we have two press lines and three assembly lines. The two press lines involve the making of blades part of the fork. One line makes blades for R/T, SLR and Hero 22"; and other line makes it for Hero 24". In the three assembly lines, I line makes 22" Hero Fork, II line 24" Hero Fork and III line makes 2500 22"x24" Hero and 100-1500 R/T and SLR, Forks.

5.2 Existing

Fork fitting section involves firstly, in the press line making of blades. The swaged pipes are allowed to pass through these four main steps:

a) D-Pressing

b) Mitering

c) Liner Fitting

d) End Pressing & Slotting

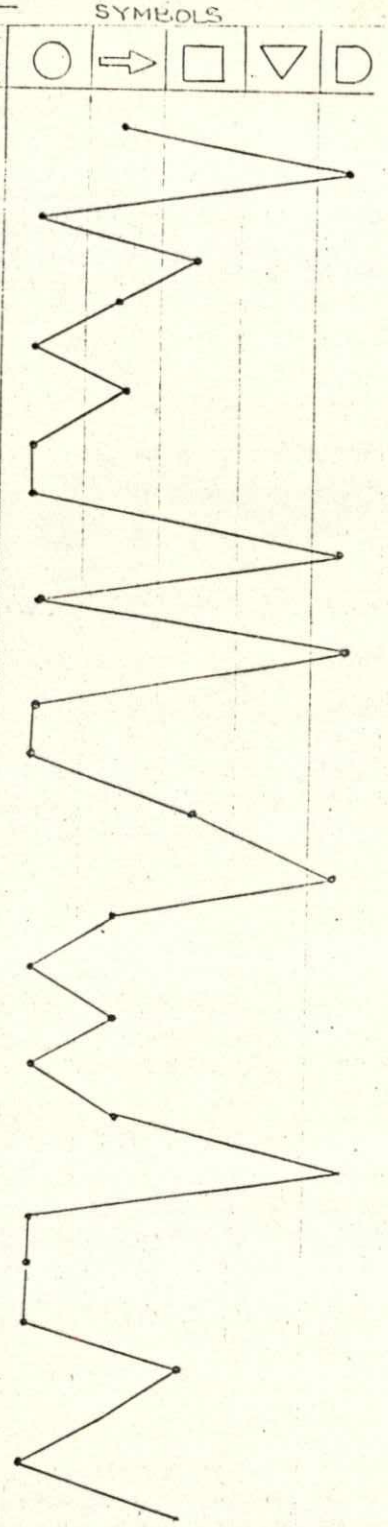
Immediately after the blades are formed, they're shifted to the racks for a temporary storage.

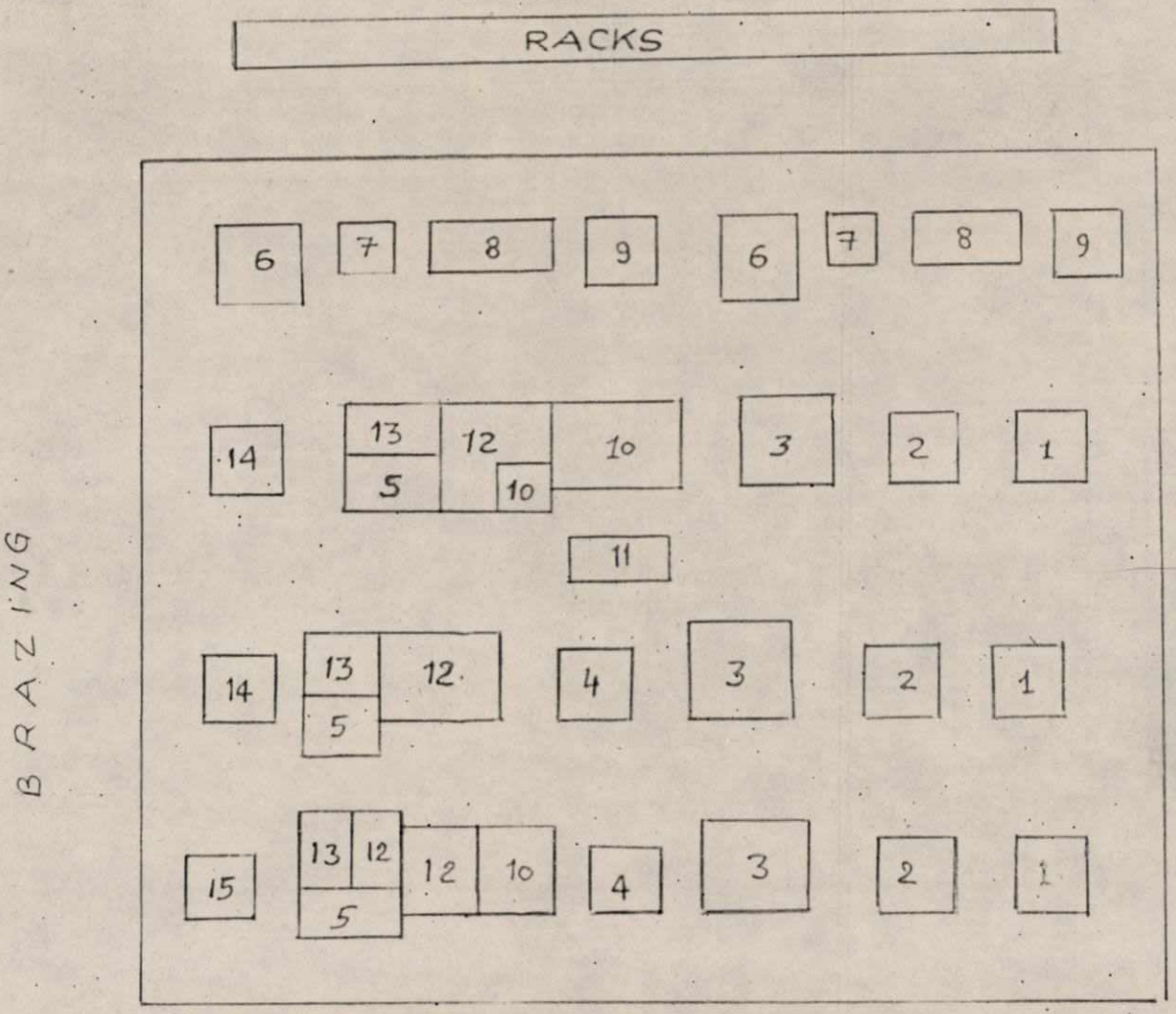
In the meantime, in the assembly lines the process sequence is:-

FLOW PROCESS CHART

S.NO	PROCESS DETAILS	TIME TAKEN SECS	DISTANCE MOVED IN MT.
1.	MOVE HEAD TUBE TO DEG. PLANT	10	18
2.	DELAY	x	x
3.	DEGREASING	x	x
4.	INSPECTION	x	x
5.	MOVE TO HEAD TUBE TO PRESS SHOP	x	16
6.	HEAD TUBE PUNCHING	2.5	x
7.	MOVE H/T TO FITTING SHOP	x	9
8.	LUG FITTING IN H/T	4.68	x
9.	PRESSING OF LUGS	2.93	x
10.	DELAY	x	x
11.	FITTING OF FRAME	x	x
12.	DELAY	x	x
13.	FITTING OF FRAME	21.3	x
14.	DRILLING & NAILING	15.2	x
15.	INSPECTION	x	x
16.	DELAY	x	x
17.	MOVE TO BRAZING SHOP	x	10
18.	BRAZING OF HEAD TUBE	15.2	x
19.	MOVE TO ANOTHER UNIT	x	6
20.	BRAZING OF SEAT LUG	7.3	x
21.	MOVE TO WELDING SHOP	x	10
22.	DELAY	x	x
23.	ASSLY & WELDING	7.27	x
24.	FINAL WELDING OF C/S	12.6	x
25.	FINAL WELDING OF FRAME	45.1	x
26.	INSPECTION	x	x
27.	MOVE TO BRAZING SHOP	x	10
28.	BRAZING OF B.B SHELL	16.5	x
29.	INSPECTION	x	x

SYMBOLS





EXISTING LAYOUT FORK ASSLY

i) Fork Col. Champhering

ii) Column Bush Fitting

iii) Cup Column Assembly

iv) Cup Column Dimpling

v) Mataka Fitting (Lug)

Between Cup-col Dimpling and mataka fitting, blades from the racks are brought in by another worker. Two processes taking place, in between, are:-

i) Blade Bush Fitting

ii) Blade Axle Fitting

Both the mataka fitted Cup-column assembly and Axle fitted blades are then subjected to

a) Final Fork(Cup-col-blade)-Assembly

b) Dimpling.

5.3. Flaws in the Existing Method

1) There is a lot of unnecessary material movement taking place i.e.

   a) Cup-column dimpling to mataka fitting

   b) Press line to racks

   c) Racks to respective blade bush fitting tables

   d) Blade bush fitting table to blade axle fitting

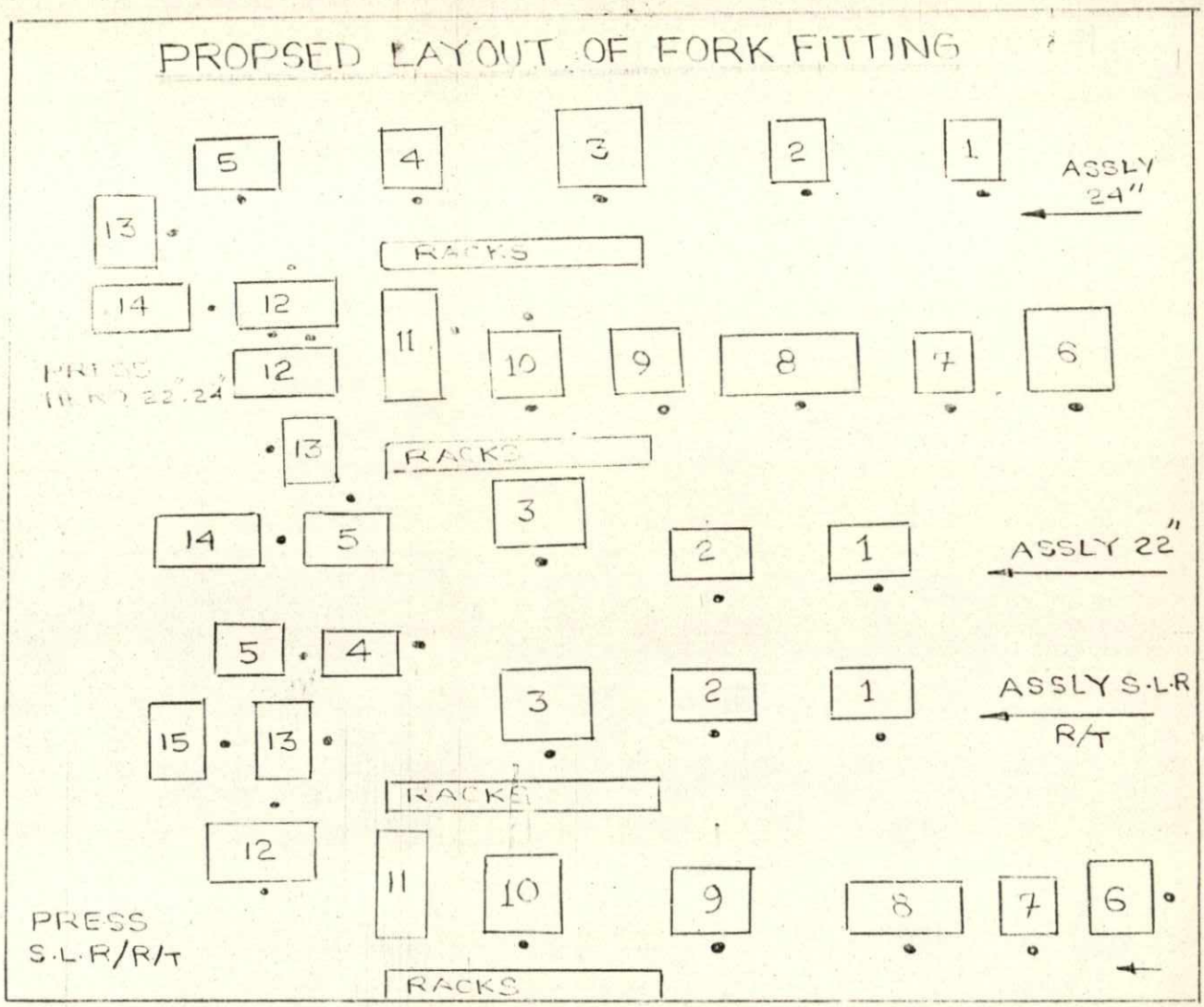
2) There is an additional worker employed for the movement of blades

3) There is no sequential working e.g. cup-column dimpling is followed by blade axle fitting or blade bush fitting and then comes mataka fitting

5.4 Proposed Layout

This involved a smooth, synchronized and sequential working pattern:

PROPSED LAYOUT OF FORK FITTING



S.NO	DESCRIPTION
1.	FORK COL. CHAMPHER
2.	FORK BUSH FITTING TABLE
3.	CUP COL. ASSLY PRESS
4	DIMPLING PRESS
5	FORK BRIDGE FITTING TABLE
6	BLADE PRESS LINE HERO, S.LR & R.T
7	MITERING PRESS
8	LINER FITTING M/C
9	END PRESSING & SLOTING
10	BLADE BUSH FITTING TABLE
11	BLADE BUSH FITTING M/C
12	BLADE AXLE FITTING M/C
13	CUP COL. ASSLY M/C
14	FORK ASSLY DIMPLING
15	NAILING M/C

5.4.1. Benfits (of the proposed method)

1) There are no bottlenecks

2) There is a smooth sequential and synchronized working

3) There is saving of manpower by one

4) The material movement is reduced

5) The worker's efficiency has increased

6) A continuous production has been facilitated

7) The production may be increased owing to less burden on workers now

5.5. Template Models of the Layouts

To present the state of affairs in a better way we prepared a template model of our proposed layout. Mr. Rai told us to prepare a template model for the existing layout as well. We prepared the same for the existing fork section and showed the material movement with the help of arrows. On comparing the two it could be easily seen that the proposed layout template model involved a sequential and synchronized working with little or no material movement.

5.6 Benefits in changing the layout of fork section

a) Sequential working of operations - Press operations - Blade bush fitting - Axle fitting - Assembly

b) Reduction in material movement - At present Press line - Racks(after inspection)- Blade bush fitting in respective lines - Dimpling to mataka fitting (around 4 metres)

c) Reduction in manpower by one - The man who is at present responsible for distribution of blades from racks to respective lines will be freed.

d) Synchronizing the whole process - Both the lines will be working simultaneously (Pressline and Assembly)

e) No crowding of carriages at the output or input stages or in lanes.

f) This will favour theincrease in contract as workers labour will be reduced a lot.

5.7 Conclusion

Discussions were held in a meeting chaired by Mr.Rai and attended by Mr.Dhillon, M.S.P.Sondhi and Mr.Ravinder Garg. I explained them my proposal as best as I could. Mr. Rai was all for it. He, however, informed us that they were planning to put up an automatic press line and in that case they'll be putting the proposed layout into practice. As a result, the proposed layout, although approved, could not be implemented in the existing pattern of working.

CHAPTER 6 (April 11 - April 16, 1983)

TITLE: REPORT ON DESIGNING OF A JIG FOR REDUCTION IN DRILL CONSUMPTION

6.1 Introduction

Drilling is a very common feature here. In fork section, drilling is done twice, once in fork fitting and once in fork machining. In fork fitting, the drilling precedes the nailing operation. In fork machining, the drilling is done after fork bending for crown mudguard fitting. In fork fitting we have two drilling fixtures and in machining part, we have three drilling machines. In fork fitting 36 No.drills are employed and in fork machinery 20 No.drills are employed. The purpose of the nailing operation is that the mataka fitted fork cup-column firmly holds the axle fitted blades during brazing.

6.2 Existing Method

The operation involves two workers working on two fixtures where in after drilling operations immediately nails are fitted. The drill is quite thin(less than 1/8") and rotates at quite a speed, so in the process,if the feed is more,the drill net urally gives way and needs to be changed. As a result, a lot of drills are wasted and are broken even in less than two hours. I studied the qty.of drills consumed in the last whole year.

For Drill 36 No.

Sr.No.	Year & Months	Drills consumed	Production of fork	Average production per drill
1	Jan 1987	94	47950	510
2	Feb 1987	101	54900	543
3	Mar 1987	85	53280	626
4	Apr 1987	70	55560	793
5	May 1987	85	64700	761.5
6	June 1987	85	57470	676
7	July 1987	75	56800	757.3
8	Aug 1987	76	58850	774.34
9	Sept 1987	75	51200	683.50
10	Oct 1987	75	58170	775.4
11	Nov 1987	69	50560	732.5
12	Dec 1987	67	51825	773.5
13	Jan 1988	67	46700	692.5
14	Feb 1988	54	45900	850

6.3 Proposal

I noticed this fact and decided to have a jig designed so as to reduce drill consumption and also to have both the blades drilled simultaneously. I talked of this project to our Director, Mr.S.K.Rai. He permitted me to go ahead with it. I got a drawing prepared by Mr. Diljit Singh. I showed the drawing to Mr. Verma, the Manager Tool Room. But Mr.Verma turned down the proposal stating that this type of jig had already been considered long before and dropped as part of the drill will be going waste in the guide. (about 1.0 cm).

6.4 Striking finding

I was a bit disappointed and got back to the floor observing the process again meticulously. For one complete day, I undertook a study of their material movement, their timing, the activities and every other minor detail. Drill, normally has a length of around 2"-2.5"(6.6 cm). About 1"(2.7 cm) is the shank part and remaining is the drill part. On the very next day I noticed that the workers are cutting 1.5 cm of the drill (from front portion the cutting edge side not shank portion) before beginning the operation, thereby wasting 1.5 cm of the drill every time. This discovery fired my spirits. I started studying the feasibility of cutting 1.5 cm from the shank side, but for a firm grip, the shank has to be kept intact. But, there was a redeeming feature. If we got the special purpose machine prepared in the form of a (double) drilling guide, it could naturally save us of 0.5 cm of drill wastage, at present, going on, alongwith the reduction in drill consumption. The special purpose machine with a pneumatic control was ordered.

6.5. Conclusions

Mr.Verma was convinced by my finding and was ultimately all for the machine was immediately ordered. The drawing was faired up. I hope the company will be able to benefit itself out of this finding.

CHAPTER 7 (APRIL 16- APRIL 22, 1988)

TITLE: DETAILED SAFETY CHECK OF PRESSURE VESSELS AND CHAIN PULLY BLOCKS AND CODIFICATIONS OF THE SAME

7.1 Introduction

Pressure vessels are all those containers or vessels which maintain a pressure above the atmospheric pressure. It mainly comprises the receiver in which the compressed air is stored. In our factory, we have around thirteen pressure vessels with safety pressures around 100 psi.

The chain pulley blocks are the implements employed for lifting the loads. Mainly chains are employed. The capacity of these blocks differ from 1 ton to 10 tons. They are either manual, electrically operated or semi-automatic. A few proformas were supplied to feed in the details of each pressure vessel and chain pulley blocks. A copy each of both the proformas has been attached.

7.2. Procedure Adopted

7.2.1. For pressure vessels

On a holiday I came to the factory and tested the pressure vessels by firstly having them evacuated and then filling in the compressed air continuously till the safety valve blew off. I noted the safety pressure and a red mark was made on that particular pressure. All the details were supplied in a tabular form giving details in safety(working)pressure, the tes pressure, the location was fixed, the utilization positions were

studied. The codes were fixed as 'AC' indicating Air-Compressor. The safety pressure for most of the pressure vessels was around 100 psi.

7.2.2. For Chain Pulley Blocks

In the test undertaken we checked the capacity of the block and it varied from 1 ton to 10 tons. We prepared a chart giving in details of capacity, location and date of installation. Alongwith it, the codes were fixed. The codes were fixed as 'CH' indicating 'chain pulley block'.

7.3. Conclusion

The fully filled proformas for 14 pressure vessels and 15 chain pulley blocks were submitted to Mr. Deepak; Deputy Manager(Personnel). We gave an order to get plates bearing code nos. and capacity of respective chain pulley blocks. These plates were then put up at respective locations.

S.No.	Compressor Type(with detail of supplier)	Working pressure (capacity)	Test pressure	Code fixed	Location	Utilization	Being utilized at what pressure
1	Air Compressor Supplier - Ingersoll Rand Co. S.No. - 8625391 Type ESV-1-LUB	100 psi (514-RPM)	-	AC-01	Compressor Room	Plant (in general)	100 psi
2.	Air Compressor Supplier - Ingersoll Rand Co.NY S.N. 785954 Type ESV-1-LUB	110 psi (514 RPM)	-	AC-02	Compressor room	Plant (in general)	110 psi
3	Screw type air compressor Supplier Mis Khosla Indair Ltd. S.No. SES-529 Type Screw	21.7 kg/cm^2 (100 psi)	26.25 kg/cm^2	AC-03	-do-	"	
4	Air Compressor Supplier Atlast Copco Model BT-4	125 psi (RPM 1460)	-	AC-04	"	"	125 psi
5	Air Compressor Supplier -Intergsoll Rand Co. Type ESV-1-LUB	110 psi	-	AC-05	"	"	110 psi
6	Air Compressor Supplier Ingersoll Rand Co. Type ESV-1-LUB S.No. B42362	110 psi	-	AC-06	"	"	110 psi
7	Air Compressor Supplier Elgi Equipments Ltd. S.No. B-706	100 psi	150 psi	AC-07	Paint shop	Paint shop	100 psi
8	Air compressor Supplier-Ancillaries & Accessories S.No. 560 3R'g	125 psi	190 psi	AC-08	Honda Rim Plant	Honda Rim Plant	125 psi
9	Supplier Elgi Equip.Ltd. S.No. 4799	135 psi	185 psi	AC-09	"	"	135 psi

10.	Compressor(Two Receivers S.No. 815822-815823 Supp. Tanwar Diesel Eng.Co.Ltd. Japan.	30kg/cm^2	45kg/cm^2	AC-10	Generator room	Generator room	30kg/cm^2
11.	Compressor DDR Supp. DDR-Schiffs-Revision Klassifikation, German	30 kg/cm^2	45 kg/cm^2	AC-11	"	"	"
12	"	"	"	AC-12	"	"	"
13	"	"	"	AC-13	"	"	"

S.No.	Type(with the name of supplier)	Code No.	Capacity (in tons)	Location	Date of installation (year)	Checked on (frequency of testing)
1.	Fixed chain Pulley Block	CH-01	10 tons	Near Time Office (Porch in front of Mr.Nanda's office)	Oct.1985	
2	Moving Chain Pulley Block	CH-02	1 ton	In Press shop(Main) (near chain wheel presses)	Jan.1988	
3	Fixed chain pulley block	CH-03	1 ton	In Elect.Maintenance Deptt.	Feb.1975	
4	Powered Hoist(Electrically)	CH-04	1 ton	Handle brazing unit	Feb.1988	
5	Semi-powered hoist (H)Horizonal movement - Manual Vertical(V)" - Electrically controlled	CH-05	1 ton	Electroplating Deptt. (Main)	Sept.1986	
6	Fixed chain Pulley block	CH-06	1 ton	Rectification Deptt.	July1979	
7	Semi-power Hoist (H - manual; V-electrically controlled	CH-07	1 ton	Rim Plant	1970	
8	-do-	CH-08	1 ton	-do-	1975	
9	-do-	CH-09	1 ton	-do-	1977	
10	-do-	CH-10	1 ton	-do-	1979	
11	Powered hoist(Electrically)	CH-11	1 ton	Swaging plant	Dec.1987	
12	-do-	CH-12	1 ton	Honda Rim Plant	Jan.1987	
13	Semi-powered(fixed) Hoist (only vertical movement)	CH-13	1 ton	Honda Rim Plant	Jan.1987	
14	E.O.T.C. Powered hoist attached to a moving carriage(with free motion in all directions)	CH-14	1 ton	Strip & Pipe stores	Dec.1986	
15	Powered hoist (electrically)	CH-15	1 ton	Mudguard section	Jan.1979	

FORM-8
(See Rule-61)

REPORT OF EXAMINATION OF PRESSURE VESSEL OR PLANT.

1. Name of occupier(of factory):

2. Situation and address of factory.

3. Name, description & distinctive number of pressure vessel or plant.

4. Name and address of manufacturer and reference to the test certificate of competent person.

5. Nature of process in which it is used.

6. Particulars of pressure vessel or plant:

   (a) Date of construction

   (b) Thickness of walls

   (c) Date on which the pressure vessel or plant was first taken into use.

   (d) Maximum permissible working pressure recommended by the manufacturer.

   (e) Design pressure, if known (The history should be briefly given and the examiner should state whether he has seen the last previous report)

7. Date of last hydrostatic test (if any)and pressure applied

8. Is the pressure vessel or plant is open or otherwise exposed to weather or to damp?

9. What parts(if any)where in accessible?

10. What examination and test were made?(specify pressure if hydrostatic test was carried)

11. Condition of the pressure vessel or plant,(State any defects materially affecting the maximum permissible working of the pressure vessel or plant)

External ----------

Internal ----------

P.T.O.

A RECORD TO BE MAINTAINED UNDER SUB-CLAUSE(iii)OF THE CLAUSE(a) OF SUB-SECTION(1)OF SECTION 29 OF THE ACT.

(i) Name of occupier of factory :

(ii) Address of the factory :

(iii) Distinguishing number of mark, if any, and description sufficient to indentify the lifting machine, chain, rope, or the lifting tackle.

(iv) Date when the lifting machine, chain, rope or lifting tackle was first taken into use in the factory

(v) Date and number of the certificate relating to any test and examination made under sub-rules(1) and (7) together with the name and address of the person who issued the certificate.

(vi) Date of each periodical thorough examination made under sub-clause(iii)of clause(a)of sub-section(1)of section 29 of the Act and sub-rule(6)and by whom it was carried out.

(vii) Date of annealing or other heat treatment of the chain and other lifting tackle made under sub-rule(5)and by whom it was carried out.

(viii) Particulars of any defects affecting the safe working load found at any such thorough examination of after annealing and of the steps taken to remedy such defects.

jcv.

CHAPTER 8 Time duration(April 29 - May 16)

TITLE : REPORT ON AUDITING OF MANPOWER

8.1 Introduction

I was directed to audit the manpower of complete plant. Auditing implied studying the various sequence of operations and relative manpower as it exists and then finding out the standard manpower. Actually Hero Management wants to increase the production to 8,500 and so they wanted a standard manpower for the said figure.

8.2 Study conducted

I started my job with Rim Plant and made a note of the process sequence. Rim Plant basically, comprises: Rim manufacturing, Rim Grinding, Cutting and Polishing, Electroplating. It also includes the Honda and Moped Rim Plant. I prepared a note of process sequence alongwith the details in terms of manpower and production contracts. I presented the results in a tabular form to our Director(W) Mr.Rai who was immensely glad to see it. He directed me to extend the findings to other parts of the plant and tally them up with the daily attendance.

The standard manpower was prepared on the assumption of 10% as improved performance of the worker on the production contract (this being performance rating). On adding them in the end we added roughly 10% as against absenteeism. This gave us a departmentwise standard manpower workout.

After rim plant we extended our areas of study to paint shop, tubular plant, finishing, assly, crank, handle, polishing and packing and export. By and by we could see that in almost all the departments the manpower was running quite surplus and there were operations where even the piece rate was not fixed yet.

8.3. Report Submitted

Mr.Rai directed me to prepare a summary for the complete plant. The problem I faced was that in some cases the production was 6000 or 5000(in place of the desired figure of 8000) and the rest was purchased from outside. In such cases, I had to calculate the standard manpower for 6000 or 5000. The things were discussed with the DGM(Personnel) and Dy(Personnel)Manager. Mr.Rai then took the details of the proposals along with the summary to M.D.(Works) Mr.Satya Nand Munjal, who evinced a keen interest in the proposals. I brought my proposals back, prepared a fair draft and had it photocopied. My studies showed a surplus of 65 in the strength of the workers. When I was fairing it up, I noticed that in the Rim Plant and the Finishing they had already kept 10% workers A.A. So the total surplus manpower went up to 117. I made the submission to this effect to Mr.S.N. Munjal.

Dy.(Personnel)Manager,Mr. Deepak asked us to round off the standard figures at the operation level. This gave us a reduced surplus which came at 75.

We then made our study on packing and exports. Both of them were relatively simpler. We completed our job, got it photocopied and submitted a copy to the Manager.

TOR - TIME OFFICE RECORDS

FINAL SUMMARY

S.No.	DEPTT.	Total Strength (existing)	STANDARD MANPOWER Before rounding off +10%(AA) A	Total on rounding off + 10%(AA) B	SURPLUS A	SURPLUS B	SHOFT IF ANY FOR (B)
1.	Press Shopt	32	32	35	-	-	3
2.	(a) Handle m/c Shop	34(2 TOR)	33	34	1	-	-
	(b) Crank M/c Shop	34	34	36	-	-	2
3.	Assembly Shop						
	(a) Handle assly.	52	47	49	5	3	-
	(b) Chain wheel assly.	11	11	11	-	-	-
	(c) Seat Assly.	14	13	13	1	1	-
	(d) Pedal Assly.	50	46	46	4	4	-
	(e) Brake Assly.	9	8	9	1	-	-
	TOTAL in (assly.)	136+4 TOR	125	128	11	8	-
	(After TOR)	140					
4	Finishing Shop	189+20 TOR					
	After TOR	209	184	193	25	16	-
5	Electroplating	109 + 2 TOR					
	After TOR	111	105	106	6	5	-
6	Polishing	61	60	61	1	-	-
7.	Paint Shop						
	(a) Bonderizing	19	19	19	-	-	-
	(b) Paint Shop	188	173	174	15	14	-
8	Rim Plant	317 + 20 TOR (337)	304	311	33	26	
9	Tubular	432 + 12 TOR (444)	417	430	27	14	
	TOTAL (GRAND)	1609	1486	1527	123	82	

SUMMARY (MANPOWER AUDITING)

S.No.	Section	Annexure No.	Production (Varies from job)	MANPOWER STANDARD	MANPOWER ACTUAL	SURPLUS	SHORT
1	Press Shop	MAU-01	Varies from job to job	32	32	-	-
2	Hande & Crank m/c shop	MAU-02					
	(a) Handle shop		6000	33	32	-	1
	(b) Crank Shop		12000	34	34	-	-
3	Assembly Shop:	MAU-03					
	(a) Handle Assly.		6000	47	52	5	-
	(b) Chain wheel assely.		5500	11	11	-	-
	(c) Seat Assly.		3000	13	14	1	-
	(d) Pedal assly.		16000	46	50	4	-
	(e) Brake assly.		6500	8	9	1	-
				125	136	11	-
4	Finishing Shop	MAU-04					
	(a) Frame finishing		8000	116	119.5	3.5	-
	(b) Fork finishing		8000	32	33	1	-
	(c) Mudguard finishing		8000	30	30	-	-
	(d) Chain Cover finishing		6000	7	6.5	-	0.5
				185	189+10% 208	4.5 23	0.5
5.	Electroplating shop	MAU-05	Varies from operation to operation	47	51	4	-
	(a) On piece rate basis						
	(b) On time rate basis			58	58	-	-
				105	109	4	
6.	Plishing:	MAU-06	Varies for diff. operations				
	(A) Time rating	-		10	10	-	-
				46	51	5	-
				56	61	5	
7.	Paint Shop:	MAU-07					
	(a) Bonderizing		8000	19	20	1	-
	(b) Electrostatic		2800	56	61	5	-
	(c) Sames Electrostatic		1600	24	26	2	-
	(d) Undercoat		5200	30	33	3	-
	(e) Finish		3000	39	43	4	-
	(f) Tail end white		8000	5	5	-	-
	(g) Miscellaneour(+Maintenance)		-	20	20	-	-
				193	208	15	-

S.No.	SECTION	ANNEXURE No.	Production	MANPOWER Standard	Actual	Surplus	Short
8.	RIM PLANT						
	A. Rim Manufacturing	MAU-08	16000	58+2=60	62	2	-
	B. Rim Grinding		16000	64	68	2+2	-
	C Rim Polishing		17000	66	65	-	1
	D. Rim Electroplating		18000	67	61	-	6
			(incl.Honda & Moped Rims)				
	E. HONDA Rim + Moped Rim		1900 ..	25	36	11	-
			Net M.P.		317+10%	19	
			In Rim	305	349	44	
9.	TUBULAR UNIT						
	A. Degreasing plant	MAU-09	8000	11	10	-	1
	B. Quadrant fitting		8000	46	42	-	4
	C Frame Brazing & Assly.		8000	111	128	17	-
	D. Frame machining		8000	66	63	-	3
	E. C/S & S/S Press		8000 pairs	28	29	1	-
	F. Blade Pressline		16000	25	27	2	-
	G. Fork assly.		8000	29	30	1	-
	H. Fork Brazing & Polishing		8000	27	28	1	-
	I. Fork m/cing		8000	21	25	4	-
	J. Debressing		8000	23	22	-	-
	K. Fitkit & BMX		(24+20)	5	5	-	-
	L. Mudguard Section		16000	24	23	-	1
				416	432	26	10

TOTAL MANPOWER (ACTUAL) = 1601 (A.A.)
STANDARD MANPOWER = 1484
SURPLUS 117

If we take whole nos.(+ A.A.10%)
M.P. 1526
Surplus 75

DEPTT. NOT COVERED

S.No.	SECTION	MANPOWER
1	Tool Room	61
2	Maintenance	56
3	Elect.Maint.	19
4	Sanitation	24
5	Inspection	100
6	Loading	11
7	Transportation	11
8	Packing & Export	100
9	Watch wards	25
10	Rim Electrical	11
11	Rim Tool Room	40
12	Store	94
	Total	552

ANNEXURE AU-1

PRESS SHOP (MAIN)

OPN. CODE NO.	PROCESS DESCRIPTION	PRODUCTION CONTRACT	PRODUCTION	MANPOWER EXISTING	MANPOWER STANDARD
2602	Fork Cup Bending	5100/W	5100	1	0.9
2604	Break Lever Cutting	6000/W	6000	1	0.9
2605	Break lever Bending	5000/W	5000	1	0.9
2606	Blanking Pedal Cug Big	50000/W	55000	1	0.9
2607	Pedal Cup Big Collar	18000/W	18000	1	0.9
2608	Blanking Pedal Cup Small	55000/W	55000	1	0.9
2609	Collar Pedal Cup Small	18000/W	18000	1	0.9
2610	Blanking Pedal Plate Outer	13000/W	13000	1	0.9
2611	Punching Pedal Plate Outer	8000/W	8000	1	0.9
2612	Blanking Pedal Plate Inner	13000/W	13000	1	0.9
2613	Punching Pedal Plate Inner	8000/W	8000	1	0.9
2618	Bending Crown Cover	6500/W	6500	1	0.9
2619	Punching Hole Crown Cover	8000/W	8000	1	0.9
2620	Jalli Crown Cover	5500/W	5500	1	0.9
2621	Trimming Crown Cover	6000/W	6000	1	0.9
2623	Operation Chain Wheel	1000/W	6000	6	5.45
2624	SLR C/S Bridge	5000/W	5000	1	0.9
2634	Face Pedal Cup Big	6000/W	6000	1	0.9
2635	Face Pedal Cup Small	6000/W	6000	1	0.9
2636	Lady Loop Bridge	5000/W	5000	1	0.9
2638	Small Fork Bridge Bend	8000/W	8000	1	0.9
2640	New Fork Cup Hole	8000/W	8000	1	0.9
2641	New Fork Cup Collar	7500/W	7500	1	0.9
-	Material Movement	-	-	2	2
-	Crown Coil Cutting	-	-	2	2
				32	29.25

Total M.P. - 32
STD - 32

ANNEXURE MAU-02

HANDLE & CRANK M/C SHOP

(A) HANDLE SHOP(Av.6000)

Operation Code No.	Process Description	Production contract	Production	Manpower Existing	Manpower Standard	Standard Manpower
3810	All Operation Mech.	600/W	6600	11	9.1	9.[illegible]
3815	All Operation Handle Fitting	800/W	5600	7	6.82	7.[illegible]
3816	Column Brazing	1000/W	6000	6	5.45	5.[illegible]
3817	Column brazing(Helper)	1350/W	5400	4	4.04	4.8
3818	Handle Bar Pickling	-	-	2	2	2
3819	Col., Pipe, Tee Degreasing	2250/W	4500	2	2.42	2.63
				32	29.83	32.59
(B) Crank shop (Av.12000)						
3601	Crank Auto Drilling	800/W	6400	8	7.27	
3602	12.9" MM Counter	7000/W	7000	1	0.91	
3603	15.5 MM Counter(5/8")	7000/W	7000	1	0.91	
3604	15.5 Reamer(5/8")	3500 RT) 1 W	7000	1	0.91	
3611	" " "	3500 LT)				
3605	Turning	1200/W	4800	4	3.64	
3606	Press & Undercutting	3100/W	6200	2	1.[illegible]2	
3607	3/8" Counter(15.5, 12.9)	7000/W	14000	2	1.82	
3608	3/8" Reamer	6000/W	12000	2	1.82	
3609	Threading & Packing	3700/W	7400	2	1.82	
3610	Auto Drilling	900/W	5400	6	5.45	
3612	Movement	5000/W	10000	2	1.82	
-	Crank Polishing Repair	-	-	1	1	
-	Machine Setter	-	-	2	2	
				34	31.19	

ANNEXURE MAU-03

ASSEMBLY SHOP

	Process Description	Production contract (for a new worker)	Existing details of production contract	Total	MANPOWER Existing	MANPOWER Standard (for 6000)	Standard Reqd. (for 7000)
7601	Handle eye bolt fitting	590/650/W	650x10 (1xA.A.)	6500	10+1=11	8.39	9.79
7610	Handle eye bolt tightening	1500/w	1500x4 (1600x1(A.A.)	6000	5	3.62	4.24
7602	Handle fitting	450/w	450x10 440x1 460x2 (4200x(A.A.)	5860	14	11.85	13.83
7603	Handle grip fitting	750/w	750/8	6000	8	7.27	8.48
7604	Handle bolt fitting						
7605	Handle chalk cleaning						
7606	Handle wrapping	800/w	800x6 600x2 (650x1)(A.A.)	6000	9	6.81	7.95
7607	Handle & Seat M. to F.G. Store	4750/W	4750/w	9500	2	2	2
7608	Paper cutting	-	-	-	1.5	1.5	1.5
7609	Material movement	-	-	-	1.5	1.5	1.5
					52	42.94	49.29
	CHAIN WHEEL ASSLY						
7701	Chain wheel fitting	500/w	500x11	5500	11	10 (for 5500)	10.9 (for 6000)
	SEAT ASSEMBLY						
7806	Cover punching	300/w	3000x1	3000	1	0.9	1.05
7803	Dhancha fitting	800/w	800x4	3200	4	3.41	3.97
7807	Back plate	1000/w	100x3	3000	3	2.7	3.18
7808	Seat Hook	1500/w	1500x2(1A.A.)	3000	2	1.81	2.12
7809	Seat label	3000/w	3000x1	3000	2-1=1	0.9	1.06
7804	Seat fitting	3000/w	3000x1	3000	1	0.9	1.06
7805	Seat packing	3000/w	3000x1	3000	1	0.9	1.06
	Against absenteeism	-	-	-	1	-	
					14	11.52	13.51

ANNEXURE MAU-03 contd..

S.No.	Process Description	Production contract (for details of production contract) (a new worker)	Existing	Total production	MANPOWER Existing	MANPOWER Standard	Standard reqd. for 8500 bikes
7902	Pdeal Dhancha Fitting	2400/W	2400x6	14400	6	6.06 (for 8000 bikes- 16000 pedals/day)	6.44
7903	Pedal Axle fitting	800/w	800x4 700x8 650x10	15300	22	18.18	19.3
7904	Axle Cleaning(Gula)	7000/W	7000x1	7000	1	1.03	1.1
7905	Pedal fitting	1400/w	1400x6	16200	12	10.38	11.04
7906	Pedal packing & movement	1300/w	1300x6	7800	6	5.59	5.94
-	Material movement	-		-	1	1	1
-	Miscellaneous	-	-	-	2	2	2
					50	44.24	46.8
(E)	BRAKE ASSLY						
8001	Brake packing	1500/w	1500x3	6500	4.5	3.94	4.24
8002	Brake strip fitting	4000/w	1400x1 1200x0.5				
			4000x1 5000x0.5	6500	1.5	1.47	1.59
8003	Brake wire fitting	3000/w	3000x1 2500x1 1500x1	7000	3	1.97	2.1
					9	7.38	7.93

Total manpower - 136
Standard " = 125

ATTENDANCE (on 23/4/88) and (on 25-4-88)

Process line	23/4/88/	25/4/88
1. Handle assly.	46	43
2 Chain wheel assly.	9.5	14
3. Seat assly.	12	14
4. Pedal assly.	44.5	42
5. Brake assly.	9	7
Total output	126	117

ANNEXURE MAU-C4

FINISHING SHOP

	Process Description	Production contract for new workers	Production contract for existing workers	Total production	MANPOWER Existing	Standard (8000/Day)	Standard manpower (8500/day)
	FRAME FINISHING						
6302	Frame Transfer	-	-	8000	18	16.36	17.38
6303	Frame Head Punching	3600/W	3600x2	8200	2.5	2.02	2.15
6304	Frame Label	1300/W	1750x1 1700x1 1300x1 1500x1 1250x1 1000x0.5	7500+500 =8000	5.5	4.15	4.41
6305	Frame Cup Fitting	2350/W	2350X2 2750x1	7450+550 = 8000	3.5	2.64	2.89
6306	Frame Counting(Twice)	5000/W	5000x3	15000	3	2.91	3.1
6307	Frame Paper Wrapping	650/W	760x4 700x2 650x4 600x1	7640)) 8240	11)))13	9.13 (for 7640)	9.57 (for 8000)
6315	Frame Plastic wrapping	300/W	300x2	600)	2)	1.8 (for 600)	2(for 600)
6308	Frame Gatta Wrapping	650$W	760x5 700x2 650x2 600x2	8350	12	9.57	10.17
6309	B.B.Shell tapping	1625/W	1625x4 1650x1	8150	5	4.41	4.68
6310	B.B.Cup Flank fitting	1100/W	1100x7	7700	7	6.6	7.02
6311	B.B.Cup Plain Fitting	1100/W	1100x7	7700	7	6.6	7.02
6312	Frame C/S Lupy wrapping	1100/w	1100x7	7700	7	6.6	7.02
6313	Frame Number	2700/w	2700x3	8100	3	2.7	2.86
6314	Seat Pillar Fitting	-	-	8000	4.5	4.1	4.33
6316	Frame Gatta cutting	3600/w	3600x2	7200+800 = 8000	2.5	2.02	2.15
6317	Frame Movement	-	-	8000	2	1.8	1.9
6318	Frame Cleaning	8000/W	800x1	8000	1	0.9	0.96
6320	Frame Tape	1100/W	1100/7	7700	7	6.6	7.0
6321	Frame Lining(New)	650/w	650/wx13	8450	13	11.18	11.88
-	Miscellaneous	-	-	-	3	3	3

	Process description	Production contract for new workers	Production contract for existing workers	Total production	MANPOWER Existing	Standard (for 8000)	STANDARD manpower (for 8500)
6401	Fork lining	1750/w	1750x5	8750	5	4.15	4.41
6402	Fork Transfer	1600/w	1650x2 1600x3	8100	5	4.41	4.68
6403	Fork Wrapping	1400/w)	1500x1				
6407	Fork plascting wrapping	700/w)	1400x4(paper)	7100+700	6	4.85	5.15
6404	Fork fitting		700x1(plastic)	=7800			
		-	-	8000	15	13.6	14.5
6405	Fork eye fitting	100/w	100x2	2000	2	1.8	2
						(for 2000/day)	
					33	28.81	30.74
	MUDGUARD FINISHING						
6501	Mudguard white wrapping	3000/w	3000x2 4000x0.5	6000+2000 =8000	2.5	2.4	2.6
6502	Mudguard rear label	2000/w	2000x4	8000	4	3.6	3.86
6503	Mudguard rear lining	2000/w	2000x4	8000	4	3.6	3.86
6504	Mudguard rear packing	2000/w	2000x4	8000	4	3.6	3.86
6505	Mudguard pairs	4000/w	4000x2	8000	2	1.8	1.9
6507	Mudguard front lining	2000/w	2000x4	8000	4	3.6	3.86
6508	Mudguard front packing	4500/w	4500x1 (Time rating-1)	4500+3500 = 8000	2	1.6	1.7
6509	Mudguard opening	6500/w	6500x1	6500+1500 = 8000	1.5	1.12	1.19
6510	Mudguard movement	7000/w	7000/1	7000+1000	1.5	1.04	1.1
-	Mudguard front transfer	-	-	-	4.5	4.5	4.5
					30	26.86	28.43
	CHAIN COVER FINISHING						
6601	Chain cover lining	-No longer operational -					
6602	Chain cover transfer	-	-	-	5	4.5	4.8
6603	Chain cover packing	4500/w	4500x1	-	1.5	1.6	1.7
					6.5	6.1	6.5
						167.27	

Total No. of workers = 189
Against absenteeism(10%) 19
208

Total existing manpower = 208
Standard manpower = 167.27 + 16.7(A.A.)
= 184

ELECTROPLATING PLANT

ANNEXURE MAU-05

Operation Code No.	Process Description	Production contract	Production	Manpower Existing	Manpower Standard
On Piece rate basis					
6803	Handle Eye Bolt, Jigging	10000/W (2 shifts)	20000	2 (2 shits)	1.82
6804	Handle Eye Bolt Washer, Bolt washer Jigging	6250/W	31250	5 (1 shift	4.54
6805	Handle spring Jigging	11000/W	11000	1	0.91
6806	Check Nut ' Brake lever Jig	11000/W	14333.33	1.33	1.18
6807	Pedal Plate. Inner Jig	10000/W	13333.33	1.33	1.2
6808	Pedal Plate Outer Jig	10000/W	13333.33	1.3	1.2
6809	Pedal Cup Big Jigging	10000/W	15000	1.5	1.36
6810	Pedal Cup Small Jigging	10000/W	15000	1.5	1.36
6811	Pedal Rod Jigging	10000/W	30000	3	2.73
6812	Loading, Unloading & Jigging	100000/group (3 shifts)	100000	30 (10, 10, 10)	27.27
6815	Suspender's Nickle stripping	16/W	32	2	2
6816	Suspender's Nickel stripping & unloading	8/w	8	1	1
				51	46.57
On Wages Basis					
1	Operator (on Automatic plant)	-	-	4(2, 1, 1)	
2	Counters	-	-	6(2, 2, 2)	
3.	Water treatment plant	-	-	4(2, 1, 1)	
4.	Pedal Pipe Barelling	-	-	1(G.S.)	
5.	Plant Fitter	-	-	3(1, 1, 1)	
6.	Zinc Plant(Loading/Unloading)	-	-	2(G.S.)	
7.	Chem.Maintenance	-	-	3(1, 1, 1)	
8.	Store Counting	-	-	4(2, 2)	
9.	Handle stamping	-	-	4(2, 2)	
10	Ni stripping	-	-	2(1, 1)	
11	Repairs(Rechrome)	-	-	6(G.S.)	
12	Suspender Maker	-	-	6	
13.	Suspender Stripper	-	-	4	
14	Wlder	-	-	2	
15.	A.A. & Sunday Maintenance	-	-	7	
				58	

ANNEXURE MAU-06

POLISHING DEPTT.

OPN CODE NO.	PROCESS DESCRIPTION	PRODUCTION CONTRACT	PRODUCTION	MANPOWER EXISTING	MANPOWER STANDARD
7301	Crank Polishing	216/W	4536	21	19.2
7302	Handle Polishing	72/W	1656	23	20.91
7404	Chain Wheel Polishing	2500/W	5000	4 (2 operators) (2 helpers)	3.64
7401	Chain Wheel polishing(A)	330/W	660/W	3 (1-A.A.	1.82
					45.47
	Leather wheel dressing	-	-	5	
	Barelling	-	-	2	
	S.C.'s polishing	-	-	2	
	Buffeting	-	-	1	
				61	

Total Manpower in Electroplating - 109 S.D. 105

In Polishing 61 S.D. 56

PAINT SHOP

ANNEXURE MAU-07

S.No.	Process	Worker's description	Production contract	Manpower Existing	Manpower Standard
A)	Bonderizing (6201)				
1.	Loading/Unloading	Loaders (3 in each shift)	7500/day (Group job) 7-6-7)	9	
2.	M.M.	M.M.(2,1,2)		5	
3.	Extra work	Helper(1 per shift)		3	
4.	Against absenteeism	A.A.(1 per shift)		3	For 8000/day 19.39
				20	
B)	ELECTROSTATIC (6201)				
1.	Painting	Painters(3 per shift)	2800 set/day	9	
2.	Sand Paper Rubbing	Sanders(5 per shift)	(Group job)	15	
3.	-	Helpers(4 per shift)	(20-20-21)	12	
4.	Loading	Loader(1 per shift)		3	
5.	Unloading	Unloader(2 per shift)		6	
6.	For Small components	S.C.(1 per shift)		3	
7.	Material movement	M.M.(1 per shift)		3	
8.	Helpers for increasing prod. from 2500	Workers		7	
				~~3~~	For 2800/day
				58	52.72
9.	Helpers for Fitkit	Workers		3	3
				61	55.72
C)	SAMES ELECTROSTATIC(6201)				
1.	Painting	Painter(2 per shift)	1600 set/day	4	
2.	Loading	Loader(2 per shift)	(Group job)	4	
3.	Unloading	Unloader(2 per shift)	(13-13)	4	
4.	-	Helper(3 per shift)		6	
5.	For small components	Worker S.C.(1 per shift)		2	
6	Against Absenteeism	A.A.(1 per shift)		2	
7.	Against C-off	C-off(1 per shift)		2	For 1600/day
8	Material movement	M.M.(1 per shift)		2	
				26	23.6

S.No.	Process	Worker's description	Production contract	Manpower Existing	Manpower Standard
D)	UNDERCOAT(6201)				
1	Dipping	Dipper(2 per shift)	5200 set/day	4	
2	Dipping & Helping	D/Helper(2 per shift)	(16-14-3)	4	
3.	Extra work	Helper(5 per shift)		10	
4	Unloading	Unloader(2 per shift)		4	
5	Loading on conveyor	Loader(1 per shift)		2	
6	Against absenteeism	A.A.(")		2	
7	Small components Jigging(6204)	Worker(2 per shift)		2	
8	" " "	M.M.(1 per shift)		2	
9	Painting(for 3rd shift)	Painter(for spare work in 3rd shift)		1	
10	Helping (")	Helper (")		2	For 5200/day
				33	30
E)	FINISH (6201)				
1.	Dipping	Dipper(2 per shift)	3000 set/day	4	
2	D/Helping	D/Helper(2 ")	(22-21)	4	
3.	Sandpaper Rubbing	Sander(6 per shift)		12	
4	Unloading	Unloader(2 per shift)		4	
5	Helping	Helper(5 " ")		6	
6	Material movement	M.M.(3 ")		6	
7	Against Absenteeism	A.A.(1 ")		2	
8	Helping	Helpers for increasing production from 2700 bikes to 3000 bikes/day)		5	For 3000/day
				43	39.1
F)	TAIL END WHITE(6202)				
1.	Dipping	Dipper	7000/day	2	For 8000/day
2.	Helping	Helper		3	5.2
G)	RECTIFICATION				
1.	Rectification				
2.	Stripping	Workers	-	6	6
3.	Sunday Maintenance				
H)	MAINTENANCE	Workers	-	14	14
			TOTAL MANPOWER	208	193

Total existing manpower = 208
Standard Manpower = 193

ANNEXURE - MAU-08

RIM PLANT

C.No.	Process Description	Worker's Description	Production contract	Total prodn.	MANPOWER Existing	MANPOWER Standard	Standard
(A) RIM MANUFACTURING							
8525	Coil loading	Loader(1,1,1)	25 coils/W	75	3	2.7	2.89
8501	Rim rolling	Operator(4,4,4)	1300/W	15600	12	11.18	11.88
8506	Butt welding	Operator(2,3,3)	2400/W	19200	8	6.06	6.44
8509	Rim Sizing	Operator(3,3,3)	2400/W	21600	9	6.06	6.44
8526	Loading on Conveyor	Loader(1,1,1)	4500/W	13500	3	3.23	3.44
					(for 13500)	(for 16000)	
8514	Autopunching & Lading	Operator(2,2,2)	2200/W	13206	6	5.45(for 13200)	
8510	Manual Punching	Operator(2,2,2)	1100/W	6600	6	5.45(for 6600)	
8528	Loading on auto-punching	Loader(1,1,1)	4400/W	13200	3	3.30	3.51
					(for 13200)	(for 16000)	
8530	Reseam Welding	Operator(1,1,1)	250/W	750	3	2.72(for 750)	
-	For Small Rim (Rectification)	Worker	-	-	6	6	
-	For Cleaning	Cleaner	-	-	1	1	
					60	53.17 + 5.3 = 58	
(B) RIM GRINDING							
8701	Grinding front (Spoke side)	Operator(6,5,6)	1000/W	17000	15+2	14.5	15.45
8704	Grinding Back	Operator(2,2,2)	3000/W	18000	6	4.85	5.15
8705	Rough Joint Polish Front	Operator(5,5,5)	1100/W	16500	15	13.22	14.05
8704	Rough Joint Polishback	Operator(2,2,2)	3000/W	18000	6	4.85	5.15
8706	Fine Joint Polish	Operator(5,5,5)	1100/W	16500	15	13.22	14.05
8708	Refine Polishing	Operator(2,2,2)	3000/W	18000	6	4.85	5.15
-	Rectification	Worker(G.S.)	-	-	3	3	3
					68	58.33 + 5.8 = 64	

ANNEXURE - MAU-08 contd.

C.No.	Process description	Worker's description	Production contract	Total production	MANPOWER(for 16000 Rims) Existing	Standard
(C) RIM POLISHING						
8601	Cutting & Polishing(Manual)	Operator(10,10,10)	400/W		30	
8606	TCE m/c polishing	Loader(2,2,2)				40
		Unloader(6)(2 in each shift)		7000	15	
		Operator(1,1,1)				
8608	Loading/Unloading on conveyor	Loader/Unloader (2,3,2)	2300/W	16100	7	6.5
8605	Wheel dressing	Dresser(2,2,2)	35/W	-	5	
-	Transfer from storage to Polishing	Helper	-	-	1	1
-	Rectification	Worker	-	-	6	6
-	H/R Rim Polishing	Operator	-	-	1	1
					65	60+6=66
(D) RIM PLATING(including Honda Rim & Moped Rims)						
-	Suspender Maker	Maker(3,3)	1	-	6	6(for 18000)
8802	Loading & Unloading	Loader(12,12,12)	500/W	18000	36	35.4
-	Maintenance(Chem.)	Worker (G.S.)	-	6	6	
8801	Stripping) Rectification	Worker(2,1,1)	250/W	-	4	4
8803	Rechrome)		300/W			
8806	Nickel chrome plating	Operator (2,2,2)	2750/W	16500	6	6.1
-	Honda Bundling(Wrapping)	Worker(1,1,1)	22 Bundle/W	-	3	3
					61	60.5 = 61

S.No.	Process description	Worker's description	Production contract	Total production	MANPOWER Existing	Standard
HONDA & MOPED RIMS						
	HONDA RIM(1500/24 hrs)					
8522	Coil Loading) Rim Sizing)	Operator(1,1)	550/W	1100	2	2
8519	Rim Rolling	Operator(1,1)	550/W	1100	2	2
8520	Butt welding	Operator(1,1)	550/W	1100	2	2
-	Wobble checking	Operator(1,1)	350/W	700	2	3
8518	Runching	Operator(2,2)	300/W	1200	4	3.6
-	Run out test	Operator(1,1)	600/W	1200	2	1.82
	MOPED RIM(800/8 hr)					
-	Coil loading & Rim Sizing)	Operator	300/W	900/3W	3	2.7(for 900)
8518	Rim Rolling)	Operator	300/W			
-	Butt Welding)	Operator	300/W			
-	Punching	Operator(1,1)	350/W	700	2	2.25
-	Run out test	Operator(1,1)	600/W	1200	2	1.36
					21	20.7
8605	Wheel dressing	Dresser	35/W	-	2	2
	HONDA(700)					
8725	Grinding	Operator	300/w	900	3	2.1(for 700)
8524	Joint Polishing(front)	"	125/w	750	2	5.2
	" " (back)	"	600/W	1200	2	1.1
8607	Machine polishing	Operator(3,3,3)	300/w	900	9	6.4
	MOPED(700)					
8709	Grinding	Operator(2)	400/w	800	2	1.6
8715	Joint polishing(VIP)	Operator	150/W	300	2	1.8(for 300)
8727	" " (Popular)	"	250/w	500	2	1.8(" 500)
-	" " (Back)	"	600/W	600	1	1.1
8603	M/c polishing	Operator(1,1,1)	400/W	1200	3	1.6
-	Rectification	Operator	-	-	4	4
					36	22.7

M.P. - 349
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ANNEXURE MAU-09

TUBULAR PLANT

Operation	Process Description	Production contract	Production	Manpower(8000/day) Existing	Manpower(8000/day) Standard	Standard Manpower (For 8500/day)
	Degreasing Plant					
5401	Operating, loading & unloading pipes	750/W	7500	10	9.97	10.3
	Quadrant fitting					
3901	Tope Pipe Mitering	4500/W	9000	2	1.62	1.72
3903	Bottom/T Mittering	7000/W	7000	1	1.04	1.1
3904	Bush Fitting(T/T & B/T)	6500/W	13000	2	2.24	2.38
3902	Head/T Punching(Slotting)	7000/W	7000	1	1.04	1.1
3903	B.B.Shell Punching	7000/W	7000	1	1.04	1.1
3905	B.B.Shell Notching	7000/W	7000	1	1.04	1.1
3926	Seat/T Slotting	7500/W	7500	1	0.97	1.03
3906	Qd.Fitting Set(Group of 7)	2500/line	7500	21	20.36	21.64
3907	Qd.Fitting Set(Group of 8) (S/B)	2200/line		8	8	8
3908	Qd.Fitting Set(D/B) "	1100/line				
3909	Material Movement	5000/W	5000	1	1.45	1.54
3910	Lady Pipe Bending	200/W	400	1	1.82(for 400)	2
3913	Head/T Turning(C/B, BMX)	100	-	1	1	1
				42	41.62	43.7
	Frame Brazing & Assly.					
5101	Qd. Movement	3250/W	9750	3	2.24	2.38
5102	Qd. Brazed	1250/W	10000	8	5.82	6.2
5103	Brazed helper	1250/W	10000	8	5.82	6.2
5105	Seat Helper	2500/W	7500	3	2.9	3.1
5106	Seat Movement	2500/W	7500	3	2.9	3.1
5104	Seat Brazed	2500/W	7500	3	2.9	3.1
4301	C/S MIG Welding	1500/W	9000	6	4.85	5.15
4303	C/S MIG Helper	1500/W	9000	6	4.85	5.15
4320	S/S MIG Welding	1500/W	9000	6	4.85	5.15

Annexure MAU-09 contd.

Operation Code No.	Process Description	Production contract	Production	Manpower Existing	Manpower Standard	Standard Manpower (For 8500/day)
	Chain stay and seat stay press line					
5611	Chains/S Ready (Hero)	1200/W		15	13.63	14.5
	(Left R/T)	1200/W				
5612	Chain stay ready (right R/T)	800/W				
5614	C/S Counting & Movement	15000/W	15000	1	0.97	1.03
5615	Seat Stay Ready	1600/W	17600	11	9.1	9.66
5618	SLR C/S Ready	1000/W		2	2	2
5619	" S/S Ready					
				29	25.7	27.1
	Press Line for Blades					
5601	Degreasing Blade Pipe	7500/W	15000	2	1.94	2.1
5603	Old Swaging Machine (H)	2200/W	8800	21000 6	6.6	7.02
	(R/T)	1700/W	3400	4 10		
5616	New Swaging Machine (H or R/T)	2200/W	8800			
5604	Anealing	4500/W	13500	3	3.23	3.43
5607	Anealed Pipe Movement	15000/W	15000	1	0.96	1.03
5608	Blade Ready PH/Type	1500/W	16300	11	9.7	10.3
5609	Blade Ready RT/SLR	1400/W				
				27	22.43	23.88
	FORK ASSEMBLY					
4201	Column Facing	3500/W	8750	2.5	2.08	2.21
4202	Col.Bush Fitting	3500/W	8750	2.5	2.08	2.21
4204	Cup Col.Fitting	3500/W	8750	2.5	2.08	2.21
4205	Cup-Col.Dimpling	7000/W	10500	1.5	1.04	1.1
4206	Blade Bush Fitting	3500/W	14000	4	4.16	4.42
4207	Blade Axle Fitting	3000/W	15000	5	4.85	5.15
4224	Mataka Fitting	2500/W	6250	2.5	2.2(for 6000)	2.4(6500)
4208	Blade cup-col.assly.	3000/W	9000	3	2.42	2.58

Annexure MAU-09 contd..

Operation Code No.	Process description	Production Contract	Production	Manpower Existing	Manpower Standard	Standard Manpower
4321	S/S MIG Helper	1500/W	9000	6	4.85	5.15
3914	C/S & S/S Pairing (Assly.)	1000/W)				
3915	Frame Assly.	1000/W)		21	14.54	15.46
5107	B.B.Shell Brazed	1250/W	10000	8	5.82	6.2
5103	B.B.Shell Brazed Helper	1250/W	10000	8	5.82	6.2
5108	Brazing Alignment	1250/W	10000	8	5.82	6.2
5101	Movement To Brzers	3000/W	9000	3	2.42	2.58
5112	Qd. Movement	3250/W	9750	3	2.24	2.38
-	Stacking of Frame in Debrassing	-	-	2	2	2
-	Furnace Lighting	-	-	1	1	1
4307	SLR Frame Welder	100/W	400	4	3.64(For 400)	4
4308	SLR Frame Helper	100/W	400	4	3.64(")	4
4309	C/B or H/R Frame Welder	50/W	150	3	2.73(For 150)	3
4310	C/B or H/R Frame Helper	50/W	150	3	2.73(")	3
4318	Lady Loop Welder	250/W	500	2	1.82(For 500)	2
4319	Lady Loop Helper	250/W	500	2	1.82(")	2
-	SLR Drilling	-	-	1	1	1
				128	101.26	108.08
	Frame Machining					
3916	Movement to Machining	2000/W	8000	4	3.64	3.86
3917	Machining (Group of 4)	2000/Group	8000	16	14.54	15.45
3918	Movement to polishing & Insp.	3500/W	14000	4	4.16	4.42
3919	Frame Polish	800/W	7200	9	9.1	9.66
3929	Steel Wool	1750/W	3500	2	1.82 (for 3500)	2.1 (for 4000)
5801	Frame filing	500/W	5500	11	10(5500)	11(6000)
-	Movement to Alignment (After Steel wool)	3500/W	3500	1	0.91(3500)	1.04(4000)
3921	Frame Alignment	1400/W	7000	5	5.2	5.52
3928	R/T Drilling	1500/W	4500	3	2.73(4500)	3
3920	Dressing wheel	-	-	2	2	2
3923	Counting/Nut tightening	6500/W	13000	2	2.24	2.38
3918	Frame Movement to Paint shop	3500/W)				
4223	Fork Movement to Paint Shop	6500/W)		2	2	2
-	Stacking to Paint Shop	-		2	2	2
					60.34	64.43

Annexure MAU-09 contd..

Operation Code No.	Process description	Production contract	Production	Manpower Existing	Manpower Standard	Standard Manpower
4209	Fork dimpling	3000/W	6000	2	2.42	2.58
4210	Nailing	900/W	2700	3	2.02(2000)	2.53(2500)
4225	Blade movement	7000/W	7000	1	1.04	1.1
				29.5	26.37	28.49
	Fork Brazing & Polishing					
5301	Fork blazed	1200/W	8400	7	6.1	6.44
5302	Brazing helper	1200/W	8400	7	6.1	6.44
5303	Axle opening	3000/W)		5	2.42	2.58
4211	Fork Movement	3250/W)			2.24	2.38
4212	Column polishing	2000/W	8000	4	3.64	3.86
4213	R/T Polishing	700/W	2100	3	2.6(2000)	3.25(2500)
4214	Repair Polished Fork	1500/W	3000	2	1.82(3000)	2
				28	24.92	26.95
	Fork Machining					
4215	Threading & Collar Turning	1000/W	10000	10	7.27	7.73
4216	Reaming	3000/W	9000	3	2.42	2.58
4217	Bending	4000/W	12000	3	1.82	1.93
4218	Drilling	3000/W	9000	3	2.42	2.58
4219	Alignment	3000/W	9000	3	2.42	2.58
4221	Eyelet Reaming(Old M/C)	1200/W	2400	2	1.52(2000)	1.9(2500)
4223	Fork loading & Mv.to(Paint shop)	7000/W	7000	1	1.04	1.2
				25	18.91	20.4
5701	Debrassing(Frame & Fork set) (Group of 7)	2600/group	7800	21	19.58	20.8
-	Frame Stacking	-	-	1	1	1
				22	20.58	21.8
4317	Fitkit Welding	8/w	24	3	2.73	3
4322	BMX Frame Welding	10/w	20	2	1.82	2
				5	4.55	5
	Mudguard Section					
3701	Mudg. Processing	700/w	14700	21	20.78	22.08
3702	" R/T	100/Rs.0.9	-	-	-	-
3704	" Stacking	10000	2000	2	1.45	1.54
				23	22.23	23.62
		M.P. - 432		431.5	378.88	383.75

CHAPTER 9 (MAY 16 -MAY 23)

TITLE : CHANGING THE LAYOUT OF EXISTING PRESS SHOP

9.1 Introduction

Press shop is a part of the Tool Room. It comprises presses of varying tonnage. It employes blanking, forging, cutting, bending etc. The presses are arranged in four rows. The first row has the automatic presses. The remaining operations follow these automatic presses. Actually, the basis of press shop study was just the project on manpower auditing. It was during this study that I noticed a few flaws in the existing layout of the press shop and talked about the same to Mr.Rai. He was at once impressed to hear it and directed me to prepare the changed layout and put it before him.

9.2 Existing

In the press shop, the material movement is quite haphazard. In some cases, the material movement is taking place from one corner to the other corner of the shop wherein a lot of time is consumed. The facing of pedal cups, both big and small, is being done in handle brazing shop.

9.3 Press shop - A Study

1. It comprises basically of 4 main rows
2. The layout is quite haphazard, giving rise to unnecessary man-material movement.
3. There area a lot many breakdowns in the automatic machines.
4. In order to maintain continuous production, the additional dies(one in each case)may be made available and immediate replacement should take place.

5. Problem of power cuts is also there which spoils the pieces(if not avoided)

6. The pneumatic working is quite erratic and may be replaced by a set of planetary gear train system(mechanism)(as working is reduced to manual as soon as pneumatic working is disturbed).

7. The idle time of both the workers and the automatic machines is quite large, e.g. worker has to switch off the machine while loading. But he switches off the machine and then brings in new packed roll. He removes the packing and then loads it, something he can definitely avoid.

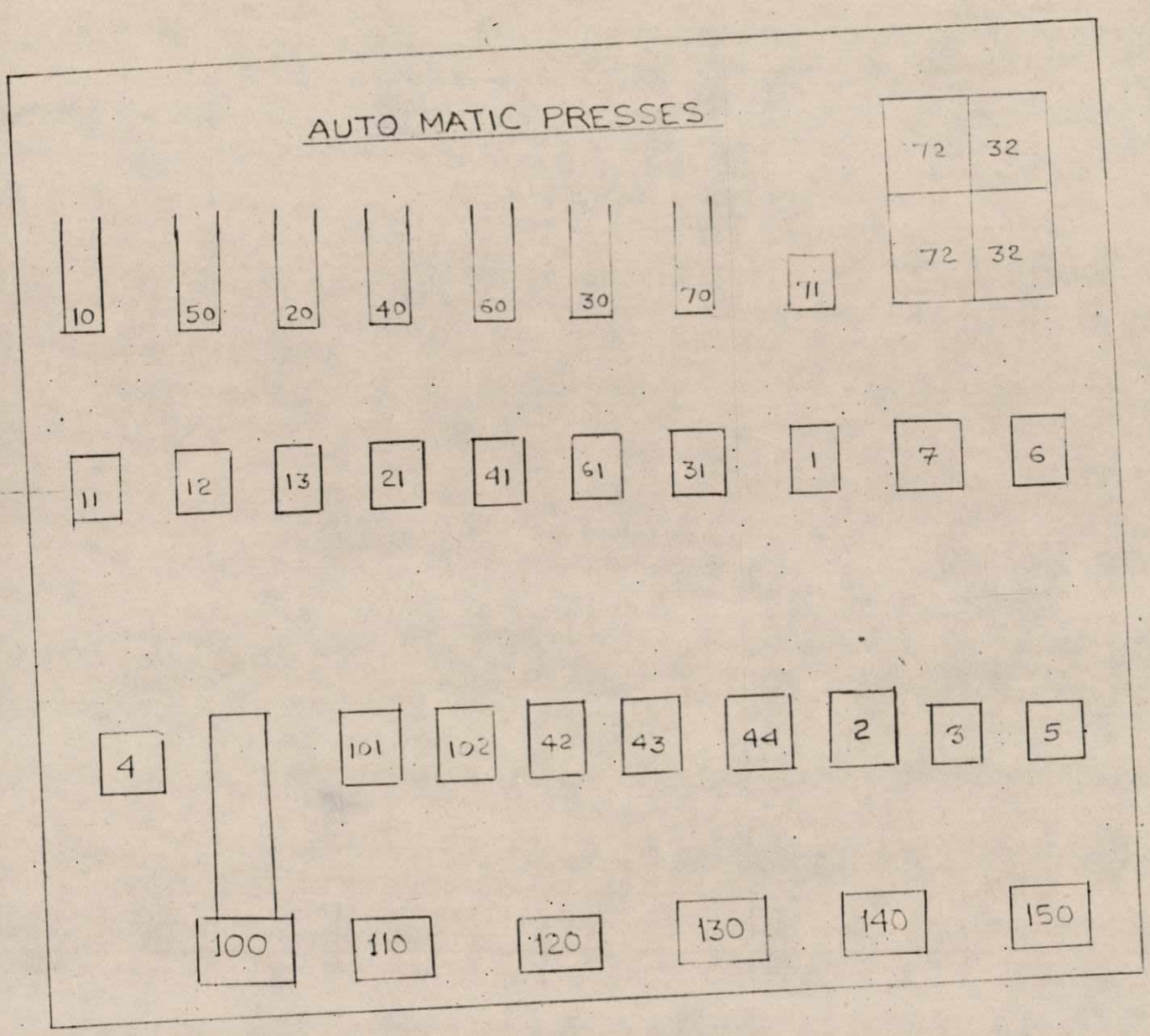
   - Again the bin employed for containing blanked pcs may be provided in pairs. When the worker goes to empty that bin after every half an hour or so, he switches the machine off.

   - Same is the case with scrap removal carriage.

8. The need of providing chutes from one operation to next.

9. The scrap in the chain wheel manufacturing can be directly thrown out of the existing wall instead of using an additional worker to do so.

10. Similarly, a worker is employed for material movement of chain wheel from one operation to the next. This can be avoided by putting up a chute.



PROPOSED LAY-OUT OF PRESS SHOP

9.4. Proposal

I planned the layout of the press shop. The proposal was discussed with Mr.Ram Singh. He was convinced about most of the changes. I showed the proposal to Mr. Rai. Mr. Rai discussed it over with Bhandari and Mr. Ram and ordered its implementation within a week's time.

9.5. Conclusion/Implementation

Instead of the change in the presshop layout in full, a partial change was made. This change involved disturbing of around five to six presses.

CHAPTER 10 (May 23 - May 30)

TITLE: TIME STUDY OF PRESS SHOP AND STANDARDIZING THE NO. OF STROKES OF AUTOMATIC PRESSES AND FINDING LOAD FACTOR FOR THEM

10.1 Introduction

Automatic presses involve the blanking operation in particular and they have a mechanism of automatic feeding (through a feeder). In some presses, the no. of blanked pieces coming out per stroke is one and in a few cases it is more than one. The material movement is quite haphazard. After finding out the no. of strokes per minute I calculated the load factor on each automatic machine.

10.2. General Observations of Press Shop

a. It comprises basically of 4 main lines.

b. The layout is quite haphazard giving rise to unnecessary man-material movements.

c. There are a lot many breakdowns in the automatic machines.

d. The problem of powercuts is also there. Whenever there is a cut, the stroke slows down and loses its force. It results in deformation of the pieces being produced.

e. The pneumatic working (of feeding in) at two automatic machines is quite erratic and requires independent attention.. It may be replaced by a set of planetary gear train system (or mechanism).

f. The idle time of both the workers and the automatic machines is quite large.

10.3. Data

S.No.	Machine Description	Strokes /mt.	No.of pcs.per stroke	M/c hrs to be put in (For 8000 bikes/day)	No.of coils used	Production/ coil	Loading time+ Inspection load+M.M.+ Breakdown (hr s)	Total work load on m/c(m/c hrs+ allowances)	Load Factor
1.	Fork Cup Blanking	45	1	3	3.5	2400	2	4 hrs	0.75
2.	Fork cup bridge blanking	62	2	2.15	1	19000	1.5	23.65	0.3
3.	Pedal Cup small Blanking	55	3	1.62	1	19000			
4.	Crown cover blanking	62	1	2.15	2.5	3500	1.75	2.90	0.7
5.	Pedal Plate(Inner)	48	1	5.5	4.5	3500	2.5	7.00	0.8
6.	Pedal Plate(Outer)	46	1	5.8	4.5	3500	2.5	7.30	0.8
7.	Pedal cup Big	68	3	1.3	1	19000	1.5	1.8	0.7

Breakdown time - 1 hr in each machine

10.4. Conclusion

On the basis of time study of the automatic machines I can safely conclude that the total man hours come to around 26 hrs including allowances. This means we require around 3.2 workers for the job whereas we are having 4 workers. The allocation to three workers may be made as follows:

I Worker -
- Fork cup - 8500
- Fork bridge 1900
- Pedal cup small - 19000

II Worker -
- Fork crown cover - 8500
- Pedal inner plate - 17000

III Worker-
- Pedal Outer Plate - 17000
- Pedal Cup Big - 19000

I Worker to be put on machines (10,20 and 30) Ist, 2nd &3rd

Where worker operates Ist & 3rd in 8.30 to 12.30 p.m. shift

Ist & 2nd in 1.00 p.m. - 5.00 p.m. shift

II Worker on 4th & 5th (40and 50)

III Worker on 6th and 7th (60 & 70)

CHAPTER 11 (May 30th - June 27th)

TITLE: REDUCTION OF MANPOWER IN STORES

11.1 Introduction

Stores form an important part of Hero Cycles. Their basic purpose is to cater to the needs of the shops/departments in immediate vicinity. The procedure followed is that the material coming from outside party is inspected either through sampling or wholly at Receipt & Despatch stage. The approved material reaches the respective stores where it is arranged in racks. As per the order from the shops, the storekeeper arranges the disposal of items to the respective shops. The policy is thus, of decentralization. I did ask the management during the course of my discussions if the stores could be centralized but the reply was in the negative. Two reasons were attributed to this. One was the shortage of space and the second was that they were not maintaining any inventory. In most of the stores, I realized that the workers are not allocated any job as such but work randomly. As a result, the working goes quite haphazard and the manpower becomes surplus.

11.2 Issues discussed for material handling at stores

a) Can we have a gang of 6 workers(with 1 Foreman & 1 clerk) and they look into the entire material distribution of the plant?

b) Standardized packing be implemented in full swing and should be at the R&D level immediately after the counting is done.

c) The CP store which is running standardized packing scheme is running short of boxes and thereby the entire exercise of packing in plastic boxes is proving futile.

d) If we have a standardized packing system we can do with just one or two workers in each stores (so as to adjust the boxes in the racks and issue the same when demanded)

e) The order from any shop must be in advance at least by one day.

f) The stock position needs to be maintained properly by the shop supervisor on daily basis (so that he does not have to send requisition orders again and again and he may not bother to count the material in the shop everyday)

g) Even in the stores, we do not need to count the material everyday. When we know the input, we know the material being issued we can easily have the stock position. They can instead be checked weekly or fortnightly.

h) Maintaining a stock of atleast 5 days should be strictly enforced and adhered to.

i) Even in case of emergency, when the shop supervisor needs the material he should inform the store incharge at least one or 2 hrs in advance.

j) A material brake guthi(Brake assembly) is brought in the assembly shop directly from R&D and quite a bulk of them loosen up and are disassembled. These disassembled brake guthis are sent to C.P.Store where the workers are called upon to assemble them. These spoilt pcs should be either sent back to parties or be checked at R & D level

k) We may provide gangmen with one whole time jumbo.

11.2.1. Benefits

(i) Manpower reduction

	Existing	Proposal
C.P.	12 workers	2+4
R.M.	10 workers	2+2
F.G II	4 workers	1
Bank store	5 workers	3
	31	8+6 = 10+4 = 14

(ii) We don't have to count, fill and weigh again and again at the store level and shop level.

(iii) Working becomes smooth and synchronized.

11.3 DATA

ANNEXURE #1

S.No.	Name of Job	To Deptt.	No of workers	Qty.per round	For movement	Time per round(min)	Qty.per day	Total time(min)	Man Hrs.	Allow. ances	Reqd.Man hrs.
1.	Filling & weighing of sacks	All Deptts.	2	1 bag	M.C.	1.5	255 bags	382 min	6.4	.128	7.7x2(15.4)
2	Pedal Plate Movement	Barrelling	1	6000	M.C.	5 min	36000	30 min	0.5	0.1	0.6
3	Brake lever	"	1	8000	M.C.	6 min	8000	6 min	0.1	0.02	0.12
4	Brake Rod Front(22")	Electroplating		4000	JUMBO		4000				
5	Handle bolt	"		5000	"		5000				
6	B.B. Ring	"	2	10000	"	23 min	10000	23 min	0.4	0.1	0.5x2
7	Brake rod(Back)(22")	"		4000	"		4000				(1.0)
8	Check Nut	"		9000	"		9000				
9	Pedal Rod	"		2500	"		30000				
9a	Pedal Rod	Electroplating	2	27500	Jumbo	10 min	27500	10 min	0.2	0.05	0.25x2(0.50
10	Mataka loading movement & unloading	Tubular (Mudguard)	2	16000	Jumbo	30 min	16000	30 min	0.5	0.1	0.6x2(1.2)
11	Fork cup	"		8000	"		8000				
12	Mudgauard cup(back)	"		14400	"		14400				
13	Mudguard clip(Front)	"		8000	"		8000				
14	DODI Washer Big Small	Electroplating	1	24000	Jumbo	8 min	24000	8 min	0.2	0.05	0.25
15	Handle Bolt washer	"		5000	"		5000				
16	Fork eye	"		5000	"		5000				
17	Seat carriage Bolt	Electroplating	2	6000	Jumbo	15 min	6000	15 min	0.25	0.05	0.3x2(0.6)
18	Front Brake Rod(24")	"		1500	"		1500				
19	Handle Dodi	"		9000	"		9000				
20	Brake rod Back(24")	"		1500			1500				
21	C/S Nut Bolt	Tubular	2	16000	Jumbo	25 min	16000	25 min	0.5	0.1	0.6x2(1.2)
22	C/S Hero Bridge	"		6000	"		6000				
23	C/S R/T bridge	"		2000	"		2000				
24	S/S Hero bridge	"		6000	"		6000				
25	S/S R/T bridge	"		2000	"		2000				
26	S/S SLR Bridge	"		2000	"		2000				
27	C/S Liner	"		12500	"		12500				
28	S/S Liner			35000			35000				
29	Fork Blade Liner(Her+R/T)	"		12550	"		12550				
30	Tiki(In R/TFrame) (Frame Bolt washer)	"		2500	"		2500				
31	SLR C/S Bridge	Tubular	1	2000	M.C.	20 min	2000	20 min	0.3	0.06	0.36
32	X-Bar lug	"		200	"		200				
33	X-Bar Bridge	"		500	"		500				

11.3 Contd..

S.No.	Nature of Job	To Deptt.	No.of workers	Qty.per round	For movement	Time per round (min)	Qty. per day	Total time(min)	Man hrs.	Allow-ance	Reqd. man-hrs
34.	For B.M.X.	Polishing	1	100	M.C.	8 min	100	8 min	0.2	0.05	0.25
35	Crank	To Crank M/c shop	2	550	M.C.	10 min	11000	200 min	3.33	0.67	4x2=8
36	Crank	Issuing to outside parties for polishing	1	1000 pcs 10 sacs (Filling up, supplying to outside parties) +bringing in carriage etc.)	Sacks manually pulled	40 min	8000	320 min	5.3	1.06	6.86
37	Handle	-do-	1	300 (Loading, M.M., Unloading & helping outside worker in loading)	M.C.	12 min	4500	180 min	3	0.6	3.6

Work being done by 3 workers handling Tubular (R.M.Store II) and R.M.Store III(Mudguard, chain cover etc.)

38	Chain Cover	Paint Shop	2	3000	M.C.	20 min	6000	40 min	0.6	0.13	0.73x2=1.46
39	Mudguard stay	-do-	2	12000	M.C.	20 min	3600	60 min	1	0.2	1.2x2=2.4
40	Brake wire	-do-	2	6000	M.C.	15 min	6000	15 min	0.25	0.05	0.3x2=0.6
41	Black Chimti	-do-	2	6000	M.C.	15 min	6000	15 min	0.25	0.05	0.3x2 =0.6
42	Mudguard	Taken by Paint Shop workers themselves(16000)									

In Tubular (R.M.II)

			Section	Worker	Qty.per round	Movement	Time per round	Qty. per day	Round	Total Time	Man Hrs.	Allow.	Reqd. Man Hrs
43	Frame Lug Hero	Top Bottom Seat	Degreasing Plant	1	1000 (2sacks)	M.C.	1 min	18000	18	18 min	0.3	0.06	0.36
44	Frame Lug R/T	T B S	-do-	1	1500 (3 sacks)	M.C.	1 min	4500	3	3 min	0.05	0.01	0.06
45	Frame Lug S.L.R. Gents	T B S	Frame Section	1	300	M.C.	3 min	300	1	3 min	0.05	0.01	0.06
46	Frame Lug S.L.R. Lady	T B S	-do-	1	300	M.C.	4 min	600	2	8 min	0.2	0.05	0.25

11.3 contd..

S.No.	Nature of job	To section	No.of workers	Qty.per round	For movement	Time per round (min)	Qty. per day	Rounds	Total time (min)	Man hrs	Allow. ance. (20%)	Reqd. Man-hrs
47	Frame lug D/B 22" Top Bottom Seat Lady	Frame	1	400 200 - -	M.C.	4 min	1000	2	8 min	0.13	0.023	0.153
48	Frame Lug Parallel Bar Top Bottom Seat Loop	-do-	1	1000/ (2 sacks)	M.C.	4 min	2000	2	8 min	0.13	0.023	0.153
49	Frame Lady Top B S L	-do-	1	400 (2 sacks)	M.C.	5 min	800	2	10 min	0.16	0.03	0.18
50	C/B Patti Small	-do-	1	200/sac.	M.C.	4 min	200	1	4 min	0.1	0.02	0.12
51	B.B. Shell Hero	Degreasing	1	400/4 sac	"	2 min	6000	15	30 min	0.5	0.1	0.6
	" " R/T	-do-	1	-do-	"	"	1500	4	8 min	0.13	0.023	0.153
	" " S.L.R.	Frame Section	1	200/2 sac	"	"	400	2	4 min	0.1	0.02	0.12
52	Frame Bush Big	Frame	1	2000/2 "	"	3 min	8000	4	12 min	0.2	0.05	0.25
	" " Small	-do-	1	2000/2 "	"	"	8000	4	"	0.2	0.05	0.25
53	Frame Lug R/T Top	Degreasing	1	1500/3 sacs	M.C.	2 min	1500	1	2 min	0.03	0.006	0.036
54	" " " Bottom	-do-	1	1500/3 "	M.C.	2 min	1500	1	2 min	0.03	0.006	0.036
55	Weighing & Loading	General	1	1 sac	-	1 min	143sacs	143	143 min	2.4	0.48	2.88
												10.7 Man -Hrs. (8 MH - 1 worker)

Total proposed manpower required = 5*1.5 = 6.5

Additionally for around 10 items regular material transfer takes place in which 5 of them are once a week or after a fortnight. For these items we can take into account 4 hrs additionally (man - hrs - 4) i.e. proposed manpower becomes

6.5 + 0.5 = 7 workers

11.3 RAW MATERIAL STORE (RM STORE) - A Report 16-6-88

11.3.1. Existing

In RM store, we have in all 10 workers. A jumbo has been provided to facilitate the easy and quick material movement. There are around 70 items in the store. Other than the main RM store (right next to press shop) we have two more RM establishments (one in the tubular (RM-III) (to cater to the needs of tubular workers) and one near the maintenance department (RM-II) to supply material to paint shop workers).

Distribution of 10 workers

In Tubular

3 workers - 8.30 a.m. - 5.00 p.m.(for RM II & RM III solely)

In MainRM

5 workers - 8.30 a.m. - 5.00 p.m.(For electroplating,tubular, Barrelling, crank m/c shop, polishing,mudguard)

2 workers - Issue to outside companies - { - Crank, - Handle } For Polishing

11.3.2. Existing - 10 (in all)

Details:

2 workers employed in filling the bags and weighing

2 workers carry the major material movement in Jumbo

1 worker exists solely for crank issuing

1 worker exists solely for handle issuing

1 worker in moving manual carriage

11.3.3 Details of Crank movement

I. Issuing to outside companies

The job of the worker involves just to fill up sacs

with 100 cranks each and pull them to the gate (RM store). He is idle for most of the time.

II. Transfer of polished cranks from outside companies to Crank m/c shop

Polished cranks are normally brought in trucks which empty the cranks off the sacs on the floor. The entire area is blocked and it hinders all sorts of material movement. The inspector then inspects the cranks. After the inspection two RM store workers are called upon to lift the cranks spread on the floor into manual carriage and counting them thereby. These carriages are then carried to crank m/c shop for machining. But everytime 10 minutes of RM workers are wasted in lifting and counting the cranks into the carriages. In a day around 200 minutes(3.3 man-hrs) are wasted which can be easily avoided.

11.3.4. Proposed

(1) Cranks be unloaded directly in a carriage. These can be inspected in groups of 5 everytime (as is the practice now) & put in another carriage.

(2) Handle and crank workers(2) have ample time to collect all the cranks and take them to crank m/c shop.

(3) Instead of manual carriage movement, only jumbo be employed (in tubular). Jumbo can cover the entire job in just 5 rounds (replacing around 50-60 rounds using manual carriage).

(4) The bags brought in from R & D Centre be as such placed in racks so that the time wasted in first emptying the bag and again filling it up and weighing the same may be saved.

(5) Proposed manpower = 8

(6) The filling and weighing job (if at all it is to be done) be accomplished in early hours so that the material movement workers may not have to sit idle.

(7) For sometime, the crank and handle workers may be called upon to devote some time in filling up and weighing of sacs.

11.3.5. Benefits

(1) Saving of manpower = 2

(2) Efficiency improved (By employing Jumbo)

(3) Idle time of workers will be reduced

(3) No bottlenecks or blocking and facilitating smooth material flow (if cranks put up in carriages) (instead of on floor)

(5) Futile effort of first emptying and then again filling may be avoided

Annexure 1 : Time study (Man-Hr Chart)

Annexure 2 - Allocation of jobs to proposed manpower

11.4. DATA

PIPE STORE

S.No.	Nature of job	Modus operandi	Capacity of carriage (No. of pipes)	Time taken per round (min)	Total material transfer per day	Total time reqd. (min)	Man hour	Manpower
1.	Seat stay tube loading on carriage	Manual carriage	800	1	16000	20		
2.	Chain " " "	"	500	1	16000	32		
3.	Top Tube Loading "	"	500	1	8000	16	3 +0.6 (allowance 20%) = 4	1
4.	Bottom " " "	"	400	1	8000			
5.	Seat " " "	"	400	1	8000	20		
6.	Head " " "	"	500	1.5	8000	24		
7.	Column " " "	"	400	1.5	8000	30		
8.	Blade " " "	"	500	1	16000	16		
						178		
9	S/S Movement	"	800	3.5	16000	70		
10	C/S " (invluding loading)	"	500	3.5	16000	112		
11	Top " (To degreasing plant)	"	500	3.5	8000	56		
12.	Bottom " "	"	400	3.5	8000	70	12.5 +2.5(allowance 20%) = 14	2
13.	Seat " "	"	400	3.5	8000	70		
14.	Head " "	"	500	5	8000	80		
15.	Column " "	"	400	5	8000	100		
16.	Blade " (To Swaging Plant)	"	500	6	16000	192		
						750		
17.	Pedal pipe loading & movement (To Barrelling Deptt.	"	3600	8	15000	34	5.6+1.1 (allowance 20%) = 6.7	1
18.	Miscellaneous work (Stacking, Rejection etc.)	-	-	-	-	300		
						334		

11.4.1. Existing Man-power (8.30 a.m. - 5.00 p.m.)

Workers for movement of pipes	=	6
Unloader for helping R&D's worker	=	1
		7
Worker for inspection	=	1
Worker of R & D Store	=	1

11.4.2. Proposed man-power (8.30 a.m. - 5.00 p.m.)

Worker for loading	=	1
Worker for movement	=	2
Worker for Misc. work (Pedal pipe, rejection, stacking etc.)	=	1+1
		5

11.4.3. Surplus worker = 7 - 5 = 2

11.5. Data

Main Store

11.5.1. Existing man-power

Worker for brazing store (Chem.)	=	1 (7 a.m. to 3. p.m.)
Worker for tool store	=	1 (8.30 to 5.00 p.m.)
Worker for elect. store	=	1 (8.30 to 5.00 p.m.)
Worker for oil loading/unloading	=	1 (8.30 to 5.00 p.m.)
Worker for Main Store	=	3 (8.30 to 5.00 p.m.) 1 (9.30 a.m. to 6 p.m.)
		7

(Issuing material to workers and receiving material from outside companies, filling gallons with acids and oils etc.)

11.5.2. Proposal Man-power

Worker for Brazing(Chem.)Store)	=	1
Worker for Tool Store	=	1
Worker for Elect. Store	=	1
Worker for Oil loading/Unload.	=	1
Worker for Main Store	=	2
		6

Oil loading and Brazing worker(Chem.) will also help the workers of Main Store in their spare time.

11.5.3. Surplus Worke r = 7 - 6 = 1

11.5.4. Proposal

Workers controlling brazing store, tool store, electrical store, oil loading/unloading do not have a whole time(8 hrs) job. Their working may be so timed that they may do their respective jobs for half the day and for remaining 3-4 hrs they may be utilized in the main store itself (as they are already helping the main store workers at times). In that case, we can do without one more main store worker.

11.5. DATA F.G. STORE

S.No.	Nature of Job	Existing worker	Material transfer per day	Modus operandi	Capacity of carriage	Time for loading on carriage (min)	Transfer time(min)	Time for unloading from carriage (min)	Time for loading racks or stacking (min)	Total time per round (min)	No.of rounds	Total time taken/ day(min)	MH	MH + 25% allowance
1.	Movement of Fork	4	8000	Manual	160	5	6	-	3	14	50	700	11.6	15
2	Movement of Brake set	2	800	carriage	400	10	4	5	3	22	20	440	7.3	9.3
3	Movement of Handle(Hero)	2)	7500	"	350	-	4	4	-	8	22	176	3)	5.1
4	Movement of Handle(Variety)	)	500	"	100	6	4	3	-	13	5	65	1.1)	
5	Movement of Pdal (Hero)		7500	"	1300	-	6	10	-	16	6	96	1.6	
6	" " " (Variety)	2	500	"	150	6	3	8	-	17	7	68	1.13	3.4
7	" " Chainwheel(Hero)		6000	"	900	-	5	10	-	15	7	105	1.75	
8	" " " (Variety)		500	"	500	8	4	8	-	20	4	80	1.1	3.6
9	" " Tubes, Reflect. Tape Side, Stand, Support Carrier	1	8000	"	400	10	4	6	-	20	20	400	3.33	4.2
10	Movement of Mudgard	2	8000	"	225	5	3	12	-	20	36	720	12	15
11	Movement of Hub(Pairs)		6000	"	200	2	3	1	-	6	30	180	3	
12	" " Chain	3	6000	"	700	3	4	1	-	8	9	72	1.2	6.3
13	" " Freewheel		6000	"	1100	3	4	1	-	8	6	48	0.8	
14	Movement of Bags(Enclosing Hub, Chain, Axle, F.W. etc.)	1	8000	"	200	3	4	1	-	8	40	320	5.3	6.6
15	Movement of seat	2	8000	"	200	5	5	10	-	20	40	800	13.3	16.6
16	Movement of cycle parts to Cycle Fitting	1	125 cycles	"	-	-	-	-	-	-	-	90	1.5	1.9
17	Movement of Chain Cover & Spokes	1	8000									360	6	8
18	Counting Items coming from Finishing	1										360	6	8
19	Unloading & Stacking of Frames	5	8000											40
20	Against Absentism	1												8
		28												151

Total existing manpower = 28
" Proposed " = 23
Surplus = 5

11.6. F.G.(Finished Goods) Store

11.6.1. Existing

FG store contains, receives and supplies the finished goods for outside despatch. In all we have around 28 workers in F.G.I . There are around 25 items in F.G.I.

11.6.2. Detailed distribution of 28 workers

4 workers up to 10.30 a.m.(right from 6.00 a.m.onwards) are involved in counting work (rims, tyres, tubes, frames(on conveyor), saddles, hub, chain, free wheel, chain-cover, fitted cycles etc.). After that they are involved in material movement.

5 workers are involved in unloading frames from the conveyor, moving them and placing them in a stacking fashion.

1 worker is against absenteeism.

1 worker for counting items coming from finishing shop.

17 workers are involved in the material movement taking place from the F.G. store to packing.

11.6.3. Existing allocation

		No.of workers	Shifts	
1.	Frame	5	8.30 a.m.-5.00 p.m.)	5
2.	Fork	1 1 (4) 2	8.30 a.m.-5.00p.m.) 10.30 a.m.-7.00 p.m.) 2.00 p.m.-10.00 p.m.)	1 1 2
3.	For counting	1	11.30a.m.-8.00 p.m.)	1
4.	Chain cover & spokes	1	10.30a.m.-7.00 p.m.)	1
5.	Handle	2	10.30a.m.-7.00 p.m.) 2.00 p.m.-10.00p.m.)	2
6	Brake set	2	8.30 p.m.-5.00 p.m.) 2.00 p.m.-10.00p.m.)	2
7	Pedal & chain wheel	2	8.30 a.m. 2.00 p.m.)	2

8.	Seat	2	10.30 a.m.-2.00 pm.)	2
9	Tube, Reflector, Rim, Tape, carrier, Side Stand etc.	1	10.30 a.m.	1
10	Chain, Hub & Free wheel	3	10.30 a.m. 8.30 a.m.	2 1
11	B.B. Axle, Hub, Chain, Guthi, Freewheel	1	10.30 a.m.	1
12.	Cycle Fitting	1		
13.	Mudguard	2	10.30 2.00	1 1
14	A.A.	1		1
		28		

11.6.4. Proposed Manpower allocation

For movement of fork, handle & cycle parts	=	3	workers
For movement of brakeset, chainwheel & pedal	=	3	"
For movement of Tube, Reflector, Rim Tape etc.	=	1	"
For movement of Chain cover, spokes	=	1	"
For movementof Frame =	=	5	"
For movement of Mudguard	=	2	"
For movement of seat	=	2	"
For movement of Hub, chain, freewheel & Guthi	=	3	"
For counting the items(from finishing)	=	1	"
Against Absenteeism	=	2	"
		23	

11.6.5. Surplus = 28 - 23 = 5 workers

11.7 DETAILS OF MANPOWER IN STORES(A SUMMARY)

11.7.1. Raw material store

Workers(total strength) = 8

Details: In Main RM

(a) 6 workers - 8.30 a.m. - 5.00 p.m. (For electroplating tubular Barrelling crank m/c shop Polishing Mudguard)

(b) 1 workers - 9.30 a.m. - 6.00 pm. Issues handle to outside polishers

(c) 1 " - 9.30 a.m. - 6.00 p.m. Issues crank to outside polishers.

11.7.2. CP Store (Chrome plated cycle parts store)

Workers (Total strength) = 12

Details

(a) 2 workers - 6.00 a.m. - 2.00 pm. - Receiving material from Electroplating, counting, weighment & placing in racks.

(b) 5 workers - 8.30 a.m. - 5.00 p.m. - Material movement to Assly. Finishing, Fitkit assly.

(c) 3 workers -2.00 p.m. -10.00 pm. - Receiving material from R & D, Electroplating etc.

(d) 2 workers - 10.00 p.m. -6.00 p.m. - Receive material from Electroplating.

11.7.3. F.G. Store (Finished Goods)

Workers(Total strength) = 28

Details

F.G.1

(a)	5 workers 8.30 a.m. - 5.00 p.m.		Frame movement
(b)	4 workers	-	Fork movement
(c)	1 "	-	For couting
(d)	1 "	-	For chain cover & spokes transfer
(e)	2 "	-	For handle movement
(f)	2 "	-	For Brake set movement
(g)	2 "	-	For pedal and chain wheel
(h)	2 workers	-	For seat movement
(i)	1 worker	-	For tubes, reflector, rim tape, carrier side stand
(j)	1 "	-	For cycle fitting
(k)	2 "	-	For Mudguard
(l)	1 "	-	Against absenteeism

F.G.II

(m) 3 workers - Chain, hub & Freewheel
(n) (.B.B. Axle, Hub, chain, Freewheel) Guthi - 1 worker

11.6.4. Pipe Store (+ Lug Store)

Workers(Total manpower) - 9

Details

(a) 6 workers - For movement of pipes
(b) 1 worker - Helper to R & D Worker
(c) 2 workers - For distributing lugs in respective shops

11.7.5. Main Store

Workers(Total Manpower) - 7

(a) 1 worker - Chem. Store
(b) 1 " - Tool store (Supervisor)
(c) 1 " - Electrical store
(d) 1 " - Oil loading & unloading
(e) 3 workers - Issue & Receipt(of material)

11.7.6. R & D Store

Workers(Total manpower) - 23

Details

(a) 1 worker - Transferred to Maintenance Deptt.
(b) 1 worker - Handle counting(from outside olishers)
(c) 1 worker - Counting in pipe store
(d) 24 workers - For Receipt, Issue & Movement of Material

11.7.7. Bank Store

Total manpower - 5

Job involves receiving and issuing material to various shops.

11.7.8. Packing material store

CHAPTER 12 (Feb. 23 - March 15)

TITLE: ACCOUNTING OF MATERIAL IN TUBULAR UNIT

12.1 Introduction

Accounting implies keeping of a proper track of the incoming raw material and the outgoing finished goods. Mr. Rai gave me this project to work out an improved method of accounting in the tubular unit. I was supposed to bring into focus the stage at which the flaw occurred and any remedy for the same.

12.2 Study Undertaken

I undertook my study and daily had the morning and evening input and output readings with intermittent checks in between. But this did not help me. There used to be material on the floor and in a few cases it happened that the output was more than the input. In such cases I had not taken into account the material lying on the floor. Then, I decided to orient my studies to full one week study where I counted the material lying on the floor before the study began and I again counted the material on the floor. On the completion of the week I could easily see a lot of discrepancy in the existing pattern of working.

12.3. Conclusion

I concluded that for accounting we introduce a system of issuing the material through weighing instead of counting. By this the standard count of a particular weight is known and can be easily compared with the output claimed (omitting the rejections in the process).

PROJECT WORK ON ACCOUNTING FOR TUBULAR UNIT

Date	S.No.	Column Pipe Supplied	Fork Recd.	Head Tube Supplied	Frame Recd.
Feb.23,1988	1	8072 +178 previous day's material	8250	8500	8500
Feb.24,1988	2	11500	8250 (3250)-inventory (on Floor)	9300	8500 (800) on floor

SUNDAY TO SUNDAY

Stock Position as on 27/2/88 at 9.00 p.m.(Saturday Night)

FORK SECTION

1.	Column Pipe	8,425	15994 Forks
2.	Cup with Column	1,387	
3.	Assembled(Kacha)Fork (Before Brazing)	1,400	
4.	Column Polished Fork	2,132	
5.	Threaded Fork	1,601	
6	Complete Fork	1,049	
7.	Fork Blade Ready	18,390	Total Blades

FRAME SECTION

1.	Kacha Dhancha(Quadrants)	1,680	14631 Frames
2.	Head Brazed	1,070	
3.	Seat + Head Brazed	445	
4.	B.B. Shell "	480	
5.	Debrassed Frames	5,041	
6	Machined Frames	548	
7.	S/S Welded	3,508	
8	C/S "	1,859	

MAIN ITEMS PREPARED

Date	S.No.	Column Pipe supplied	FORK Fork Recd.	Head Tube supplied	FRAME Frame Recd.	Frame Pipe Rejections
Feb.29,1988 (Monday)	1	8500	Target 8500 Passout 8250	Frame set 9650 H.T.	Target 9000 Passout 8500	21 T.T. 10 B.T. 26 S.T. 4 H.T.
March 1,1983 (Tuesday)	2		8250		8500	
March 2,1988 (Wednesday)	3	6300	9000	7600	9000	
March 3,1988 (Thursday)	4	8600	10000	8800	9000	
March 4,1988 (Friday)	5	5000	3000	3600	3500	
March 5,1988 (Saturday)	6	7800	8250	Frame set 9000	8250	
March 7,1988 (Monday)	7	8300	8250	9500	8250	
March 8,1988 (Tuesday)	8	7300	8250	9600	9000	
March 9,1988 (Wednesday)	9	6800	8250	7500	8250	
March 10,1988 (Thursday)	10	7600	8250	7200 H.T.	8000	

CHAPTER 13 (March 5 - March 10)

TITLE: STUDY OF RIM PACKING MACHINE

13.1. Introduction

Rims after electroplating are being sent for temporary storage. The workers in that temporary store have to unload the rims from the conveyor and arrange them in the stacks. These rims, before being despatched on to the trucks, are bound manually in coir packs. However, a new automatic packing machine was brought in wherein the pack was accomplished by a synthetic strip type wrap and the wrap was sealed by application of heat at the joint. Two workers were required for holding the rims in position. After wrapping in synthetic strips, they were packed in coir sacks and then sewed. The job was to study whether working with an automatic machine was faster or not as compared to manual means.

13.2. Study undertaken

(a) Existing working

10 workers -manually packing 1000 bundles. Each bundle has 8 pairs of rims.

(b) Packing on automatic machine

Two workers working on automatic machine for rim packing. ~~One worker for wrapping and sewing the bundles.~~

Time taken (in secs) for Rim packing (8 pairs) by two workers = 50, 47, 53, 53, 56, 49, 46 secs.

Av = 50 secs/bundle

Time taken for wrapping and sewing one bundle(8 pairs) by one worker = 46, 41, 40, 43, 47, 45, 46, 43 secs.

Av = 45 secs/bundle

Total production target = 1000 bundles

Total time taken for packing of 1000 bundles with Automatic machine by two workers = 1000 x 50 secs

= 14 hrs

Total time taken for wrapping and sewing bundles by one workers = 1000 x 45 secs.

= 12.5 hrs

Hence we can make two groups each of three workers which will work on two automatic machines

Total proposed manpower = 6

Existing manpower = 10

Surplus = 4

13.3 Conclusions

Owing to the repeated breakdowns of the automatic machine, the proposal was not able to meet the said target of 1000 bundles and so was not considered to be viable.

CHAPTER 14 (MARCH 5 - MARCH 10)

TITLE: STUDY OF DIGITAL WEIGHING MACHINE IN COMPARISON WITH THE EXISTING ANALOG MEANS

14.1. Introduction

In finished goods store, there are numerous small sized items, like nuts, springs, washers etc. which are being weighed, counted and packed. A physical balance is employed to weight them and count them. I suggested to the Management to switch over to digital method of weighing in a bid for more accuracy and for saving manpower. A salesman from a digital (counter) machine company (ATCO) was invited.

14.2. Study undertaken

Mr. Rai put me on the job to check the working of the weighing machine and study if it could accomplish the weighing and counting job in a better way than the analog means. The salesmen showed me its working. I checked the working myself. I then enquired if it had any maintenance cost, which, he replied, was negligible. They also provised a two year guarantee and any time serivce.

14.3. Conclusion

I gave my approval to the digital counting machine. The machine cost was placed at Rs.20000 and it was ordered. Before the installation, we got a wooden box made and ultimately the machine was installed.

ATCO

ATCO

MODERN BUSINESS
EQUIPMENTS & SERVICES
2118 SECTOR 35
CHANDIGARH-160

ATCO COUNTING SCALE

CHAPTER 15 (March 25 - April 11)

TITLE: IMPROVING THE WORKING CONDITIONS IN TUBULAR UNIT

15.1 Introduction

Tubular unit is the backbone of Hero Cycles Pvt.Ltd. It has around four hundred workers working in this unit. The fork and the frame are the main accessories of the bicycle industry which are made in the tubular unit. The working conditions in the tubular unit have to be excellent.

15.2. Project undertaken

It was during one of my project studies that I noticed a few flaws in the existing working conditions:

(1) A few workers were sitting on metal drums with sacks placed on them.

(2) The carriages lie spreadout hindering all material movement.

(3) Workers have to displace their feet through some distance for operating the presses.

(4) No adequate cleanliness near degreasing plant

(5) No waste paper bins provided

(6) There was intense heat owing to smoke in the tubular.

15.3. Conclusions/Proposals implemented

1. Workers were provided with wooden stools.

2. ~~The carriages were assigned a fixed place to avoid material~~ hinderance on the gangway.

3. Foot-rests were proposed to be provided so that the worker may not have to lift his foot everytime he operated the press.

4. There was already a proposal in consideration for the provision of air-cooling of the tubular.

5. All the exhausts were repaired for an easy disposal of the smoke.

CHAPTER 16 April 22 - April 25)

TITLE: RECTIFICATION OF SUCTION (EXHAUST) SYSTEM IN POLISHING DEPTT.

16.1. Introduction

In the polishing section, the working conditions were miserably, with dust packed all around. A person could not stand there for more than five minutes. In this miserable plight, the workers were called upon to work for eight hours.

16.2. Project undertaken

On seeing the dust cloud engulfing the polishing shop, I thought of undertaking the project for freeding the handle polishing shop of all dust. I talked bout it to Mr.Rai. He asked me to go ahead with it. I cam to know that they had already put up a suction system there, but it was seldom operational. I came to know that the system demanded an immediate rectification. I talked over to Mr. Kewal Singh (Maintenance) and got it rectified to some extent. The shop-incharge was instructed to keep the suction system working atleast for the time when there was no power cut.

16.3. Implementation

I made a few surprise checks to see if the suction system (for exhausts was working or not, and in most of the cases it was found working, making the conditions slightly improved.

CHAPTER 17 (APRIL 22 - APRIL 25)

TITLE: TO FIND OUT THE TOTAL BRAZED SURFACE AREA OF FORK AND FRAME

17.1. Introduction

Brazing is a phenomenon wherein, the joints are strengthened through the addition of brass and other additives like borax, boric acid, zinc bricks etc. Other than the joint positions brass spread in the vicinity of the joints. To know the total brass consumption, I was called upon to calculate the total brazed surface area of a fork and a frame for both 22" & 24". The selection samples were taken from the brazed lot of forks and frames and study undertaken.

17.2. Observations Made

17.2.1. Frame 22"

(a) Top Tube Length = 70 mm
Diameter = 26 mm

(b) Seat Tube Length 63 mm
Diameter 28 mm

Surface area of joint of Top & Seat Tubes (incl. seat lug)

$= [(\pi \times 70 \times 26) + (\times 63 \times 28) + (16 \times 18) + 16 \times 20)] - (13)^2$

$= 10120 \text{ mm}^2$

(c) Bottom tube Length 112 mm
Diameter 30 mm

(d) Seat Tube Length 25 mm
Diameter 28 mm

(e) Chain stay C/S Length 71mm
Diameter 26 mm

(f) B.B. Sheel Length 67 mm
Diameter 42 mm

Surface area of joint of seat tube, bottom tube and chain stay with B.B. Shell

$$= [(67 \times 42) + (112 \times 30) + (25 \times 28) + 2\ (71 \times 26)] - [(15)^2 + (14)^2 + 2\ (13)^2]$$

$$= 30809\ mm^2$$

(g)	Bottom tube:	Length	60 mm
		Diameter	30 mm
(h)	Top tube	Length	48 mm
		Diameter	26 mm
(i)	Head tube	Length	140 mm
		Diameter	34 mm

Surface area of Joint of Head Tube, Top Tube, Bottom Tube

$$[(140 \times 34) + (60 \times 30) + (48 \times 26)] - [(15)^2 + (13)^2]$$

$$= 23292\ mm^2$$

Total Brazed surface area for 22% Frame is:

$$10120 + 30809 + 23292 = 64221\ mm^2$$
$$= 642.21\ cm^2$$

17.2.2. <u>Frame 24"</u>

(a)	Head Tube:	Length	190 mm
		Diameter	35 mm
(b)	Top Tube	Length	40 mm
		Diameter	30 mm
(c)	Bottomtube	Length	70 mm
		Diameter	34 mm

Surface area of Joint of Head Tube, Top Tube & Bottom Tube

$$[(190 \times 35) + (40 \times 30) + (70 \times 34)] - [(15)^2 + (17)^2]$$

$$= 30524\ mm^2$$

Surface area of seat lug and B.B. sheel joints are the same as in 22" frame.

Total brazed surface area for 24" frame: $71453\ mm^2$
$= 714.53\ cm^2$

17.2.3. Fork 22"

(a) Column Pipe Length 168 mm
Diameter 26 mm

(b) Blade Length 22mm
Diameter 24 mm

(c) Cup Surface Area

$$[6400+(21x51)]- \quad x(9.5)^2$$

$$= 7471 - 283.53$$

$$= 7187.47 \text{ mm}^2$$

Total brazed surface area of 22% Fork(incl.internal surface area of column.

$$2 \quad (168x26)+[(6400+21 \text{ x}51)- \quad (9.5)^2]+2 \quad (22x24)$$

$$= 37193.9 \text{ mm}^2$$

$$= 371.94 \text{ cm}^2$$

17.2.4. Fork 24"

(a) Column pipe Length 222 mm
Diameter 26 mm

Blades & cup surface area is the same.

Total brazed surface area(including internal surface area of column)

$$\approx \quad (222 \text{ x } 26) + [7471 - \quad (9.5)^2] + 2 \quad (22x24)$$

$$= 46015.5 \text{ mm}^2$$

$$= 460.16 \text{ cm}^2$$

17.3. Conclusions

Material used in brazing

1. Brass 80 gm (including wastage)
2. Boric acid (Gun power) 14.6 gm(app.)
3 Borax 7.3 gm
4. Zinc bricks 7 gms

For 1 Frame

Average variation in thickness of fork - 0.05mm - 0.125 mm

Average variation in thickness of frame- 0.15 mm 0.525 mm

17.3.1. Surface area for Frame

22"	-	642.2 cm^2
24"	-	714.5 cm^2

17.3.2. Surface Area for Fork

22"	- With outer surface -	234.71 cm^2
	With inner surface of column pipe	371.93 cm^2
24"	External surface area	278.82 cm^2
	With internal included	460.15 cm^2

CHAPTER 18 (April 25 - April 27)

TITLE: LAYOUT OF FORK MACHINING SHOP

18.1 Introduction

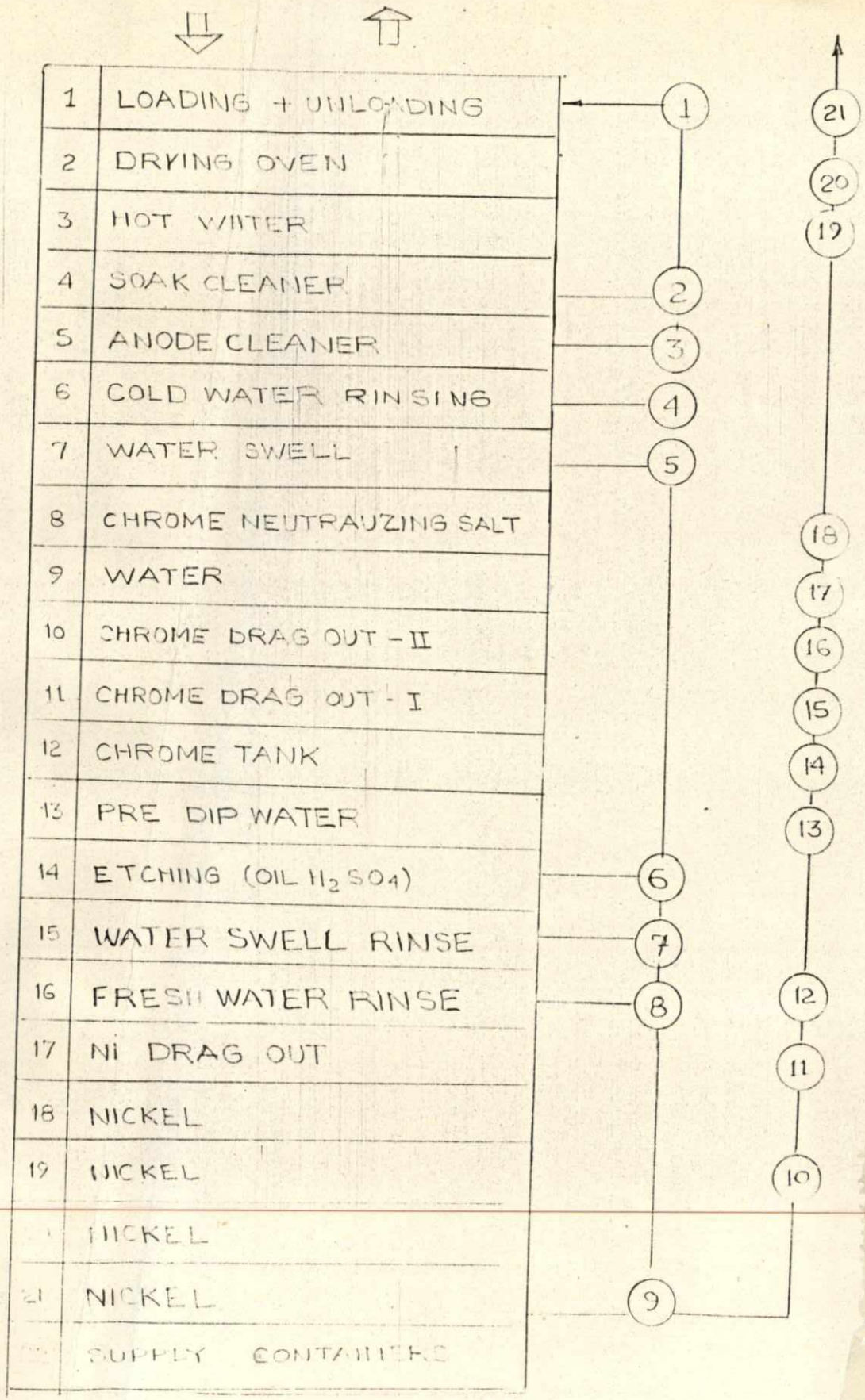
Fork machining is a process after debrassing and polishing and it involves collar turning, threading, reaming, drilling, bending and ultimately alignment. The machines are quite haphazardly arranged. The collar turning and threading machines have been placed on the disposal of one worker. There are nine such combinations.

18.2 Proposal submitted

The layout was proposed to be such that it facilitated a smooth material flow and free from any bottlenecks.

18.3 Conclusion/Implementation

But in the meantime, my proposal that three collar turning machines and three threading machines be placed at the disposal of one worker each was accepted. This overshadowed the change in the fork machining layout.



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