

Work-Study and Design of Material Handling System in Soot Girni

A. P. Edlabadkar, Anup P. Ingle

Abstract- Aim of this research paper is to minimize the processes and cost of the production in soot girni (spinning mill). Work-study is done for the purpose of possible use of man, machine and materials etc. In this soot girni, I have done work-study in carding section for effective use of labor and reduce fatigue of labor for eliminating the one labor in carding section I need to offsetting the time of carding machine and use of the material handling system. I offset time of the entire carding machine and maintain the smooth flow of drums to the drawing machine. I have given the suggestion of concept of the material handling system to reduce the number of labor. So that, labor cost will reduce and unit cost of the production is reduce.

Keywords - material flow, work-study, man-machine char, new material handling process.

I. INTRODUCTION

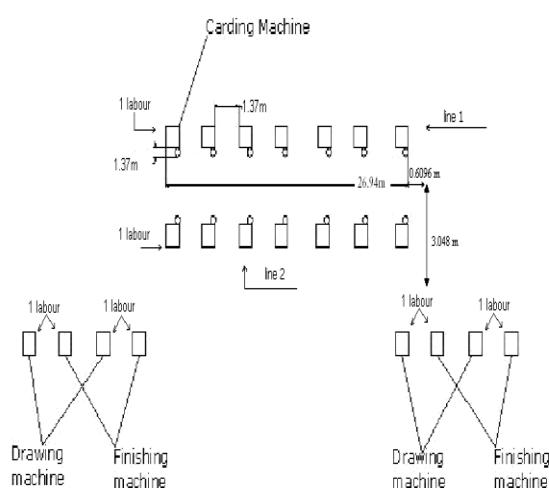
Work-study, it is the investigation by means of a consistent system of the work done in an organization in order to attain best possible use of man, machine and materials etc. I will be done work-study in carding section for Reduce the cost of the workforce. As the true cost of labor is not just defined by the salary as there are many other costs issues to consider such as total number of productive hours, holiday entitlements, pension and benefits payments, equipment provided, space used, support required etc. A quick way to get an estimate of these total costs of labor is to multiply the basic salary by

170%..To reducing the cost of labor I will be given suggestion for material handling system. Material handling (MH) system is applied for both manufacturing and distribution operations. The three basic characteristics of material handling are picking up the load, transporting the load and setting the load down. Production effectiveness can be increased by having the right quality of material at right place at the right time. The material handling problem required

Combining the total logical and physical aspects of material flow and then justifies the design from performance and economic perspective.

II. ANALYSIS OF EXISTING LAYOUT

This case is based on the cotton mill industry. The original layout of carding section is shown in figure 1. The details of each section were described as follows.



Cardining Section

In cording section, at the starting, man engage with carding machine for the inserting operation, and start the machine for that he takes the time 5sec and to reach to the next machine he takes 3 sec. i.e. he takes 8 sec to perform the inserting plus to reach to next machine. And he doing same operation on all 7machine, for completing the inserting operation on all 7 machines he takes 56 sec .After completing this he go to the drawing machine for the arranging the empty drums for the 7 carding machine, he carry two drums at time. For c1 and c2 he required 32 sec, for c3 and c4 he required 28sec, for c5 and c6 he required 22sec, for c7 he required 10sec. Total load carrying time required is 1min and 32sec. when the Doppler speed is 140 r.p.m. then for filling the drum machine required 25min.when Doppler speed is 110 r.p.m. then for filling the drum machine required 36.36 min. At that time man has no work until the drums are full and man has an ideal time of 22min and 48sec.

When drum get full after 25min then man pull drum from carding machine and load empty drum. Weight of the drum is 40kg. Man carrying this 40kg of drum to the drawing machine that distance from c1 machine to drawing machine is 30.59 m. when man carrying 40kg of drum to the drawing machine then at the return he taken a empty drum with him to c1 so that required time of arranging the empty drums is get reduce.



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Time required to (pull drums of c1 + load empty drums + carrying the drums & empty drums + to reach the c2 machine) =32 sec & he do the same process for c3, c4, c5, c6, c7.

Time required to (pull drums of c2 + load empty drums + carrying the drums & empty drums + to reach the c3 machine) =28 sec

Time required to (pull drums of c3 + load empty drums + carrying the drums & empty drums + to reach the c4 machine) =24 sec

Time required to (pull drums of c4 + load empty drums + carrying the drums & empty drums + to reach the c5 machine) =20 sec

Time required to (pull drums of c5 + load empty drums + carrying the drums & empty drums + to reach the c6 machine) =16 sec

Time required to (pull drums of c6 + load empty drums + carrying the drums & empty drums + to reach the c7 machine) =12 sec

From this man-machine chart, it shows that the ideal time of machine is generated at the starting. This is because of the load carrying & arranging the empty drums. But because of this ideal time this machine is start at some time. For example machine c1 complete its drums at 25 min & 8 sec after then he pull the drums and load the drums. (Not required to stop the m/c it means it mean machine are continuously running and zero waste) and to reach to the c2 machine for that he required 32 sec and it means he reach at the 25 min and 40 sec. but the c2 complete its drums at 25 min and 16 sec. It mean that $(25:40 - 25:16) = 24$ sec.

It means c2 m/c is ideal for the 24 sec.

From man-machine char it show that,

C3 machine is ideal for the 44 sec.

C4 machine is c3 m/c is ideal for 60sec.

C5 machine is c3 m/c is ideal for 1min & 12 sec.

C6 machine is c3 m/c is ideal for 1 min & 20 sec.

C7 machine is c3 m/c is ideal for 1 min & 24 sec.

But because of the machine c2 is starting after 24 sec late, means machine is start at 25:40 and complete full drum at 50:40.

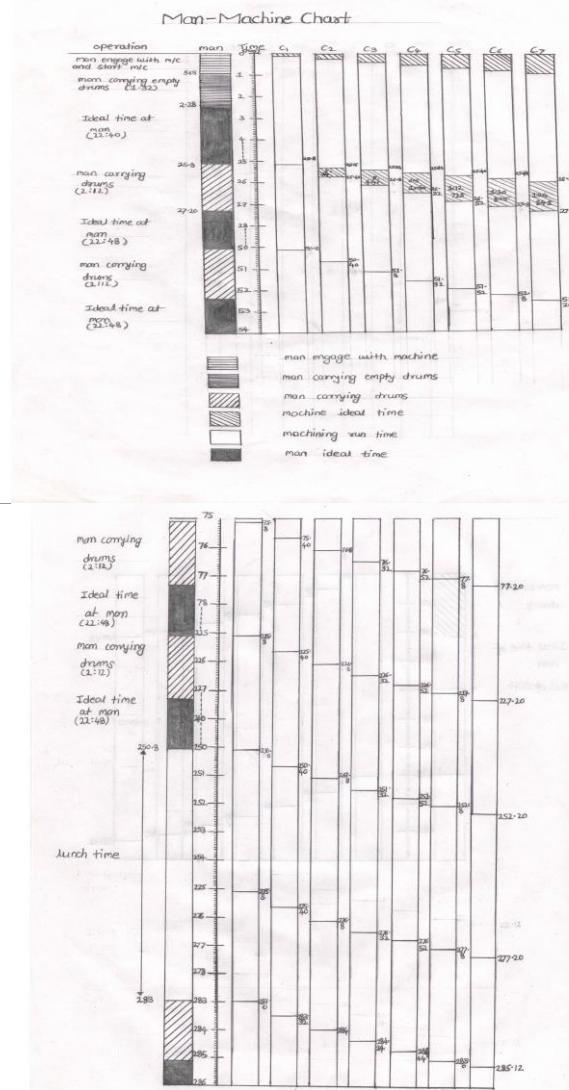
At the next cycle, means at the 3rd cycle, after doing the carrying operation from c1of 32sec, Then he will reach at c2 at the exact time at 50 min & 40 sec. and same condition will be happened with all carding machine & c3 machine will be start at 26 min & 8 sec., c4 machine will be start at 26 min & 32 sec, c5 machine will be start at 26 min & 52 sec, c6 machine will be start at 27 min & 8sec, c7 machine will be start at 27min & 20 sec and take 25 min to complete the drums. Same cycle is repeated up to the 10th cycle, means up to the 225min and 8sec.

There is lunch time after 4 hr. means at the 253 min for 30 min after completing the 11th drum and then he load the 12 drum and the machine is start for 25 min for 12th drum and run up to 25 min after then he will go for the lunch time 253 min and he leave the machine without stop and machine is run until the drums not full, when the drums is full, then machine is automatically stop. (there is sensor are to be provided when the drum get full then red light is glow & machine will stop) then all machine will be ideal for an 7 min & 52 sec. When the man will come at 283 min then he start from the c1 and Carry drums to drawing machine and return to c2 and required time is 32 sec and start c2 machine, and after 28 sec he start c3 machine and Carry 3rd drums to the drawing machine and after 24 sec he start c4, after 20 sec he

start c5, after 16 sec he start c6 & after 12 sec he start c7 and same sequence maintained that previously done.

In such a way that in 8hr shifts 18 cycle is complete by all the seven carding machine, and produce the 126 drum by seven machine and same condition will be happened with the next 7 carding machine and total drums produce are 252 by the 14 carding machine.

Man Machine chart for line 1



III. FOR PROCESS ON LINE 1

- 1) Time required for man carrying empty drums =1:32 min
- 2) Time required for man carrying drums = 2:12 min
- 3) Total ideal time of man = $22:40 + (22:48)*17 = 410:16$ min
- 4) Total engage time of man with machine =56sec
- 5) Total full drums carrying time of man = 37:25 min
- 6) Total ideal time of machine of c1 = $7:52 + 8\text{sec} = 8\text{min}$

Total ideal time of machine of c2
 $= 7:52 + 16\text{sec} + 24\text{sec} = 8:32 \text{ min}$

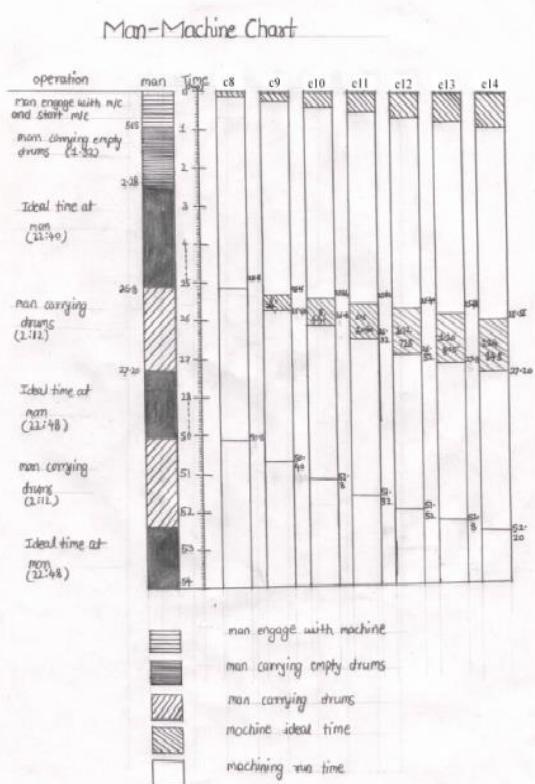
Total ideal time of machine of c3
 $= 7:52 + 24\text{sec} + 44\text{sec} = 9 \text{ min}$

Total ideal time of machine of c4



- = $7:52 + 32\text{sec} + 60\text{sec} = 9:24 \text{ min}$
 Total ideal time of machine of c5
 $=7:52 + 40\text{sec} + 1:12 = 9:44 \text{ min}$
 Total ideal time of machine of c6
 $=7:52 + 48\text{sec} + 1:20 = 10 \text{ min}$
 Total ideal time of machine of c7
 $=7:52 + 56\text{sec} + 1:24 = 10:12 \text{ min}$
- 7) Total running time of machine c1
 $=480\text{min} - 8\text{min} = 472\text{min}$
 Total running time of machine c2
 $=480 - 8:32 = 471:28 \text{ min}$
 Total running time of machine c3
 $=480 - 9 = 471\text{min}$
 Total running time of machine c4
 $=480 - 9:24 = 470:36 \text{ min}$
 Total running time of machine c5
 $=480 - 9:44 = 470:16 \text{ min}$
 Total running time of machine c6
 $=480 - 10 = 470 \text{ min}$
 Total running time of machine c7
 $=480 - 10:12 = 469:08 \text{ min}$
- 8) All machine complete its 18 drums
 And time required for 1 drum = 25min
- 9) 126 drums required in 8 hours
 7 carding machine produce total drums are $=18 * 7 = 126$ drums
- 7) Total ideal time of machine of c9 = $7:52 + 16\text{sec} + 24\text{sec} = 8:32 \text{ min}$
 8) Total ideal time of machine of c10
 $=7:52 + 24\text{sec} + 44\text{sec} = 9 \text{ min}$
 9) Total ideal time of machine of c11
 $=7:52 + 32\text{sec} + 60\text{sec} = 9:24 \text{ min}$
 10) Total ideal time of machine of c12
 $=7:52 + 40\text{sec} + 1:12 = 9:44 \text{ min}$
 11) Total ideal time of machine of c13
 $=7:52 + 48\text{sec} + 1:20 = 10 \text{ min}$
 12) Total ideal time of machine of 14
 $=7:52 + 56\text{sec} + 1:24 = 10:12 \text{ min}$
 13) Total running time of machine c8
 $=480\text{min} - 8\text{min} = 472\text{min}$
 Total running time of machine c9
 $=480 - 8:32 = 471:28 \text{ min}$
 Total running time of machine c10
 $=480 - 9 = 471\text{min}$
 Total running time of machine c11
 $=480 - 9:24 = 470:36 \text{ min}$
 Total running time of machine c12
 $=480 - 9:44 = 470:16 \text{ min}$
 Total running time of machine c13
 $=480 - 10 = 470 \text{ min}$
 Total running time of machine c14
 $=480 - 10:12 = 469:08 \text{ min}$
- 14) All machine complete its 18 drums
 And time required for 1 drum = 25min
- 15) 126 drums required in 8 hours
 7 carding machine produce total drums are $=18 * 7 = 126$ drums

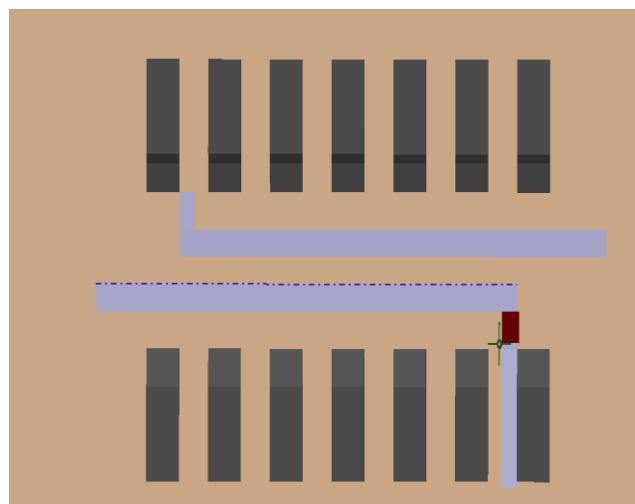
IV. MAN MACHINE CHART FOR LINE 2



For Process on line 2

- time required for man carrying empty drums = 1:32 min
- Time required for man carrying drums = 2:12 min
- Total ideal time of man
 $= 22:40 + (22:48) * 17 = 410:16 \text{ min}$
- Total engage time of man with machine = 56sec
- Total full drums carrying time of man = 37:25 min
- Total ideal time of machine of c8 = $7:52 + 8\text{sec} = 8\text{min}$

V. FUTURE CONCEPT PROCESS



In this process, we use the material handling system, and eliminate the one labor. It means, only one worker are handle the 14 carding machine, and reduce his load carrying operation to the drawing machine and he has only job to load and unload the drums from the carding machine. It is possible or is not that one worker can handle the 14 machine and this could be understood from the drawing man- machine chart. Through which, we came to know that the one worker can handle 14 carding machine.



This will help the labor to work only in the specialize area of 14 carding machine. It eliminates the carrying 40kg of drum to the drawing machine because it increases the labor fatigue.

In this at the starting one labor are engage with carding machine for starting the machine and inserting operation and reach to the next machine for that he required 8 sec. he will do same one the 14 machine and for that he required 1 min and 52 sec.

In which, C1 will start after 8 sec, C2 will start after 16 sec, C3 will start after 24 sec ,C4 will start after 32 sec C5 will start after 40 sec, C6 will start after 48 sec C7 will start after 56 sec, C8 will start after 1:04 C10 will start after 1:20, C11will start after 1:28 C12 will start after 1:36 , C13will start after 1:44 C14 will start after 1:5

And all the machine required time to complete one drum is 25 min. it means, at the end of all machine is reach at, c1=25:8, c2=25:16, c3=25:24, c4=25:32, c5=25:40, c6=25:48, c7=25:56, c8=26:04, c9=26:12, c10=26:20, c11=26:28, c12=26:36,c13=26:44, c14=26:56 form the man- machine chart it shows that , there is an 23 min and 16 sec ideal time for the man. In this time, he arranges the vacant drum to all 14 cording machine by manually or by the using material handling system.

If suppose, he will arrange empty drums by manually then he required time of 4min but he can save the electricity. But if suppose, he will arrange drum by material handling system (i.e. labor at drawing machine place empty. Drums on conveyor) than he required time of the 1 min and 40 sec. but because of the ideal time is more he must have to arrange the empty drums by manually.

When the c1 machine will fill the drums at time 25min and 8sec then he place drums on conveyor and load empty drums and start filling the second drum at c1 machine and complete after 25 min at 50min and 8sec in which, for loading and unloading and to reach to next machine he required 8 sec. and after every 8 sec, second machine at carding fill the drums. It means, when he reaches at next machine then next machine will complete the drums. It means,

There is a proper sequence in it. When c1 fill the drums at 25min and 8sec and c2 fill the drums at 25min and 16sec. After loading and unloading from the c1 and reaching to the c2 machine at 25min and16sec and same condition will be happened with other carding machine.

There is lunch time after 4 hr. means at the 253 min for 30 min after completing the 11th drum and then he load the 12 drum and the machine is start for 25 min for 12th drum and run up to 25 min after then he will go for the lunch time 253 min and he leave the machine without stop and machine is run until the drums not full, when the drums is full, then machine is automatically stop.(there is sensor are to be provided when the drum get full then red light is glow & machine will stop) then all machine will be ideal for an 7 min & 52 sec. When the man will come at 283 min then he start from the c1 and Carry drums to drawing machine and return to c2 and required time is 32 sec and start c2 machine, and after 28 sec he start c3 machine and Carry 3rd drums to the drawing machine and after 24 sec he start c4, after 20 sec he start c5, after 16 sec he start c6 & after 12 sec he start c7 and same sequence maintained that previously done. The ideal condition generated in the current processes that are not generated in this new concept process.

Man-Machine Chart

