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Optimization of Existing Plant Layout on the Basis of Backward Movement Minimization of the Product

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Abstract:
The design of plant layout has a very significant impact on the operations of the manufacturing system. The curent common intuit ive methodof selecting asuitable layout by using travel chart method for optimum solution. To reduce backward movement of the product by shifting ofmachine and find the optimum movement is the main aim of my product.The methodology considers three m ain objective for the selection oflayout: increasing flexibility, increasing production volume and reducing manufacturing cost.

1. Problem Formulation

In a manufacturing unit transportation facilities directly affect the cost of the product and efficiency of the plant. Increase in the total movement (backward and forward) of the product due to unplanned errection of machineries, decrease the efficiency of the plant and increase the cost of the product.
Backtracking gives double losses in case forward movement, hence backtracking minimization is main problem.
Here we will study the problem of GOOD LUCK STEEL TUBES LTD. SIKANDRABAD, (BULANDSHAHAR) It is a manufacturer of steel pipes of different sizes and shapes. Mill department consists three mills.

i. New Mill (1/2” to 3/2”)
ii. Big mill (5” to 10”)
iii. Old Mill (2” to 4”)

2. Objective

My aim is to reduce the backward movement of the product.

3. Solution Methodology

Travel chart is a technique to compute the number of movement of product in a complex path, with the help of travel chart, we can point out the layout problem and calculate the forward and backward movement of the product, backward movement is double harmful in case of forward movement so we can reduce the backward movement with help of travel chart method and then optimize the plant layout by changing the process of operation sequences of the production centre.

3.1. Restrictions

We can produce only one type of product at every mill according to range and mill size setting.
Let us consider we are producing ½”(15NB) at new Mill,2”(50NB) at old mill and 5”(125NB) at Big Mill at a specific time.The conversion of raw material into finished product goes on through following process.

i. Rolling(Manufacturing)-R
ii. End Facing or Beveling (according to requirement)- A
iii. Straightening- B
iv. Hydro Testing at different pressure, according to ISI standards –C
v. Threading-D
vi. Galvanizing(Zinc Coating) –E
vii. Storage -F
viii. Dispatch-G

The movement (Handling) of goods or products during above process is complex and lengthy. We want to optimize the movement of goods so that it will provide the least overall material handling.

- Assumptions a) Let the measure of effectiveness of this layout be the distance of moves of material. Recall that the distance between all adjacent production centre is same since the production centre areas are same. This criteria is reasonable, since the number of loads will be the same because of constant production.

b)Assume that Backtracking is twice harmful as forward movement because of the nature of building.
c) Assume that all moves are to be made by overhead crane and Trolly.
d)All pipes are IS1239 which is used for water supply.

Product	Sequence
½”(15NB)	R,F,A,B,C,D,F,E,G
2”(50NB)	R,A,F,C,D,E,F,G
5”(125NB)	R,A,F,C,E,G

Table 1: Sequence Summary (Existing Layout of Good Luck Steel Tubes Ltd.)

3.2. Preparation of the Travel Chart
Enter the number of moves for each combination from Table 1 and the travel n chart for my proposal will look like as shown in fig

3.3. Checking the Efficiency of the Layout
The two restrictions stated enable us in this particular problem to make use of the movement arm analogy from mechanics. If we count diagonal rows back from the diagonal, each diagonal row can represent a unit of distance. For example, in fig1 a move from A to B covers 1 unit of distance because they are adjacent. In the travel chart this figure shows up adjacent to the diagonal. A move from C to E moves two distance units because the part has to go through D. In the travel chart this shows up two diagonal rows from the main diagonal. Continuing this trend, it is possible to determine the movements around the main diagonal which will reflect not only moves, but the distance of these moves as well.

3.4. Preparation of Travel Chart

R	A	B	C	D	E	F	G

My Alternative Proposal no.1

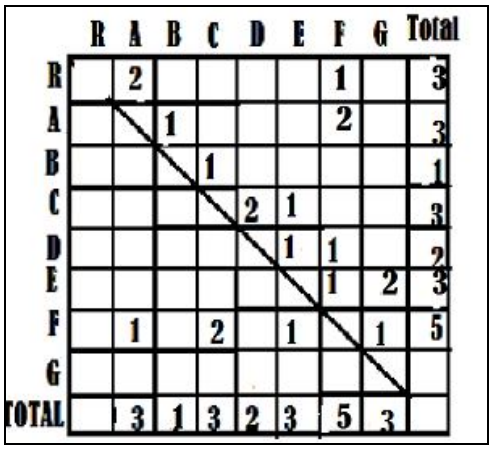

Figure 1: My alternative proposal no.1

3.5. Movement Computations of Proposal no.1

Forward Movement	Backward Movement
9*1 =9	2*1*1=2
4*2 =8	2*2*3=12
2*5 =10	2*1*5=10
6*1 =6	
Total=33	Total=24

Table 2: Total Movements= 33+24=57

3.6. My Alternative Proposal no.2

Since in backtracking we have maximum of 12 units distance movements from F to A so we rearrange A&F in AF manner and we also have second maximum backtracking movements of 10 units for F to C movements so we arrange F&C in neighbourhood such that FC.

R	A	F	C	B	D	E	G

My Alternative Proposal no.2

3.7. Movement Computations

Forward Movement	Backward Movement
9*1=9	2*2*2=8
3*2=6	2*1*3=6
2*3=6	2*1*4=8
1*4=4	
1*5=5	
Total=30	**Total=22**

Table 3: Total Movements=30+22=52 units

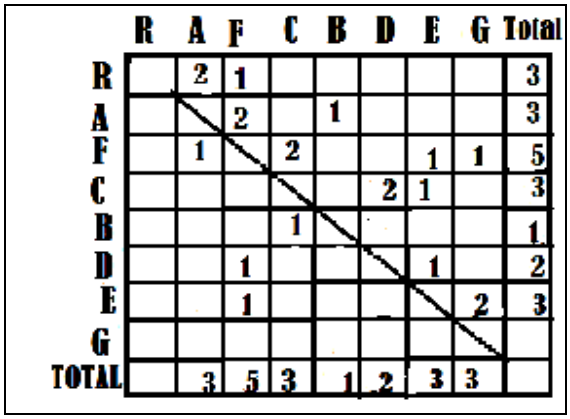

Figure 2: My alternative proposal no.2

R	A	F	C	E	B	D	G

My Alternate Proposal no.3

3.8. Calculation of Movements

Forward Movement	Backward Movement
7*1=7	2*1*1=2
2*2=4	2*3*2=12
4*3=12	2*1*4=8
1*4=4	
1*5=5	
Total=32	**Total=22**

Table 4: Total Movements=32+22=54 units

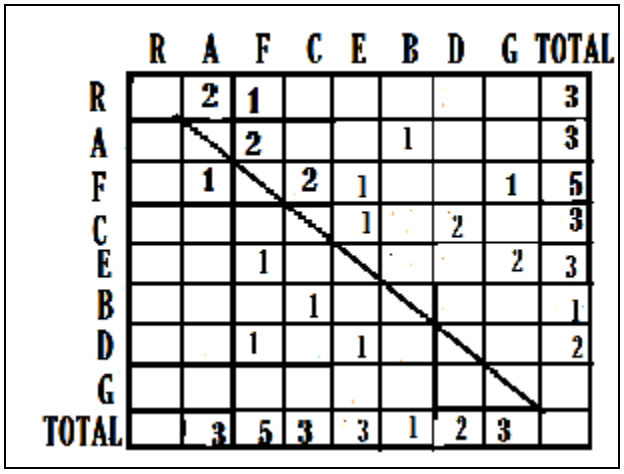

Figure 3: My alternative proposal no.3

4. Result

Since the best alternative solution to the problem is alternative 2, the floor layout which provides the minimum materials handling will be for the layout shown in fig 2

5. Conclusion

The cost minimization problem is of major importance in all types of businesses. Whether we are concerned with manufacturing, supply, transportation or service, we have to be very careful about the cost minimization. In order to arrive at a better regarding about the cost minimization, we have to take into account a number of factors, and after careful consideration can be done by various quantitative as well as by quantitative methods as discussed. We as in the case of any existing business.

6. References

i. Plant Layout and Material Handling by G.K. Agarwal
ii. Industrial Engineering by M.I.Khan.