

# Operations Research Technique for Merging Manpower in Industries for Optimization

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**Abstract:** In this paper , We have discussed the Merging of the man power which works in industries for enhancement the productivity. The purpose of study to find the role of Operations Research techniques for merge the man power of two different branch but having the similar work profile. In this paper we show that the process man power of a industry and Maintenance man power which having the same field can be merge and work together in the proper guidance. This concept helps to increase the labour productivity and cost reduction with respect to time. The paper present that the groups for execute may be merge and the number of executive can be purposed with the operation research techniques

**Key Words:** - Productivity, Assignment, Enhancement, Man power

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## I. INTRODUCTION

The problem arise in the industries to how the identified the requirement of man power for any process and the required number of maintenance. The process manpower is always busy with their respective steps and the maintenance person with their routine machine PMI. But after some experience the person fatigue with their routine work. The another view that management wants to optimize output from the man So always track the working of man power. In both condition plant productivity be suffer MostafaE.Shehata [1] provides a guide for necessary steps required to improve construction labour productivity and consequently, the project performance. It can help improve the overall performance of construction projects through the implementation of the concept of benchmarks. Also, it gives an up to date concept of loss of productivity measurement for construction productivity claims. Two major case studies, from the literature, are presented to show construction labour productivity rates, factors affecting constructionlabour productivity and how to improve it. Izaz ullah Khan and Norkhairul Hafiz[2] estimates an optimal production levels for the different products manufactured at ICI, a multinational company in Pakistan. The revised simplex method is used to maximize the profit generated in 2010 subjected to cost resource constraints The company can earn significant profit by operating on the proposed production forecasts. The top management and decision makers can maximize the profit of the company within the name plate production capacity, setting up the future goals and outlook of the company Staff scheduling and rostering problems, with application in several application areas, from transportation systems to hospitals, have been widely addressed by researchers. This is not the case of hospitality

services, which have been for-gotten by the quantitative research literature. The purpose of this paper is to provide some insights on the application of staff scheduling and rostering problems to hospitality Management operations, reviewing existing approaches developed in other similar areas.such as nurse rostering or examining adaptable problem models, such as the tour scheduling addressed by Marta Rocha, Jose F.oliveria and Maria Antonia[3]. According to Benedict I. Ezema and Uzochukaur Amakon [4] carried out to seek and arrive at the optimal product-mix of a productive firm-the Golden Plastic Industry Limited- in the layout.

The production problem of the firm was formulated as a linear programming problem and estimated as such. The result shows that only two sizes of the total eight "PVC" pipes should be produced. The study succeeded in establishing that Golden Plastic Industry Limited, Emene should produce 114,317.2 pieces of 25mm by 5.4m conduit pipes and 7,136.564 pieces of 20mm by 5.4m thick pressure pipes, and zero quantities of the rest sizes of pressure pipes per month in order to obtain a maximum profit of N1,964,537 given the present level of available funds and the technical coefficients of the products.The study also shows that only two of the raw materials and labor time- were surplus, while the other six-resin, calcium carbonate, stabilizer, cast, carbon black and blend-were scarce in relation to the formulated model. The shadow prices of the raw materials obtained showed their unit contribution to the objective function (profits) and suggests to management the prices at which they should either be bought or sold.

Rohit Bhatnagar and Venkataramanaiah[5] model the manpower planning issuesfor a computer manufacturer during the productintroduction phase when a quick ramp-up ofproduction to meet rapidly increasing demand is akey

requirement. A mix of permanent and contingent workers with different skill sets is considered. Humans are considered as the most crucial, volatile and potentially unpredictable resource which an organization utilizes. Manpower planning seeks to make the links between strategy, structure and people more explicit. Dharamvirsinh Parmar and Dr. Prashant Markaw[6] review the models which have been developed, concentrating on their assumptions and applications. The paper concludes with some notes on possible future development

**Man Power Merging Model for Industries**

The objective for the Management to optimize the man power cost. In this aspect we introduce the new model for merging the man power of Industries, So the existing manpower can help counter section. Here we discuss on the merging of process and mechanical man power of industries which comes in general shift.

In this chapter we introducing a new concept of man power merging in manufacturing industries there are two types of manpower, first is the process man power and other is Mechanical man power. We consider the mechanical man power are X1 and the process man power are X2 .

Then the objective of the management

$$\text{Minimum } Z = C1X1 + C2X2 \quad \text{where } X1 = \text{Mechanical man power}$$

man power

$$Z = \text{Total man power}$$

$$C1 = \text{rate of mechanical manpower/ day}$$

$$\text{process manpower/ day}$$

$$X2 = \text{Process}$$

$$C2 = \text{rate of}$$

But the constraint in front of industrial management

$$a1x1 + a2x2 \geq b1 \text{-----(1)}$$

$$a3x1 + a4x2 \geq b2 \text{-----(2)}$$

Then we apply the Simplex method for solving the problem and find the value of X1 and X2 for find out the optimal value of problem. This model may be used in other field where the cross functional team work.

**Case study of Operational Industry**

In this Paper We discuss on a operation base company, which provide the man power services for technical operation & for maintenance work in industry. This company work as contract basis. There are two types of man power, first are for the process purpose and another for maintenance purpose. The process persons having work in routine work for run the plant but not specific qualification. The other is maintenance persons having the knowledge of technical work and having

the technical qualification, all are ITI base & any diploma in their stream. Each process and technical services having different hierarchy and respective system. Basically This Company works for the manufacturing industry. The company profit base on profit base of manufacturing industry. The total revenue of company vary according the production volume. The total revenue of company 80% fixed and 20% is variable. The condition of production volume.

If company achieved 80% to 100% of target then 100% paid to the total contract amount.

If the Industry achieved 60% to 80% of the target then 60% paid to the total contract amount.

If below the 60% of the total target then 50 % of total amount paid.

The total revenue of the company is 1 cr is fixed and the 1 cr is variable amount. This depends on the extra ordinary performance of company and for other circumstance handling. This amount for the non- routine activities like shut down handling, boiler cleaning & bundle replacement, Thickener cleaning and their maintenance, heavy volume reactor cleaning, & new construction and new projects.

If the production volume 80 % - 100 %	1 cr
60 % - 80%	60 Lakhs
Below 60 %	50 Lakhs

But the terms and condition is there that if any fatality & accident in the industry the issue solved by the contractor company and with any safety issues industry can be apply penalty on this company. This company having All liabilities regarding man power. Then the profit of the company is

$$\text{Profit} = \text{Total revenue} - \text{man power cost} \\ = (\text{fixed} + \text{variable}) \text{ revenue} - (\text{fixed} + \text{variable}) \text{ man power cost}$$

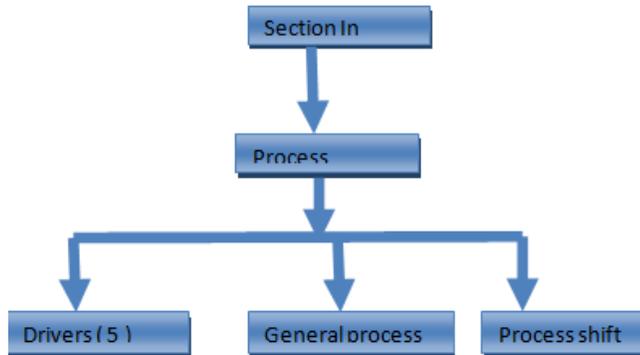
$$= (\text{fixed} + \text{variable}) \text{ revenue} - \text{total manpower cost}$$

Then there arises two conditions:-

1. Profit will be maximum when man power cost is minimum.
2. Profit will be increase when variable revenue increase

First of all we discuss on the status of man power in the company which helps us to understand the position and the total cost of manpower. There are two types of manpower process and technical services. First we discuss on the process man power , In process two type of man power one type of man power comes in general shift which timing is 8 am to 5 pm. These man power engage in the cleaning work of plant. The main objective of the man power to support in operation activities and maintain the housekeeping of the plant. This manpower includes the drivers in the plants . The number of total man power in general shift are 25, which include the 5 drivers. The plant required 4 persons in each shift for run the plant smoothly. These man power involve in

the operational routine activities. The total man power in shift 15 which take care of process.



Then the total man power for the process 46. But the drivers are only for handling the vehicles like bobcats, lifters, hydra etc. The section in charge responsible for the man power activities & fulfil the requirement in each section in general shift. The supervisor is taking care of shift activities. Each shift having one supervisor and one supervisor works as reliever.

The wages of the different post person are according to their position. The workers in shift and general shift rate is 400 Rs /day, this is the fixed price. According to production bonus & their duty overtime are consider in the variable salary. The company avoid to do the overtime to the workers, because the overtime is the double of the daily wage. The company pay 500 Rs per day to supervisor and 700 Rs/ day to section in charge. Then the company pay daily base fixed amount on man power cost

$$\begin{aligned}
 \text{Total fixed cost} &= \text{section in charge wage per day} + \text{supervisors wages per day} + \text{general shift labour charges per day} + \text{shift labour charges per day} \\
 &= 700 + 500 * 4 + 5 * 400 + 400 * 20 + 400 * 16 \\
 &= 700 + 2000 + 2000 + 8000 + 6400 \\
 &= 4700 + 14400 \\
 &= 19100 \text{ Rs/day} \\
 &= 19100 * 30 \\
 &= 5, 73,000 \text{ Rs/month}
 \end{aligned}$$

This is the manpower fixed cost which company pay to process man power. In this cost not consider the variable salary of man power.

Similarly, the company maintain the same hierarchy in maintenance. The wage of the maintenance manpower is similar to the process man power. Now we discuss on the status of man power in the company which helps us to understand the position and the total cost of manpower. We discuss on the maintenance man power , two type of man power one type of man power comes in general shift which

timing is 8 am to 5 pm. These man power engage in the preventive maintenance & spare management work of plant. The main objective of the man power to support in spare repair activities and maintain the housekeeping of the plant. This manpower includes the drivers also for movement heavy vehicles in the plants . The number of total man power in general shift are 25, which include the 5 drivers. The plant required 3 persons in each shift for run the plant smoothly. These man power involve in the operational routine activities. The total man power in shift 12 which take care of plant daily base maintenance for run smoothly process. The chart of maintenance manpower is below which shown the position of person & the number of man power in maintenance.

This organization chart shown that the general shift man power in process and maintenance are same. The wage of general shift manpower & shift man power is 500 Rs/day. The supervisor salary is according 700 Rs/day & company pay 900 Rs /day to in charge.

$$\begin{aligned}
 \text{Then the cost per day to company for handling man power:-} \\
 &= 5 * 500 + 20 * 500 + 16 * 500 + 4 * 700 + 900 \\
 &= 2500 + 10,000 + 8000 + 900 \\
 &= 29500 \text{ Rs/day}
 \end{aligned}$$

$$\text{Monthly cost} = 29500 * 3 = 8,85,000 \text{ Rs}$$

$$\text{So total man power cost in a month} = 8, 85,000 + 5,73,000$$

$$= 14, 58,000 \text{ Rs/ month}$$

Now the company decide to maximum utilization of man power & optimize the cost of man power. For this company plan to merge the manpower in both process & maintenance. So company select the concept of operation. The company decide to merge the general shift man power because there are 20 maintenance man powers in general shift and 20 man power in process. So company start enhancing the man power skill & start the man power shuffling in cross functional department. The company decide to pay same rate for each general shift person. The management pay 600 Rs to each manpower in general shift.

Let the man power of process taken X1 and man power of technical person X2.

So the objective:-

$$\text{Minimum } Z = X1 + X2 \quad \text{--(1)}$$

But the production is the main target for the industry, So without disturbing the plan there is constraint in front of company are :

$$2 X1 + X2 \geq 40 \quad \text{-----(2)}$$

$$X1 + 7 X2 \geq 70 \quad \text{-----(3)}$$

$$X1, X2 \geq 0$$

Step 1:- First convert the Minimize problem in Maximize problem:-

$$\text{Max } Z = -X_1 - X_2 + 0.S_3 + 0.S_4 -A_1 -A_2$$

Step 2 :- Now add the surplus variable and artificial variable :-

Subject to :-

$$2 X_1 + X_2 - S_1 + A_1 = 40 \text{ ----- (5)}$$

$$X_1 + 7 X_2 - S_2 + A_2 = 70 \text{ ---- (6)}$$

Where  $X_1, X_2 \geq 0$

Phase 1:- Here, the objective function is maximize

$$Z^* = 0.X_1 + 0.X_2 + 0.S_1 + 0.S_2 -A_1 -A_2$$

All  $Z_j - C_j \geq 0$ , so solution is called optimal solution that mean

$$\begin{aligned} X_1 &= 210/13 \\ &= 17(\text{app.}) \\ X_2 &= 100/13 \end{aligned}$$

= 8

Which satisfied the objectives? With the use of the  $X_1$  &  $X_2$  values, We find the

$$\begin{aligned} Z &= X_1 + X_2 \\ &= 17 + 8 \end{aligned}$$

= 25

## II. CONCLUSION

Now we calculate the cost of manpower in merging situation

Cost of manpower in general shift:

$$\begin{aligned} &= 25 * 700 \\ &= 1,75,00 \text{ Rs/day} \\ &= 17,500 * 30 \\ &= 5, 25,000 \text{ Rs/ month} \end{aligned}$$

Now with comparing the both case, In situation first the cost was 14,58,000 Rs/month.

In second scenario the cost is 5,25,000 Rs/month.

So the saving of the cost = 9,33,000 Rs/ Month.

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