INCREASING PRODUCTIVITY THROUGH MECHANIZATION OF HANDLING

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ABSTRACT

The main of the noncompetitiveness of the national industry is the low level of productivity in practically every sphere of economy, say from management to the workers including government. In this paper, a trial is done to save production time which is consumed in handling of material. The cost of material can be reduced by proper selection, operation and layout of material handling devices.

Through the suggested mechanization of the existing handling system in an egyptian branch of industry, an increase of the output volume and a decrease the cost of production might be achieved.

In general the paper presents a systematic investigation of most factors which affect the efficiency and economy of the situation being reviewed.

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INTRODUCTION

The handling of materials, parts, and products is one of the major factors that affect the productivity of factories.

Handling is non-effective from the product's point of view, and the management must do it's best to minimize it as possible using the techniques of lay-out planning, work study, cost analysis, and performance evaluation.

This article is intended to outline the solution procedure for developing a material handling system under realistic conditions.

The author feels that such a procedure as that described gives good (although perhaps non-optimal) solutions to the existing real problem, and helps in increasing productivity through the savings in production costs and the increasing of production rates.

Main Points to be Considered in the Study of Handling Systems [1,2]

The following points must be considered in the analysis of any handling system in order to achieve the above mentioned objectives :

Eliminating wasteful methods for handling:

- All the unnecessary movements must be eliminated.
- When combination of operations is possible, it saves handling of materials.
- Using the gravity for handling saves money, effort, and time.
- Mechanization of handling methods can solve many problems of production lines and increase it's rate of output.
- We must compare between moving workers to parts and materials, and moving the materials to workers.

Planning lay-out :

- Provide suitable and permenant handling methods.
- Principal aisles must exist to connect all the production steps with minimum distances.
- The layout must avoid cross-motions and back-motions as possible.

Applying proper equipments :

- Before buying new equipments, the existing ones must be used to it's maximum efficiency.
- The selection of handling equipments must be on economic bases.
- The standardization of handling equipments for the whole plant is better (for scheduling, maintenance, and spare parts).
- Stand-by units must exist to avoid delays.
- The economic size of handling must be used in the calculation of equipment's capacity.

Coordinating & facilitating operations:

- When more than one equipment is used for handling; then the

activities of each of them must be coordinated with the other's.
- The utilization of equipment's capacity is a major point to be considered.
- Avoid - as possible - the handling from ground to m/c and from m/c to ground.
- Also, avoid mixing materials or products during handling.
- Storing methods must be coordinated with the handling equipments and stores capacity.
- Packaging methods and materials must suit the handling methods.

Use and Upkeep of Equipments:

- Employees must be trained on the suitable ways to use and operate the equipments.
- Safety requirements must be provided.
- A suitable programme for maintenance of the handling equipments is necessary.

The Handling Problem to be Studied :

This study was carried out for the core section of the foundary of El Nasr Company for manufacturing steel pipes and fittings (Helwan, Egypt).

The foundary production represents a considerable part of the total production of this company.

It is an electronic casting foundary-shop producing standard units of pipes fittings. These fittings are the main connection of different sizes of pipes. Its work is a complementary process to that of the other factories of this company that produce pipes.

Accordingly, a great attention have to be paid to the increasing of the efficiency of this foundary and decreasing the costs of production of these fittings. One of the major area for achieving this goal is the handling activities and how efficiently it is done.

This foundary has a core section using core blowers of high capcity (there are 12 core blowers placed in one raw along the wall of the section).

Although the production rate of this type of core blowers is 4 cores per minute (i.e. 1920 cores per 8 hours for each blower); only 17850 cores is the average production rate of this section.

This represents the capacity of only 9.3 machines (i.e. the efficiency of these machines is 9.3/12 or 77½ % only). The reason was mainly the handling delays.

Handling was done by trolleys and 3 men servicing the 12 blowers and also the workers that part the core moulds and that place the cores.

RESULTS OF THE STUDY

The analysis of the handling methods in this section results a new system for handling. The main features of this system can be realized as following :

We introduce a belt conveyor of 18 metres length, and 680 mms.width

and with a speed of 18 metres per minute.
Only one man is required to observe the handling rates and the conveyor.

As a result of improving the handling through this suggested mechanised method, the workers of production operations are reduced from 30 to 12 only (one worker for each blower).

The following table represents the financial comparison between the existing method and the suggested one, and from it the reader can see how costs of production is reduced to only 43.1 % of the present cost.

	Old Method	Suggested Method
1. Output/shift	17850 Cores	21180 Cores (+ 18.5%)
2. Efficiency	77.5 %	92 %
3. Handling workers	3	1
4. Production workers	30	12
5. Total cost/year :	17803 £	7675 £ (-56.9 %)
- Equipments	$\frac{200}{10}$x3x1.05 = 63	$\frac{3000}{10}$ x 1.05 = 315
- Wages for handling	3 x 480 £ = 1440	1 x 480 £ = 480
- Wages for prod.	30 x 540 £ = 16200	12 x 540 £ = 6480
- Maintenance for handling equip.	100	400

Data for the Above Calculations:

Price of trolley (in the old method)	200 £
Price of the proposed conveying system	3000 £
Rate of interest	5 %
Depreciation period for equipments is	10 years
Annual average wages :	
- for handling workers	480 £
- for production workers	540 £

The unit cost (from the above table) is :

17850 £/17850 cores x 250 shift per year = .004 £ for old method but,

7675 £/21180 cores x 250 shifts per year = .00145 £ for the suggested method.

(Taking into our comparison the cost of labor & handling equipments which are the varying costs of the core making operations in our study).

This represents a decrease of 63.75% from these cost items per piece produced.

To Generalize the Economic Comparison we Made Above :

Let the production rate is P_{old} and P_{new} for old method and new method respectively.

And the depreciation costs per year is also D_{old} and D_{new}

And the wages for handling worker are S_{old} and S_{new}

And that for production worker are W_{old} and W_{new}

And number of workers for handling & production are H and C resp.
And maintenance costs per year are M_{old} and M_{new}

Then :

Increased production rate is $P_{new} - P_{old} / P_{old}$

$$\text{Saving in annual costs} = \left[M + SxH + W \times C + D\,(r+1)\right]_{old} - \left[M + SxH + WxC + D(r+1)\right]_{new}$$

$$\text{Saving in unit cost} = \frac{\left[M+SxH+WxC+D(r+1)\right]}{P_{old}} - \frac{\left[M+SxH+WxC+D(r+1)\right]}{P_{new}}$$

(r refers to the annual rate of interest).

The above mentioned method was applied in case of the factory follows the simple interest. But, when the factory follows the usual computation by considering the compound rate of interest, the formula will take the following form : [3]

$$Z_{old} = \left[\frac{M+SxH+WxC}{P}\right]_{old} + \left[\frac{K\,(RP\ r-n)}{P}\right]_{old}$$

$$Z_{new} = \left[\frac{M+SxH+WxC}{P}\right]_{new} + \left[\frac{K\,(RP\ r-n)}{P}\right]$$

Where :

K = Capital invested in handling equipment.
n = Service life of the equipment.

$(^{RPr-n})$ = Capital recovery factor.

Saving per unit = $\Delta Z = Z_{old} - Z_{new}$.

If ΔZ is a non negative value, the policy of the mechanised system will be suggested.

CONCLUSION

This paper illustrates the outline of handling analysis and procedure of studying the methods of handling in the aim of raising the

efficiency of working plants.

It also illustrates a practical case of applying these procedures and how it results a significant saving in production costs and increase in production rates.

Also it introduces a simplified pattern for cost comparisons which are the base for deciding the use of changing handling systems and mechanizing it. Unless there is a considerable saving in the costs and/or increase in the output, it is not needed to make such changes.

Of course the problems of handling are affected by many variables and need to take into account all the related techniques and methods of manufacturing, storing, packaging, and even methods of production control and supervision. But the general frame of studies that this paper illustrate remain applicable and of great value in this field.

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