

Cost Control in Port Terminal Operation

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- A Practical Approach

1 Introduction

Maintenance costs usually account for a significant part of the total costs in a capital intensive industry. A Port and Terminal operator is no exception to this. The maintenance activity in a Port includes plant and equipment encompassing mechanical, electrical and electronic items, infrastructure including all civil works, marine crafts etc. It is evident that a Port requires diverse maintenance activities (some of which require to be carried out on a 24 hour-basis throughout the year) for attending to breakdowns, maintenance etc, necessitating the employment of a large workforce, divided into several functions within the Maintenance Division. This necessitates the employment of highly skilled technicians, with high pay scales, resulting in substantial manpower costs in the maintenance function. Furthermore, demands are made on the maintenance function for a very high degree of plant availability to achieve the least possible disruption to the Operations and to ensure timely turnaround of the vessels. This means, the downtime of equipment should be at its lowest possible level, which can only be achieved by a highly planned and efficiently executed maintenance service, covering both preventive and breakdown maintenance. The high demands made on the Maintenance Division tends to exert upward pressure on the total maintenance costs.

This paper discusses the subject broadly as follows

- Maintenance Cost Management
- Maintenance Management System
- Analysis and collection of costs
- Budgeting for maintenance costs
- Cost reporting and control



2 Maintenance Cost Management

The principal elements of maintenance costs comprise of :

- Manpower costs, made up of skilled and unskilled workers, their supervision and management costs
- Spare parts and other supplies
- External repairs and maintenance. This includes all out-sourced works and services, as well as dry-docking of marine crafts

The maintenance costs are charged out to the Departments/Activities that receive the service, based on the time spent by the maintenance team, together with the materials used and any other services provided. Basically, the costs incurred in the provision of the maintenance service are recovered from the user Departments/Activities. The concept is that of an internal transfer of costs and no profit margin is allowed.

The costs incurred must be controlled and managed well to achieve economies in operating costs. Since profitability is not the criteria to measure the performance of the Maintenance Function, it needs to be controlled by other means such as the efficiency of the maintenance programmes and their costs, labour productivity, budgetary control, standard costs where possible (as often non standard diverse maintenance activity needs to be carried out) comparison of the labour charge-out rates with external sources as available and other overall efficiency measures.

The bottom line is that the maintenance costs as an item of cost in the service (product) sold to the customer should be within the target cost set, such that the price charged to the customer gives an adequate margin of profit, considering all other costs.

The objective is to achieve economies in operating costs in the Maintenance Division. There are two broad aspects to it. One is the technical management and the other is the cost management, although in a sense, they are inseparable.

Technical management involves all aspects of engineering services management. An important aspect of it is the efficient work scheduling where by the available labour is allocated to jobs in the

right priority. This is a planning process to manage workload efficiently, making available critical equipment/facility operational for work and at the same time responding to unforeseen breakdown repairs, with the lowest possible manning levels. Effective resource management is the key.

It follows that sound technical management leads to overall lower maintenance costs. The cost management aspect is the focus of this paper and the paragraphs that follow deal with this subject.

3 Maintenance Management System

First of all, it is suggested that an efficient maintenance management system that facilitates good technical management and provides for cost information and control should be in place, as otherwise by manual methods it would be extremely difficult, if not impossible, to manage the Maintenance Function. The system chosen should address all technical requirements and the cost management aspects. A good maintenance applications system, among other things, should address the following, important issues :

- Standardised and highly efficient maintenance work procedures and processes and improve overall efficiency and safety
- Maintenance planning and resource management covering material requirements and work scheduling, including manpower allocation to jobs
- Record labour hours and materials planned for each job and their actual usage
- Budgeting for maintenance costs
Standard costs for repetitive jobs and variance reporting for more effective cost control
- Maintenance cost allocation and cost information through proper job costing.
Integration with inventory and purchase management systems and the financial systems
- Maintenance information and reports, both technical and financial. Technical information include, equipment availability, their utilization failure analyses, productivity analyses etc. The financial reports include cost collection and control aspects

Several Maintenance Management packages are readily available off-the shelf in the market and a package that meets the organisational needs can be chosen. This aspect is beyond the scope of this paper and not dealt with here.

4 Analysis and collection of costs

The costing technique to be applied is the all too familiar job costing system, whereby all costs incurred on labour, spare parts and all outsourced supply/services for each and every maintenance job are accurately collected and properly categorised. Indirect costs of the maintenance function are usually absorbed into the labour hour rates or dealt with by other established costing practices such as machine hour rates and charged to the jobs concerned.

The cost incurred on each asset is accounted for, job wise. The lowest level to capture the costs should be no less than the asset itself in any elementary system, although it is ideal that cost should be identified at lower levels such as assembly and major component levels of the individual asset/plant item. In fact most systems have this facility.

Upward aggregation of costs is done

- by individual assets
- by asset category by reference to make or manufacturer
- by asset category of the generic type
- by Activity/Department/Division
- for the total organisation

The cost collection and accumulation should not only consider the assets to be maintained but also another important aspect, which is the maintenance type or category, for effective cost control. The objective is to identify the costs by their behaviour and to categorise them appropriately. The typical maintenance categories would be :-

Regular Preventive Maintenance (PM)

This is carried out at fixed time intervals such as monthly or alternatively in time cycles, considering the operating hours. Basically, this is the regular service and maintenance following a checklist. This is planned and is repetitive. The P M results in a fairly constant cost over any given time period.

Planned preventive maintenance (PPM) (or Predictive maintenance)

These works are planned in advance by anticipating potential breakdowns in the future. An example is servicing or replacement of major components just at the right time, following manufacturer recommendations and own experience. At times, such maintenance is effected at first sign of abnormal working of a plant/equipment. The difference here is that it is carried out at irregular intervals.

Overhauls and refurbishing of plant and equipment

These are again carried out under a planned programme of maintenance, except that the amounts involved are usually high and are incurred on a cyclical basis, during the lifetime of the asset.

The cost of any major overhaul refurbishing works resulting in increase in the life of the asset or its revenue earning capacity is capitalised, following normal accounting rules. Otherwise, the general overhauling works that are required from time to time (which do not qualify for capitalisation) are taken to cost. These costs are separately categorised, as the amounts involved are usually large and are also incurred at irregular intervals.

Breakdown maintenance

Breakdowns may occur in spite of regular and planned maintenance, though their incidence could be lower, where such effective preventive maintenance programmes exist. These are unplanned works arising at irregular intervals and the costs are separately identified and categorised as such. Breakdowns tend to increase with the increase in the volume of activity.

Accident repairs

Although specific incidents are unforeseen, their incidence has some kind of relationship to the volume of activity, operator fatigue, negligence, poor training etc.

These incidents are investigated upon and usually result in insurance claims such that the repair costs will be substantially offset against claim receipts.

Dry docking

Dry docking of marine crafts is carried out periodically once in 2.5/5 year-cycles and hence the costs incurred are cyclical in nature. It is suggested



to have a separate maintenance category for clarity of understanding of these costs.

Natural disasters

The examples of such disasters are flood or cyclone damages as distinct to ordinary accidents. The main point is that these are exceptional maintenance costs and occur unexpectedly and once in a while. It cannot therefore form part of the regular maintenance budget costs. These costs, as and when incurred are taken to costs and set-off to the extent of any insurance claims.

For accounting convenience, certain expenses such as the following could be identified separately and captured in the maintenance system, although not chargeable to Profit and Loss account.

- Warranty claims
- Recoverable repair costs such as a service to external parties
- Repair costs on assets for sale
- Capitalisable costs

Proper categorisation of maintenance costs helps in many ways.

The following are some of the advantages :-

- Costs can be viewed by management in the right perspective as the regular and the off the type or unusual maintenance costs are separately identified and reported. It is the management review of costs and the resultant corrective actions that bring about economies.
- When maintenance costs are presented by reference to (a) cost elements – labour, materials and external costs and analysed by, (b) reference to maintenance categories in respect of the individual assets, drilled down to assemblies and components, the management can control costs with relative ease. Cost inefficiencies are tracked instantly and corrected.
- The categorisation facilities advance planning. Substantial items of costs are planned in advance by reference to expected wear and tear of assets/components, such that cost control is effective and costly breakdown

repairs are minimised.

- Maintenance budgeting is made very effective, making cost control an easier task. Variance reporting becomes more meaningful.
- Asset replacement decisions are made easy. Costs incurred on each asset and every major assembly or component are known and thereby facilitating their replacement decisions.
- This facilitates Activity Costing, whereby only value adding activities are carried out and non-value adding activities totally eliminated. Only the right element of supervision is allowed for. Supervision and overheads are areas of costs that are easily masked and need careful scrutiny as otherwise such costs will be included in labour hour or machine hour rates and do not get easily detected, except on deliberate and careful reviews.
- This complements other management initiatives such as BPR, TQM etc.

5 Budgeting for Maintenance Costs

Budgetary control has been exercised traditionally as a useful tool for controlling cost. The merits of it are not the subject discussion here. Rather, the focus is to apply the techniques of budgeting to a Terminal Operator.

Budgeting for maintenance costs in aggregates by reference to historical information will not produce the right budget and the purpose of budgeting will be totally defeated and cost control negated. For instance, a planned overhaul which is done over say once in every three years is clearly not repetitive for the ensuing year.

Budgeting should be done by assembling maintenance costs, by cost elements, equipment-wise, in the case of all major assets/plant items and where that is not feasible, as for instance in respect of small equipment, it should be done equipment category-wise and in all cases repair category-wise (i.e. by repair types) as discussed above, for realistic budgets to be established for effective cost control. Repairs category-wise build up of budgets by cost elements will ensure that the nature of costs are

given adequate consideration, just as much as the cost elements. These are then aggregated as required.

The collection of actual costs incurred was discussed earlier in this paper. The budgeted costs and actual costs should be stated in a similar format, so that comparison of the actuals with the budget is possible.

Variations are then analysed by causes for exercising cost control. The variations thus computed pinpoint where things have gone wrong. The feedback information is used to make future budgets more meaningful for comparison of the variations in the future. This information is used by the Management to set performance targets to be achieved.

The following areas should be focused upon for cost control :

- Repairs and Maintenance manpower levels and wages
- Manning levels in the Purchase and Inventory functions
- Inventory management
- Economy and efficiency in purchasing

Repairs & Maintenance Manpower & Wages

The number of employees in the Maintenance Function by employee grades, the average pay package per each grade and the internal charge out rates per each grade of manpower should be periodically reviewed.

This is to be benchmarked against available external information or targets set internally.

If the manning levels for the Maintenance Division are set right in the budget, such costs included in the maintenance costs can be controlled properly. The manning levels should be derived by considering the total budgeted mandays of work in the Maintenance Division.

Manning levels in Purchase and Inventory Functions

Manning levels in the purchasing and inventory functions are just as important.

These are indirect costs which are easily hidden except on deliberate planning and periodical reviews.

Apart from considering the absolute amount of manpower and other costs, some practical ways to assess the manning costs in the Purchase Function is to express the total costs as a % of the value of

purchases. Likewise, the inventory keeping costs could be expressed as a % of the value of issues made.

Inventory Management

Normal inventory management techniques applied in a job costing environment should be strictly followed to avoid excessive holding of spare parts, at the same time avoiding stock run outs, as equipment idle time is very costly to the Terminal Operator and also adversely affects the turnaround time of vessels, with its consequences.

It is generally accepted that certain amount of spares are required to be stocked on site to avoid disruption to work of the Maintenance Function.

The inventory values are often high and therefore the right inventory levels should be maintained by accepted techniques. The cost of purchasing function and inventory keeping activity should be carefully monitored as well

Economy and Efficiency in purchasing

Spares are sourced from the manufacturers, their agents and often their local distributors. At times, buying agents in the country of origin are employed to procure and supply.

A variety of practices exist with regard to efficient purchases management in various industries. They include vendor managed supply systems, e-purchases etc. which are the subject of many discussions and articles in recent years. This is beyond the scope of this paper and hence not further discussed.

Whatever method is followed, the knowledge of Vendor prices, availability and delivery period are critical and that information should be available in the system for effective control over purchases.

Standardisation of equipment helps in lowering inventory costs and efficiency of the maintenance workforce. Any such schemes should of course be implemented with due care.

6 Cost Reporting and Cost Control

The Finance function does exert considerable influence through various reports it issues and the discussions it has with the concerned managers in bringing about economies in costs. Cost control is exercised by a critical review of the reports it



produces periodically and issues to higher levels of management and to the functional managers, for corrective action.

Therefore, the design of these reports and presentation of information is very crucial. Most Maintenance Management systems have standard reports that are customisable and also facilitate production of additional reports (through report generators) to suit the individual organizations and their requirements. These reports need to be designed carefully such that information is presented with clarity and the management should be able to gain an insight into the problem areas for corrective action to be taken in time.

Some of the typical reports produced are given below :

- Repair/Maintenance job cost reports by job number
 - Job costs report by Assets/Assembly/ components
 - Job costs aggregation reports (see above)
 - Job cost analyses by cost elements
 - Job cost analyses by cost category/type
 - Maintenance costs history reports
 - Standard costs/Actual costs comparison and variance analyses reports
 - Budget variance reports
 - Labour productivity reports
 - Manpower surplus/shortage reports
 - Outsourced works reports
 - Equipment down time analyses by causes/ action taken report
 - Repair/maintenance hours report
 - Assetwise analyses report by repair category
 - Aggregation Reports (discussed earlier on)
 - Equipment utilisation reports
 - Various high level reports to top management
- The listing is by no means exhaustive.

Most of these reports follow normal cost reporting principles. However, just two examples are discussed below, as it is not feasible to discuss the formats of all the above reports.

Functional level Reports

These are more directed to the Maintenance Functional Management, including middle level management. Examples are discussed below.

Maintenance costs collected by individual jobs are aggregated to monthly and cumulative figures for the year by cost elements (-labour, material, external direct costs etc.) and into the maintenance categories for individual plant and the plant category and so on as explained earlier.

It is suggested that the information, repair category wise be used for current cost control in the short term and not taken into long-term reports, to maintain clarity of presentation in historical records. The breakdown of details will be kept available, for reference as needed.

Formatting these reports should be done with care in view of the complexities involved. The reports should not only be meaningful but also readable.

High level Reports

The total maintenance cost is also expressed in terms of quay moves which is compared with the total operating cost per quay move. This in turn is compared with the average revenue per quay move.

This kind of presentation complements the reports to functional level managers and highlights areas going out of control needing investigation and action. The corrective action is taken from results in cost control.

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