Implementation Program of Computerized Maintenance Management Information System in a Fertilizer Plant

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ABSTRACT
The present paper deals with the steps required to implement Computerized Maintenance Management Information System (CMMIS) for a Fertilizer Plant. The developed computer software is user friendly, less costly and less time consuming and consisting of number of modules like Equipment's detail, Spare Parts, Inspection, Machine History, Downtime, Work Order, Maintenance Schedule, Maintenance Staff, Reports etc. Firstly, various features required by the plant team were recorded and finally CMMIS was developed based on the conceptual design. Cost estimation and software requirements for the implementation are also outlined for the fertilizer plant concerned.

Keywords--- Computerized Maintenance Management Information System (CMMIS), Maintenance Schedule

I. INTRODUCTION

It is a known fact that wherever the prestige and position of the Maintenance Engineers have been given value or respect and become well established by the top management, the manufacturing units there have shown far better results on the whole. But these type of organizations are very few. With the growing complexity of equipment, process and the magnitude of losses suffered in production due to breakdowns. Today’s management can no longer look upon maintenance as only a subsidiary function to production, but as one of the main strategic tool, which must be efficiently used to obtain the highest availability of equipment economically. Maintenance has an extended role to play and it is imperative that it is included for close and active consultation from the nascent design stages of an industry. It is essential that the maintenance personnel too be fully involved in the process/equipment selection and thereafter, when the unit goes into production, they must ensure that they are in constant coordination with the operation of the plant, so that they can keep their own performance and that of operation at the most optimum level.

Computers provide high speed, high accuracy for repetitive tasks, better handling of critical work, creative activities. It’s working is error free with repeated work, minimizing the fatigue/stress that can affect human being. Making work plan for maintenance includes daily routine activities, monthly and annual analysis etc., are the targets of the maintenance department. Maintenance requires large amount of information to be stored. A variety of maintenance software products exist in the market which can be used to manage maintenance activities efficiently. But often these maintenance software products do not always fulfill all the IT requirements of an organization. For example, most of the CMMS softwares available in market manage hardware and software assets efficiently but perform poorly for non-pc data like telephone system and office material. In these cases, good interface development to a database where useful data are stored often helps to provide good overviews, good updates and low maintenance costs.

Managing maintenance related activities should be done efficiently to minimize production loss because of maintenance. To make the maintenance system effective, it is essential to keep track of all the information related to maintenance. The objective of Maintenance Management System is to provide timely and accurate information.

II. LITERATURE REVIEW

As per Chapman, CMMS software was seen first around 1976. Manufacturing plants all over the world are using these softwares. Maintenance optimisation is achieved when firms adopt a World Class Maintenance (WCM) philosophy or strategy in collaboration with CMMS implementation. There are different parameters, which influence implementation of CMMS software and utilizing it within their plants. Corder discussed the scope of modern maintenance management, it is very wide indeed, since almost all areas of engineering and management practices have some relevance to this maintenance system.
supported adoption of CMMS software with following reasons:
• Customers requirements in conjunction with ISO 9000.
• The FDA requires CMMS for those plants which handle pharmaceuticals.
• Insurance companies want to know economics of material handling assets.

Lamendola⁴ pointed out non-value added activities related to maintenance like documentation. Travis and Casinger⁵ outlined other difficulties associated with modern maintenance management. In their work they identified the major problems faced by maintenance managers and suggested that CMMS was the solution to these problems. The problems were outlined as follows:
1. Generally, there is no support from management to implement CMMS, CMMS reports can highlight the levels of downtime and reduce costs.
2. Inventory/spare parts related problems, the need to manage inventory and minimum level of spares. In general, inventory/spare parts module is the part of modern maintenance management softwares.
3. The problems linked with assigning job to unskilled labour when skilled labour is available can be rectified by CMMS. CMMS allows managers to assign work according to the need and from available information about the labour skill.
4. Scarcity of maintenance personnel to do the job. CMMS can provide reports regarding the number of workforce as well as number of week to complete the job.
5. Breakdown due before the preventive maintenance—CMMS can generate reports for each item/equipment, which can help in identifying problem with particular parts and action can be taken before the due maintenance.

Wireman⁶ told that if CMMSs were to be properly evaluated then knowledge of primary maintenance functions needed. These are: maintenance inspections and service, equipment/machine installation, maintenance related inventory etc. He covered the objectives of CMMS, which are: better maintenance costs, reduced downtime, better equipment life, capability to store previous data for better planning of maintenance and budgeting etc., ability to generate maintenance related reports.

Most of the CMMS systems available in market have four modules for:
(a) work order planning and scheduling,
(b) maintenance spare parts, store controls,
(c) preventative/predictive maintenance,
(d) maintenance reporting.

Ramachandra⁷ et al proposed a CMMIS for a process industry. The management information system was designed to help management in monitoring and controlling different maintenance activities. Many researchers have proposed different methodologies related to maintenance and machine health diagnosis and risk mitigation studies⁸-¹⁰.

III. CMMIS IMPLEMENTATION PROGRAM

Wireman⁶ discussed on the steps required for the implementation of CMMS in any industry. These steps are as following:
(a) existing systems analysis,
(b) suitable system selection,
(c) implementation.

The scope of analysis process includes the decision, whether to implement CMMS or not. Following questions were put forward by Wireman, that should be taken into considered by management.
(a) Whether maintenance costs increasing faster than operation costs?
(b) Increased costs on maintenance compared to last 5 years?
(c) Does management aware about the maintenance cost of each equipment?
(d) Do operators spent more waiting time for work?
(e) Does spare parts management know which are the spares that are not being used since a long time?
(f) Does equipment failure takes place without any prior warning?
(g) Does top management have proper information for future maintenance planning?
(h) Is the information available can be used directly?

A committee should be formed comprising representatives from all sections like production, maintenance, store house, accounting etc.. The objectives of this committees should be:
• Proper analysis of existing record maintaining systems,
• Finalizing objectives in the areas of: work order processing, inventory related, preventative maintenance, cost controls,
• Sorting out the specifications required for the computer systems needed,
• Selecting vendor packages available in market,
• Comparative study of maintenance systems and vendors.

IV. CMMIS IMPLEMENTATION PROGRAM IN FERTILIZER PLANT

The case study is based on a CMMIS implementation in a Fertilizer Plant of India. Normally during the maintenance for a plant, the maintenance department will usually engaged with the manual maintenance process by typical paper system, each piece of equipment or asset will have a history card or file. This maintenance process is accomplished by time lapse or breakdown of any item/equipment at plant. At the time of study, no CMMS was in practice at the fertilizer plant concerned. Maintenance using CMMIS in plant will assist to highlight the levels of downtime and reduce costs. There were a total of five technicians and a maintenance manager managing the maintenance department. Existing Maintenance within the plant was a
mixture of ‘repair’ type maintenance and planned maintenance across the various departments. Analysis of breakdown and cost was not frequently carried out.

4.1 CMMIS implementation Procedure

The first step prior to implementing CMMIS was to establish an implementation team. The members of this team were the general manager, maintenance manager, a technician from maintenance staff and also from production staff. The function of this team was to draw up an implementation plan and consequently implement a suitable Computer Maintenance Management Information System in the plant. Crucial to this implementation was a review of existing systems.

4.2 Software Requirements

- WINDOWS OS (XP / 2000 / 2003 Server / 7/ 8/ 10)
- Visual Studio .Net Framework (Minimal for Deployment) version 3.5

V. COST ESTIMATION FOR IMPLEMENTATION OF ‘CMMIS’

The cost for implementation of ‘CMMIS’ in a Fertilizer Plant has been estimated considering the Software Development cost, other software packages required to run the developed software and infrastructure requirements etc. The details are shown in Table 1 as given below:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITEM</th>
<th>Qty.</th>
<th>Rate (Appro x.) in Rs.</th>
<th>Annual Cost in Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Microsoft Visual Studio.NET Package</td>
<td>1</td>
<td>15000/-</td>
<td>15000/-</td>
</tr>
<tr>
<td>2</td>
<td>Infrastructure Cost i)Computers with all accessories</td>
<td>5</td>
<td>20000*5 = 100000/-</td>
<td>20000*5 = 100000/-</td>
</tr>
<tr>
<td></td>
<td>ii)Printer</td>
<td>2</td>
<td>5000*2 = 10000/-</td>
<td>5000*2 = 10000/-</td>
</tr>
<tr>
<td>3</td>
<td>Additional work force required i)Computer</td>
<td>1</td>
<td>7000/- (Per month)</td>
<td>7000*12 = 84000/-</td>
</tr>
</tbody>
</table>

VI. CONCLUSION

The software for Fertilizer Plant has been implemented successfully and all required objectives have been achieved. By just clicking on a button, various information will be attained within no time, like Equipment details, Task details, Tools details, Work Order details, Employee details, Maintenance Schedule details, Critical issue details etc. The CMMIS Software can also be easily modified according to the needs and procedures of any Process Industries such as Sugar Mill, Refinery units, Paper Plant, Thermal Power Plant etc. This software proves useful to address many common mistakes and errors of unskilled labours and also helps to keep a check on the various mal-function practices going on in the industry by keeping a strong database of every activity being undertaken. The activities are regularly monitored so as to have proper planning of the future maintenance tasks. This makes the system more effective and economical.

Moreover, due to use of computers, there is considerable saving in time, resulting increase in plant efficiency and reduction in mental fatigue of the workers. Moreover, manual record keeping is reduced up to a large extent. All the file and paper work is reduced and their handling and storing problem is also detached. It gives fine relief to maintenance management also. It is to help maintenance activities being more efficiency, to better use of maintenance personnel, to manage spare parts and tools, to estimate maintenance cost and improve cost control in maintenance activities and to communicate with the top management with proper facts.

REFERENCES

[4] M. Lamendola, Repair more, repair less: where to focus, EC & M Electrical Construction of Maintenance,


