

# Evaluating a Computerized Maintenance Management System

A. Raouf, Zulfiqar Ali and S.O. Duffuaa

*King Fahd University of Petroleum and Minerals, Saudi Arabia*

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## Introduction

The objective of a maintenance organization is to minimize both the cost of maintenance labour and material and production losses. Maintenance management is a complex and multifaceted task performed in parallel with production operations. The maintenance management work is often facilitated by the use of an automated maintenance management system. A large variety of computer software is available on the market for this purpose. A crucial problem is to select for the intended use an appropriate maintenance management system from those available. It is observed that the acquired systems often do not work satisfactorily because the software designers do not have sufficient experience of maintenance management[1]. Such maintenance management systems periodically need modifications and require a periodic evaluation[2,3]. A major problem is to decide if the required maintenance management system should be developed by the management or purchased from those commercially available. This article describes the major functions of the maintenance management system to facilitate in developing a computerized system, and gives an instrument to select a suitable system from those commercially available. An example is given to illustrate the suggested methodology.

## Functions of Maintenance Management

The computerized maintenance management systems adopted or developed by different organizations are often inoperative or ineffective[1]. These systems are frequently modified but still do not work properly. One of the common reasons for these failures is that the designer of the computer system had no experience of managing a maintenance department[1]. To design a proper and effective computerized maintenance management system, the designer should have an adequate understanding of the maintenance functions and their purpose in a maintenance organization. This section describes the major goals and objectives of the maintenance organization. Maintenance management is traditionally divided into three categories: maintenance functions, maintenance policy, and maintenance work and cost reporting[4]. It has been proven that the concepts of quality

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management can also be applied to improve and make the maintenance operation more cost effective. Modern maintenance management goes beyond repairing and servicing equipment and must be broadened to the long-range performance aspects of the customer service system. The viability of the whole organization is dependent on effective maintenance policies, plans and operations. Therefore, the implementation of the quality control programmes by the maintenance management can lead to the improvement in the maintenance productivity and reduction in costs. The four functions of maintenance management including the management of the quality control programme are shown in Figure 1.

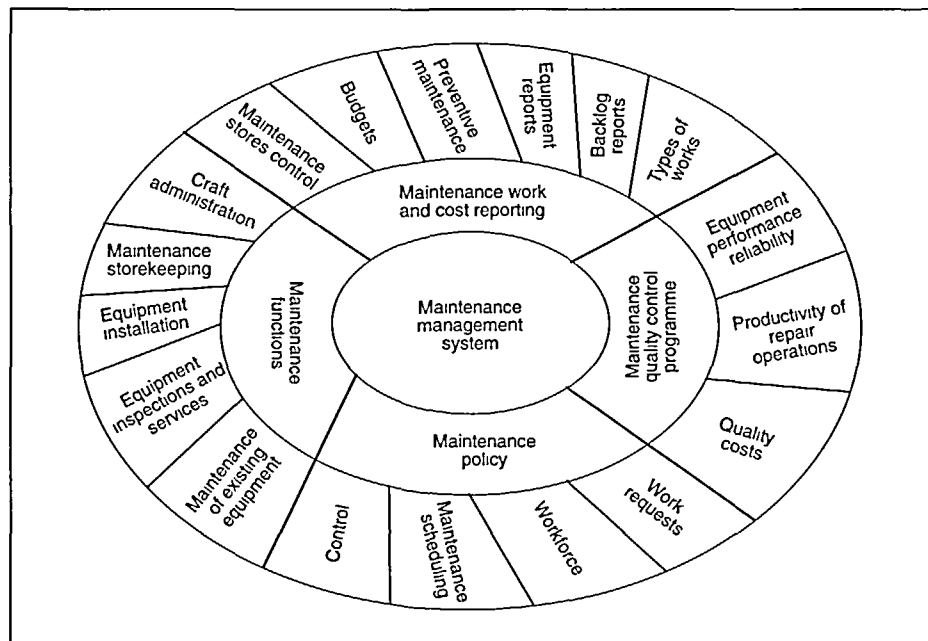
### Maintenance Quality Control Programmes

A modern maintenance management must establish an effective quality control programme. This quality control plan aims at efficient and economical operations which include: improvement in equipment reliability, improvement in maintenance productivity, and reduction in quality costs. Quality information on these three distinct performance aspects is obtained from user feedback and maintenance feedback. A quality-controlled procedure needs to be developed which should aim at identifying rework of maintenance jobs and the workers responsible for such reworks. This improves maintenance productivity.

### Maintenance Functions

#### *Maintenance of Existing Equipment*

Maintenance management is responsible for repairing the existing equipment as quickly and economically as possible. They are supposed to anticipate repairs



**Figure 1.**  
Typical Activities  
Carried Out by a  
Maintenance  
Management System

based on their experience and should use cost-effective preventive maintenance programmes.

*Equipment Inspections and Service*

The maintenance management must ensure that the equipment is serviced promptly and is in a safe operating condition. It should determine the proper lubricant, its amount, and the intervals of operations.

*Equipment Installation*

Every new equipment installation becomes the responsibility of maintenance management who need to ensure that the equipment installation meets the exact specifications.

*Maintenance Store Keeping*

A maintenance stores programme is needed to receive and distribute the spares needed for the equipment. The management needs to decide what to stock, how much to order and when to order. In order to keep low the capital investment in spares, it is also important to maintain the stores inventory levels at an optimal level.

*Craft Administration*

Effective utilization of the maintenance manpower is one of the important and prime functions of maintenance management. The optimal size of the workforce required needs to be developed. Manpower is the most variable and most difficult to control element of maintenance resources.

**Maintenance Policy**

*Maintenance Scheduling*

Maintenance scheduling is one of the most important tools used by management to achieve high labour productivity by arranging the sequence in which the tasks will be performed. Maintenance problems are known as combinational optimization problems. The responsibilities of the maintenance management pertaining to scheduling are: allocation of manpower, management of fluctuations in the workload, scheduling of work, management of the manpower pool, control of backlogs, and monitoring the flow of work orders.

*Work Requests*

Maintenance management needs to establish a policy for work order initiation and follow-up. The work orders need to have specific routing for approval and priority rating.

*Selection of Workforce*

Maintenance management has to decide upon the type of workforce to employ. This can be done in two ways: either to use internal or outside contract employees.

### *Controls*

For smooth and effective operation of the organization, maintenance management needs to establish policies for the control of the flow of paperwork and cost.

### **Maintenance Work and Cost Reporting**

Maintenance management needs to monitor closely all financial transactions and charges. Reports are needed to set properly the policies of maintenance management. Among other areas of cost monitoring are the costs of labour and material.

### *Type of Work*

In order to balance the maintenance workload effectively, the analysis of the work being performed can be made by examining the actual hours spent on different types of work. Important areas are: repair work, service work, preventive work, emergency or breakdown work. Scheduling workloads and determining efficiencies can be done by monitoring the time spent on each of these activities.

### *Equipment Reports*

Equipment reports which provide two kinds of data: maintenance repair costs and history repair records, need to be prepared.

### *Backlog Reports*

Backlog reports are important to establish manpower levels and reduce unnecessary overheads.

### *Preventive Maintenance*

The concept of preventive maintenance is dynamic[5]. Plant management views the preventive maintenance in the content of days (or hours) out of service. If the maintenance management desires equipment to be operative a larger percentage of time, the amount of preventive maintenance applied to that equipment might be increased assuming that the maintenance personnel are capable of diagnosing the faults that cause the equipment to fail.

### *Maintenance Stores Controls*

Optimal store inventory is important for cost-effective maintenance.

### *Budgets*

The maintenance expenses need to be categorized for any system. It not only helps in bookkeeping but also provides the production department with the information necessary for internal control and performance evaluation.

### **Computerized Maintenance Management System**

Computerized maintenance management systems are common in today's industries. Their use has brought a large number of benefits which include increased

productivity, reduced costs, and effective utilization of the labour force[6]. These computerized maintenance management systems were initially used on mainframe computers but this was shifted later to micro-computers[7]. A large variety of such systems is now commercially available. A survey conducted in 1985 reported a list of 60 such softwares[8], and this list has grown very rapidly during the last few years. These systems are installed mainly to improve the management of maintenance work. Figure 2 shows the basic functions of a computerized maintenance management system.

### Commercially Available Information Systems

Computerized maintenance management systems have become economically attractive and no maintenance function can ignore their advantages. The maintenance managers should have access to the computerized maintenance management systems to assist them in better planning and efficiently controlling the operating costs. They can now purchase on-line computerized maintenance management systems that can provide all the required services for a maintenance operation. The availability of computerized maintenance management systems is increasing at a significantly high rate. Surveying several of such systems shows they are basically information systems adopted to serve the maintenance problems. They

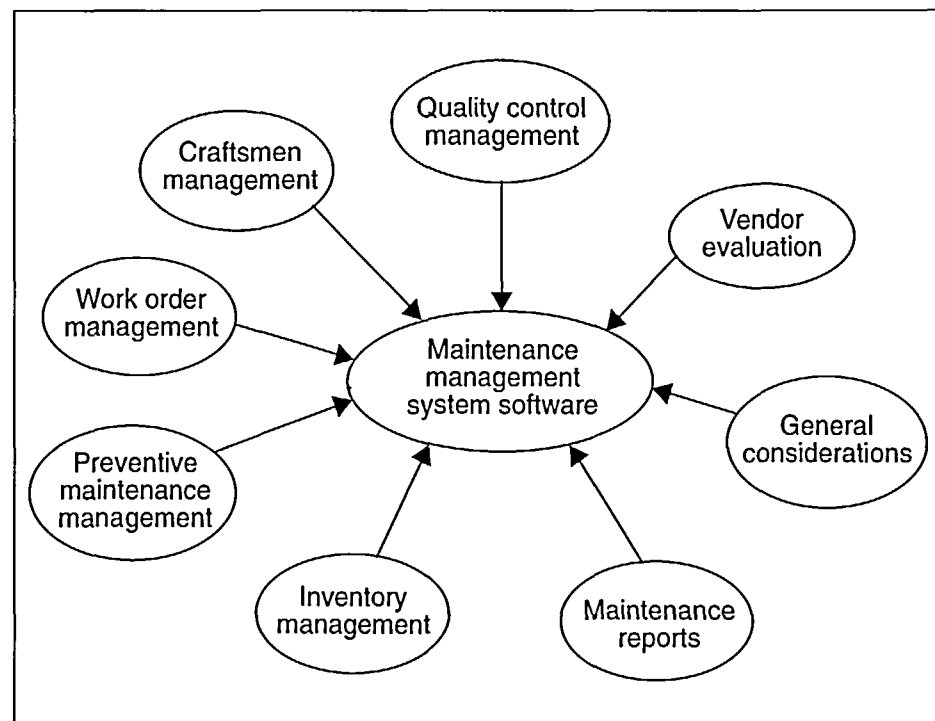


Figure 2.  
Basic Functions of a  
Computerized  
Maintenance  
Management System

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