
UNIT 8 DOCUMENTATION

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8.1 INTRODUCTION

Proper records of operation of equipment should be maintained for production, idle and breakdown hours, consumption of stores and spare parts, repairs, etc. These records are invaluable in cost accounting of equipment and in progress evaluation which serve as basic information for future estimating work.

Because of the large investment in equipment, many organisations have emphasised development of systems to maintain equipment records. The equipment record-keeping application includes such functions as recording of depreciation, scheduling of preventive maintenance, recording of maintenance charges and fuel consumption and analysis of rates. Entries to system are provided by purchase orders for new equipment, equipment cost/time cards, and shop-work orders of maintenance. With this information, the data processing system can prepare various reports necessary for equipment management. Examples include: comparative analysis of productive time and repair time, evaluation of operating cost, and analysis of repair cost. From these types of information, management can determine when a piece of equipment justifies replacement because of prohibitive downtime and repair cost, when operating rates should be changed, and the relative efficiency of similar equipment available from more than one source.

Objectives

By the end of this unit you should be able to explain how you would maintain records or about

- log books,
- POL consumption,
- other consumables,
- manpower for maintenance,
- costing records,

- spare parts consumed, and records of downtime,
- record-keeping for preventive maintenance, and
- major replacement record.

8.2 LOG BOOKS

The equipment record book (or log book) contains information about day-to-day consumption of stores, repairs and replacements, and working hours, idle hours and breakdown hours. Besides locating faulty operation or potential trouble spots, this record enables proper cost accounting of the equipment and is an invaluable record during its disposal stage. It includes all original data about a machine, and should be carefully maintained and safeguarded against loss or abuse.

All operations of construction equipment and maintenance jobs are documented to assure proper communication and control for accomplishment.

The equipment log book indicates the period of the day during which the equipment was in operation on a particular job, the period it was out of operation and the reasons for it, the fuel consumed or filled in the fuel tank. The log book is maintained by the operator and initialled by the operation foreman. The log book forms a historical record of the equipment performance and the working life of each equipment on the project is maintained in similar log books. The log books are transferred from one job to another along with the machine, while a copy is maintained in the equipment office for purposes of record.

The unit log book is used to record maintenance jobs. The log book is maintained by the operating foreman in a central office. The foreman enters the date, job order number, description of the work, and location of the job on one line of the log book. The maintenance foreman reviews the log book several times each day to see if there are many minor jobs that can be handled within the daily work schedule. These minor jobs act as filled-in work when scheduled jobs are completed ahead of time or unexpected delays cause scheduled jobs to be set back. The maintenance foreman signs and dates the log book when the work is completed and the operating foreman initials an OK of the completed job. The maintenance foreman enters the standing job order number on the daily work schedule and charges the actual time spent on the job against the standing job order number.

If an excessive number of minor maintenance jobs appears on the unit log book, they can be requested for accomplishment on a single job order. This provides the necessary manpower to clear the log book of the unaccomplished entries. Under no circumstances is the maintenance foreman to break the daily work schedule to do unit maintenance log book jobs. All emergency jobs regardless of size are requested on a job order form and are not part of the the unit log book procedure. The maintenance planner will check the log book daily to be sure its provisions are not being abused.

A typical page from a Unit Log book is shown in Figure 8.1

UNIT LOG BOOK

| Date | Job Order Number | Description of Job Wanted | Location | Date Completed | Area Foreman | Job OK |
|------|------------------|---------------------------|----------|----------------|--------------|--------|
| | | | | | | |
| | | | | | | |
| | | | | | | |

Figure 8.1: Page from a Unit Log Book

SAQ 1

- i) What information does a log book contain?
- ii) Why is a log book a historical record?
- iii) What is unit log book?

8.3 POL CONSUMPTION

A complete record of the consumption of petrol, oil and lubricants (POL) should be maintained for each equipment. This becomes necessary to monitor and to keep a note of the stores to be arranged in advance of the work for smooth operation and execution of the work.

The rate of consumption of fuel is known from the type of equipment, its horsepower, and working conditions. Thus there is little difficulty in maintaining the requisite stock of these items.

The recommendations of the manufacturers of the equipment and of the oil companies should be obtained for the purpose. There is a whole lot of lubricants and considerable confusion can be created if all of them are stocked indiscriminately.

SAQ 2

Why should a record of POL be maintained?

8.4 OTHER CONSUMABLES

Construction equipment require a number of other items which get consumed during the operation of the equipment. These include: glands, packings, bearings, brushes, etc. A record of these items is to be maintained for taking steps at suitable intervals to replenish the stock.

SAQ 3

How do you maintain a stock of other consumables?

8.5 MANPOWER FOR MAINTENANCE

In the operation of a planned maintenance system, staff or crew of appropriate skills have to be allocated to various tasks in accordance with the requirements of the control office. The actual method of allocation may be a simple manual system or a computer program but this is one aspect of planning in which good local supervision often produces the best results.

A basic work program must originate from the control office with a batch of work cards issued for the particular period. However, the issue of these cards to particular personnel is still a matter for personnel control by the foreman or supervisor. There are many local factors which may affect the decision on sending Muthu Kumar or Paras Ram on a particular job on a particular day. The system is satisfied if two men in a given labour grade are matched to a two man-day load, but with the foreman left to assign the two individuals between the jobs on the schedule. A record of the personnel working on each job on a particular day should be maintained for effective production. With a change in the placement of personnel it may be possible to improve production rates as each person has a different degree of skill and aptitude for a specific job.

A proper record of the personnel and equipment should be maintained to relieve the shop manager of lengthy record keeping and cost accounting. In centralized facilities, this assignment may be allocated to company personnel in other departments, but records must be at the shop manager's disposal at all times.

SAQ 4

- i) How do you engage staff for maintenance?
- ii) Why should a record of personnel and equipment be maintained?

8.6 COSTING RECORDS

Maintaining costing records is important. Records provide maintenance costs and information needed to distribute equipment cost to the job items so that correct job cost are included in future planning. Analysis of these records also helps in planning and controlling maintenance costs and will indicate abusive equipment operation, maintenance errors, equipment flaws or equipment misapplication.

It is important to keep records properly. Records must be brief yet complete. Incomplete records are as bad as no records, but if they are made too comprehensive, there will not be enough time to fill them out.

The following equipment costing records are to be maintained on any job.

8.6.1 Equipment Identification Card

Proper maintenance of equipment require a detailed inventory of all major items. This should include the manufacturer, model, year and number, attachments, and a list of the major components and parts required for normal service. This record should also provide a place to list major repairs. The card must be made up as soon as the equipment is purchased and must be transferred alongwith the equipment. This record is useful when buying attachments and replacement or repair parts. It is useful in the future when purchasing new equipment to review experience and to help determine when to replace equipment (Figure 8.2).

This record should be filled even after the equipment is disposed off as it provides important cost information on its operation.

8.6.2 Equipment Rental

One reason for departmental or contractor bankruptcy is failure to charge rental on equipment owned. This cost must be charged to proper job items. If it is not, additional work bid on the basis of past experience will not include this item. Thus, when it comes time for equipment replacement, no money is available.

The rental rate is determined by establishing the total cost as figured when selecting the equipment and adding additional cost for increased price of replacement units, obsolescence, and possible idle time. Specialised equipment may have to be written off on one job. If so, the rental rate must be such that when it is multiplied by the hours worked, it will equal the total cost of the unit. There are various rental rates established by rental agencies and equipment distributors.

To assure that rental is being paid by the job, the equipment should be permanently assigned and a definite rental rate established. The rate may be hourly, daily, weekly or monthly. Once the job rate is established, the job must pay to a central fund the rental on the equipment assigned to it. The only exceptions occur when the equipment is being repaired, awaiting transfer, in dead storage, or idle because of bad weather. The job must have an equipment time card so that the rental cost can be distributed to the appropriate job items. This could be a separate card, but in order to keep the amount of paper work to a minimum, the equipment time card could be on the back of the employee time card (Figure 8.3).

Equipment Identification Card

Documentation

Make Model Name Model Year
 Serial No Date Acquired Purchased From

| Component | Make | Model | Serial |
|------------------------|------|-------|--------|
| Engine | | | |
| Auxiliary Engine | | | |
| Transmission | | | |
| Auxiliary Transmission | | | |
| Power Takeoff | | | |
| Final Drive | | | |
| Starter | | | |
| Generator | | | |
| Battery | | | |
| Compressor | | | |
| Steering Pump | | | |
| Hydraulic Pump | | | |
| Tyres: Front | | | |
| Tyres: Centre | | | |
| Tyres: Rear | | | |
| Filter: Fuel | | | |
| Filter: Lube Oil | | | |
| Filter: Transmission | | | |
| Filter: Final Drive | | | |
| Filter: Air | | | |
| V Belts: Fan | | | |
| V Belts: Alternator | | | |
| V Belts: Water Pump | | | |
| V Belts: Steering | | | |
| Spark Plugs | | | |
| Other Attachments | | | |
| Overall Length | | | |
| Overall Width | | | |
| Overall Height | | | |
| Total Weight | | | |

Figure 8.2: Table of Equipment Identification

8.6.3 Equipment Utilisation Report

To document the equipment rental report, there must be some way to identify inactive equipment. This can be done by using an equipment utilisation report which is filled out monthly by a job personnel or whenever equipment is put in dead storage or is available for transfer. The report should be sent to the person responsible for managing equipment. In this way the rental rates can be verified and equipment available for transfer identified. If the

| Date | | Shift | Foreman |
|---------------|-------------------|-------------|---------------|
| Equipment No. | Type of Equipment | Hours | Cost Item |
| 12345 | Tractor Dozer | 10 | Haul Road |
| 12346 | Road Roller | 6 | Haul Road |
| | | | |

Figure 8.3: Daily Equipment Time Report

equipment is transferred, a copy of the utilisation report and the equipment identification card should be forwarded to the receiving job (Figure 8.4).

| Date 1.7.96 | | Job No -16 (Canal Bank) | | | | |
|--------------|-------------------|-------------------------|------------|---------------|-------------|-----------|
| Equipment No | Type of Equipment | Hours Worked | Hours Idle | Arrived (hrs) | Moved (hrs) | Available |
| 1234 | Dragline | 6.6 | 1.4-W | 1000 | 1800 | Yes |
| | | | | | | |
| | | | | | | |

Reasons for idle hours: W- Weather, R- Repair, D- Dead storage
 Example: 1.4-W means "1.4 hours down because of weather"

Figure 8.4 : Equipment Utilisation Report

8.6.4 Maintenance Records

The significant equipment repairs are kept on the back of the equipment identification card. Any other maintenance records are primarily for job use. It is these records which inform the mechanic when work or lubrication is required. The key to proper maintenance again is preventive maintenance. It is everyone's responsibility to be alert for minor problems and report them immediately. Reports must be written and turned over to the equipment supervisor for proper handling. Although reports do not have to be lengthy, they should be uniform in format. If written on a scrap of paper, they will probably be overlooked or discarded. Labelled "repair request", these reports should identify the equipment requiring attention and state the problem clearly. When they are signed by the reporter, the mechanic can check for any additional information and inform the originator of the outcome of the repair (Figure 8.5).

Truck No 23

| Date | Hours or km | Repairs |
|---------|-------------|----------|
| 17.1.96 | 23156 | Gear Box |
| 23.1.96 | 24117 | Brake |
| 24.1.96 | 24189 | Puncture |
| 31.1.96 | 25332 | Radiator |

Figure 8.5 : Repair Log of Truck

The lubrication man must have a schedule of the lubrication required. This should be a chart listing all the equipment on the job. As the equipment is lubricated, it should be so noted. The amount of make up oil between changes should also be noted, to provide a check on component condition. The chart will also help the lubrication man determine the supplies which he must have on hand.

A record of the repair costs should be maintained for future reference. Figure 8.6 shows a typical record in the form of a graph.

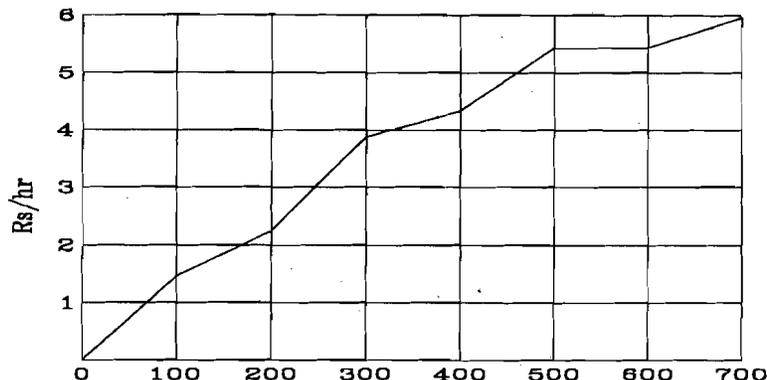


Figure 8.6 : Repair Costs per Truck

8.6.5 Tyre Records

The amount of money spent on off-highway tyres justifies records to ensure maximum service life. Tyres are listed on the equipment identification card, and when changes are made, they should be noted as significant repairs. The equipment owner should make sure that hours of service from the tyre are noted.

If the tyre change is made because of a failure, another report should be made stating the condition and reasons for the failure. This record will help determine adjustments from the manufacturer.

8.6.6 Computer Records

Many organisations are developing computer programmes to help with their record-keeping. This can be done by having a computer, leasing time, or sending the work to a data centre for processing. There are many computer consultants who have devised equipment programs to keep a record of significant events. The practical facts about such a programme can be learned from the business-equipment manufacturer, a data processing centre, or a consulting firm. However, it is important to note that the output can be no better than the input, and the input is the equipment owner's responsibility.

SAQ 5

- i) What is the necessity of maintaining costing records?
- ii) Why is it important to keep cost records properly?
- iii) What is an equipment identification card?

8.7 SPARE PARTS CONSUMED

It is often necessary to stock certain expendable repair and replacement parts to avoid excessive downtime on equipment. The extent of parts to be stocked will depend upon availability of supply, the importance of the equipment to job progress, and to the amount of equipment of a given type on the job.

A record should be kept as to the spare parts consumed on the various equipment. This will help the store keeper keep track of the spares used, the parts that are required most often so that an order for further supplies of the spare parts may be placed at the proper time.

When moving to a new area, the equipment owner should establish a working relationship with the area dealers, providing them information on the number, condition, and model of equipment to be maintained. He should work out as realistic a picture as possible of expected parts and service requirements with the dealers, and determine which items should be stocked and in what quantity. The owner should stock only expendable and maintenance items required in day-to-day service and operation, or parts with a known failure rate. He should not stock internal parts for engines, transmissions, or other gear cases unless experience has shown that specific parts are subject to failure without damaging other parts. Complete major components can be obtained from dealers on an exchange basis. In some cases, where the project is remote or the quantity of equipment is large enough, it may be desirable to stock spare engines or transmissions.

Spare parts control should include inventorying a shipment as it arrives on the job, making notations as parts are used, and reordering to stock upto required levels.

When purchasing parts for an overhaul or major repair, the owner should purchase with the understanding that surplus parts will be returned. This is important, because parts are often ordered before the unit is completely disassembled. All dealers will accept these terms provided parts are returned to them in their original containers.

SAQ 6

- i) Why the records of spare parts consumed are maintained?
- ii) How can control be exercised on spare parts?
- iii) What items of spare parts should be/not be stocked?

8.8 RECORDS OF DOWNTIME

Downtime and installation delay results in financial loss. The effect of equipment downtime on production and construction schedule should be recognised in the event of a plant renovation, rebuild, or relocation.

A complete record of downtime is required to determine the causes of equipment failure. These will help in planning the equipment maintenance program. The production of the equipment is less by the amount of the period of downtime when the equipment is unavailable for use.

It is vital to prepare a list of all affected services and to investigate the effect of added loading on existing services such as dewatering pumps, compressors, electric power, batching plant, etc.

SAQ 7

- Why should records of downtime be maintained?

8.9 RECORD-KEEPING FOR PREVENTIVE MAINTENANCE

Proper record-keeping of equipment enables the project engineer to obtain all information regarding maintenance operations readily. Different operations which include the daily servicing and maintenance of the equipment, including field repairs, should be suitably recorded. Besides helping in the control of the preventive maintenance programme, these records make it possible to trace the cause and responsibility for failure of a machine. The workshop records include the entire repair history of the equipment including the period and extent of overhauling with replacement of parts or assemblies done during each repair.

The history book of an equipment provides its technical and cost data, history of repairs and alterations and abstract of utilisation in terms of machine hours and depreciation. It helps in evaluating the general condition of an equipment at any time to decide the nature and extent of future repairs and to assess its book value.

SAQ 8

What is the need of keeping records of preventive maintenance?

8.10 MAJOR REPLACEMENT RECORD

A chart indicating where large supplies of replacement parts must be kept on hand at all times, as, for example, on a shovel operating in an abrasive material with the resulting high wear of the teeth, and other parts. A suitable chart gives a full history of performance, indicating the life of each part as well as number of parts on order and in stock and parts repaired and returned to service. Generally, such parts are rather complicated castings which may require from 1 to 2 months between the date of order and arrival on the job. This sort of record keeps the superintendent from getting into a fix.

SAQ 9

How are records of major replacements kept?

8.11 SUMMARY

By the end of this unit you will have understood the importance of documentation of construction equipment. Log books are maintained to indicate the working hours and consumption of POL and other consumables. Cost records of the equipment, rentals charged, maintenance and tyres are to be kept in neat registers or on computers. The record of spare parts consumed and the period for which an equipment was down and the reason therefore should be maintained. Preventive maintenance and major replacements on a machine should also be recorded for future reference.

8.12 KEY WORDS

- Preventive Maintenance** : Maintenance carried out at predetermined intervals, or to other prescribed criteria, and intended to reduce the likelihood of an item not meeting an acceptable condition.
- Log Book** : Log book contains information about day-to-day consumption of stores, repairs and replacements, and working hours, idle hours and breakdown hours.
- Records of Downtime** : A complete record of downtime is required to determine the causes of equipment failure. These will help in planning the equipment maintenance programme.
- Spare Parts Consumed** : A record should be kept as to the spare parts consumed on the various equipment. This will help the store keeper keep track of the spares used, the parts that are required most often so that an order for further supplies of the spare parts may be placed at the proper time.

8.13 ANSWERS TO SAQs

Check answers of all SAQs with respective preceding text.