

PLANT FAULT LOGGING SYSTEM

By D. J. D. BEZUIDENHOUT

Tongaat-Hulett Sugar Ltd, Mount Edgecombe

Abstract

Computers are well established in the sugar industry, particularly with respect to process control and scheduled maintenance programmes. The development of an electronic logbook can be viewed as an addition to the available software and not as an improvement to existing software. At Mt Edgecombe a computerised plant fault logging system has been installed to replace the traditional control room logbook. The advantages are that faults cannot be 'lost' as was the case with the traditional logbook, that all faults are recorded accurately and that the monitoring of the progress of faults being repaired is improved. Due to the flexibility of the programme, it has become a compact management information system comprising a computerised works order system, a production delay recorder and a mini message pad.

Introduction

Since the advent of the personal computer and the introduction of Local Area Networks (LAN), the trend of software in industry has been primarily directed toward process control. Works order systems and scheduled maintenance programs have generally been installed in planning offices. These systems are paper-based as the initial information is generated on paper and entered into the computer programme. Works orders etc. are then produced, and on completion of the job the works order is returned to the planning office whereupon it is updated. The areas where these data can be mislaid are numerous, resulting in lost information. These planning offices then require additional staff to maintain the 'paper-chase'.

A computerised logbook is a logical extension to the large variety of industrial software which can be implemented in control rooms. The fault logging programme is a link between the control rooms and the planning office, using the LANs as the vehicle. The programme was developed and compiled using Clipper.

Basic philosophy of the system

The fault logging system at Mt Edgecombe was developed in order to:

- Replace the use of logbooks in control rooms.
- Improve the accuracy of faults reported.
- Ensure that all faults were repaired.
- Provide an on-line database of information with respect to current and completed jobs.
- Improve reports to management with respect to the progress of repairs.
- Avoid the potentially large number of staff required in a planning office.

Design constraints for the system

Important requirements for a successful system included the following:

- (a) It be user friendly with little formal training being required. Menu bar selection be provided, thus eliminating mistakes during data entry. It be adaptable to any sugar mill.

- (b) Plant items be easily identifiable. Normally plant numbers are used to identify equipment, but this can be cumbersome as equipment is usually known by name, eg 'B-Massecuite Pump No. 1'. For the system the identification of plant and equipment had to be based on a similar 'name' basis and not by plant number, although a plant number had to be generated.

- (c) It be computer based. All fault recording and updating of data to be done on-line (no paper chasing – directly into the computer), thus the entering and updating of faults and works orders to be done by the operators and the foreman. The only output required is in the form of reports, either as works order lists, management progress reports etc. The programme should operate in the LAN environment.

- (d) It be accessible to all personnel. An internal registration system be used whereby an employee's number is used to access the system. Thus, the normal password control of LANs should be over-ridden so that when the computer boots up, it automatically invokes a menu which allows access to the users of the programme.

- (e) The system be maintenance free. Only in the event of damage to the database files or the files associated with the quick retrieval of information (index files) should a system administrator be required.

- (f) It have an easily accessible history database. All work done on a plant item be recorded. Report facilities be provided for the retrieval of information per plant item for reference purposes, analysis of faults etc.

- (g) It provide for sensible record keeping. The following information is required for each fault recorded:

Reference number
Section of plant
Plant number
Date and time of entry
Initiator
Plant description
Description of fault
Date required
Responsible foreman and worker
Estimated date and time to complete the job
Progress on each job
Actual date and time for completion of job
Instructions
Work done

Plant installation

The utilisation of a computer system is sometimes approached with a fear of the unknown, and if introduced incorrectly can lead to failure of the system. The approach adopted at Mt Edgecombe was to install the computers at plant level, i.e. in the control rooms. The result was that the operating staff entered all faults, and the foreman reacted to these requests since the logbooks were no longer being used. Since the four control rooms at Mt Edgecombe are fragmented, a computer was required for each. A fifth computer, plus a LAN printer, were located in a central position (Engineering building) which are used primarily by management

and the foremen for acquiring reports and updating of data, although any of the other four computers could be used in a similar manner. All the computers are classified as 'Direct Access Machines'. This means that when booting up, they automatically log in to the network and are immediately available for use.

Description of the program

The programme comprises three sections, namely Production delays, Fault logging and a Message pad.

Production delays

Precise information with respect to delays in sugar production is necessary for management.

Production delays can be grouped into 5 main CAUSES, shown in Figure 1. Each of these divides into sub-groups and sub-sub-groups, which are selected by a scrolling bar. The last selection requires a short description (..data..). The program flow is straightforward requiring no special computer skills.

In the event of equipment failure, the faulty item is selected, and any work performed, the workers name and the period of the delay are recorded. On completion of the entry, the fault is automatically recorded in History and includes a comment to the effect that this particular fault caused a production delay.

The flowpath for Production delays with the various options are shown in Figure 1.

Fault logging

Faults and/or Works Orders are entered in a specific manner and the flowpath is shown in Figure 2

Generally the operating personnel are well acquainted with the cause of the problem and which department would be required to repair the fault or complete the works order. This is best described by way of an example:

A problem develops in the CANEYARD section with the SHREDDER ELEVATOR - there are loose slats.

The operator selects by means of a scrolling bar the 'CANEYARD' section. He then selects 'SHREDDER ELEVATOR' whereupon a list of the components of the shredder elevator is displayed. By using the scrolling bar 'SLATS' is selected. A description of the fault and the required date are entered, and knowing that it is a mechanical problem, and having selected 'Mill Foreman', the fault is recorded.

Process faults

When any of the foremen (the Mill Foreman in this case) logs on after entering his Employee Number, he selects 'PROCESS FAULTS' and 'MILL FOREMAN' whereupon all faults directed to him (the Mill Foreman) are listed. The flowpath is shown in Figure 3.

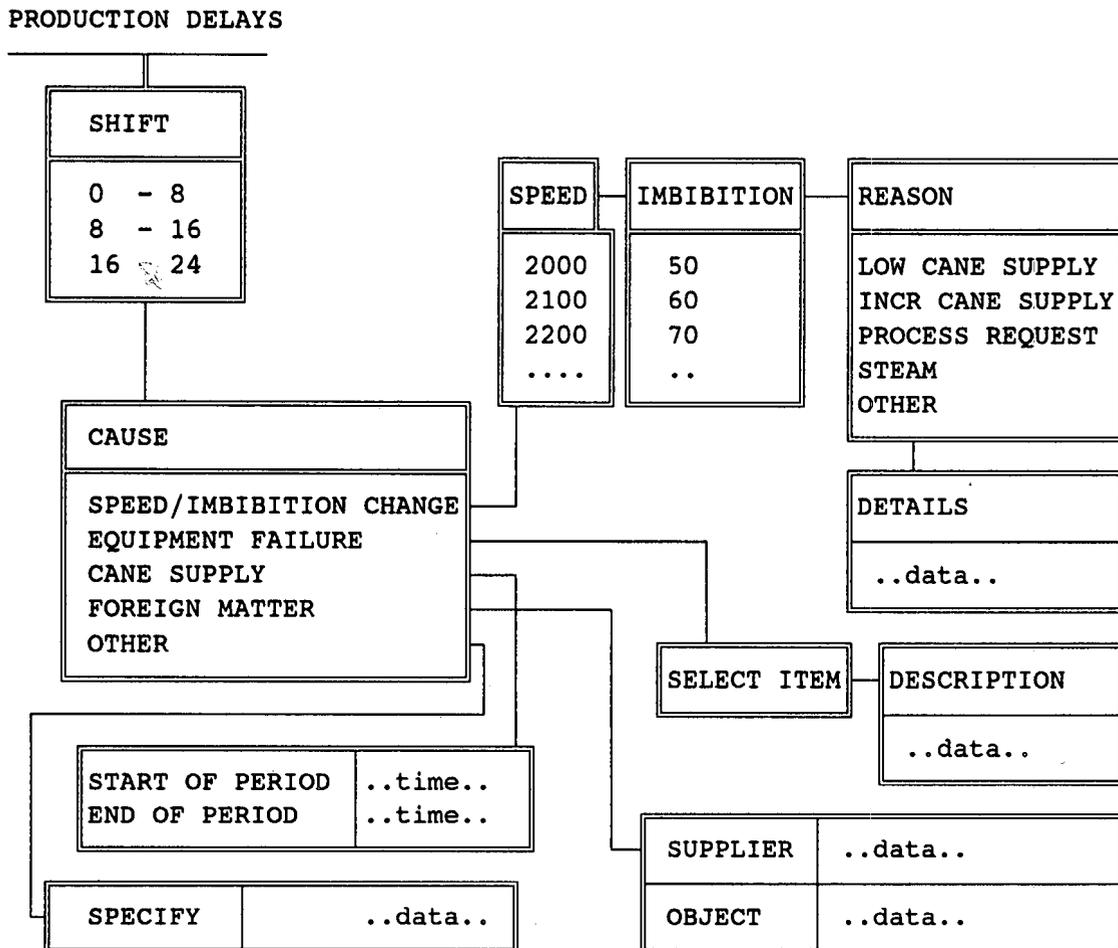


FIGURE 1 Production delays

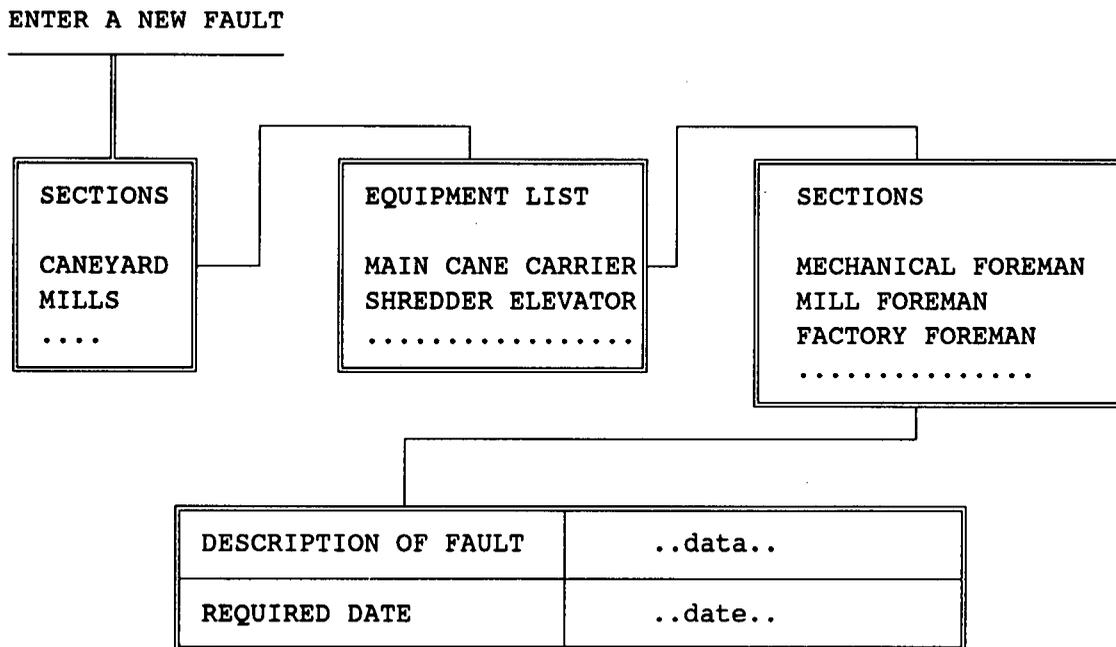


FIGURE 2 Fault logging

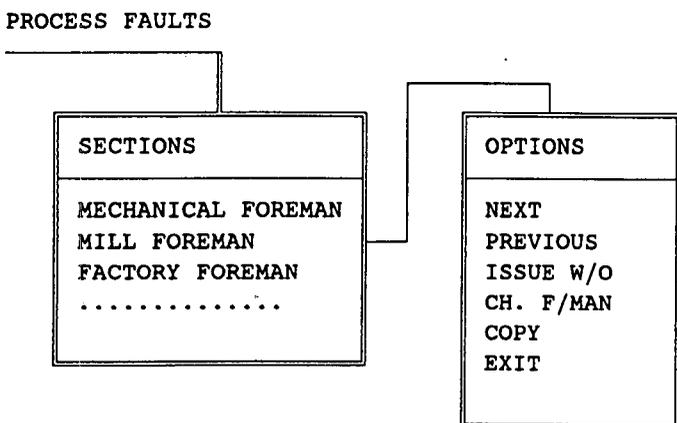


FIGURE 3 Process faults

Updating a job

Until a job has been completed and transferred to History, it 'lives' in the system and is updated. If the menu item for 'UPDATING' a works order is selected, a similar selection to 'PROCESSING' a job is followed but with additional options. The flowpath is shown in Figure 4.

- (a) Changing a worker. If the original worker did not complete the works order, a new worker may be selected.
- (b) Updating. This is used to inform anyone viewing the data as to the progress.
- (c) Changing the completion date. If the original estimated completion date cannot be met, it may be changed. On some occasions works can only be completed on a Sunday, thus if a 'Sunday' date is inserted, reports relating specifically to Sunday work may be extracted for over-time and job control.

On viewing each fault the Foreman has the following options:

- (a) Going to the next fault.
- (b) Going to the previous fault.
- (c) Issuing a works order. A fitter is selected from the list of fitters (by selecting 'MILL FOREMAN', only the applicable fitters are listed), and an estimated time, completion date and instructions are entered.
- (d) Transferring the fault to another foreman. This is done if the fault has been erroneously booked.
- (e) Copying the fault to another foreman. This is done if assistance is required from the respective department.
- (f) Completing the works order. If the work has been completed, then the worker, completion date and work done are recorded.

UPDATING A JOB

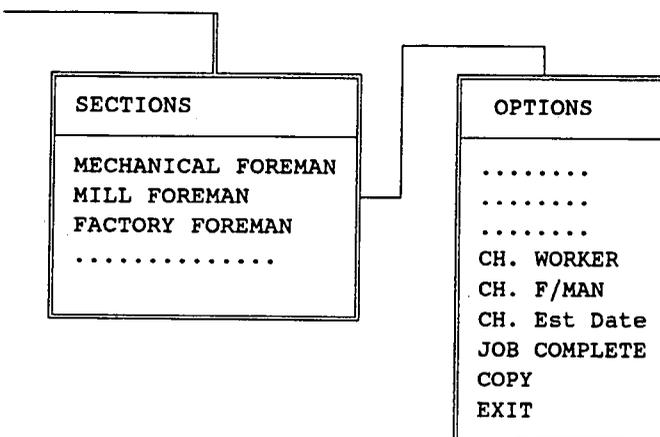


FIGURE 4 Updating a job

Reports

From the Menu a variety of 'REPORTS' which can be directed to the screen or to the printer may be obtained. These are as follows:

- (a) Reported faults. These faults can be selected by the individual department, or for all departments. All faults that have been reported and not processed (instructions, estimated completion date, and worker not entered) or seen by the respective foremen, may be listed.
- (b) Progress reports. These jobs in progress can be selected by the individual department or for all departments. Information such as date reported, description, progress, worker, etc. can be obtained.
- (c) Works order lists. These are lists of outstanding works orders per worker per department.
- (d) Works order list for maintenance day. This is useful for the weekly maintenance day. If the estimated completion date is set for a Monday (as is the case in most mills), a report listing work to be carried out on that particular maintenance day is obtained.
- (e) Production Reports. All delays to sugar production in the last 24 hours are generated for production meetings.
- (f) Morning report. Faults reported (highlighting faults which have not been processed), completed jobs for the last 24 hours and production delays are generated for the daily engineering and production meeting.
- (g) History reports. A list of faults, work performed, etc. for each plant item can be retrieved. The benefits of having an on-line database of faults and/or work done on any item of plant are self-evident. General information pertaining to an item of plant has been recorded for future reference.
- (h) Mill stops. A report listing all faults that caused mill stops or production delays can be obtained for any month of the year.

Message pad (shift instructions)

The message pad is used to relay messages to each or all of the control rooms, or a particular shift, and is used for the issuing of temporary instructions, contact telephone numbers, etc. Each message has an expiry date and only current messages are displayed. Old messages can be viewed if required. The purpose of the Message Pad is that the relaying of information to the various shifts is accurate and cannot be misconstrued.

Development of the plant database

Before the programme could be developed a database of the plant equipment had to be developed. Fortunately most sugar mills are divided into logical sections ranging from 01 upwards, i.e.:

- 01 Front end
- 02 Mills
- etc.

Thus, databases were developed for each section. The purpose of individual databases is that in the event of data corruption, only a single database need be replaced. In addition, multiple databases, being smaller in size, provide better control and speed in terms of data searching.

Within each database or section the MAJOR plant item is defined, e.g.:

001 No. 1 Mill

which is divided up amongst its various COMPONENTS:

- 001 Top roll
- 002 Motor
- 003 Pinion
- 004 Discharge roll

Thus the number for the No. 1 Mill motor would be

02 001 002 M

where the 'M' defines a type class. The type class is a broad categorisation, using the alphabet, which classifies the equipment, for example:

- Pumps P
- Motors M
- Gearboxes G
- Valves V

The purpose is that a complete list of motors, valves, etc. can be retrieved at the touch of a button.

Results

- (a) Production delays. Since the system is LAN based, reports with respect to production delays are accessible to the transport clerk for the daily cane supply report. This ensures that accurate information with respect to production delays is being relayed.
- (b) Planning. The time required for job planning has been reduced as the information has already been entered in the system. Job planning for the weekly maintenance is achieved in one half hour on a Friday morning for the Sunday (Mt Edgecombe has in the past done its weekly maintenance on a Sunday). Since all faults are logged in the computer, last minute jobs can be dealt with immediately on the maintenance day.
- (c) Overtime control. Since all jobs are allocated to a worker, by calling for a works order list, it is immediately apparent which staff are required to work overtime.
- (d) No loss of data. Jobs, works orders and faults (however inconsequential) are not forgotten. The 'little black book' that each worker previously used to store valuable information that is not found in manuals is slowly being recorded in the history files. Thus future workers can benefit from this information which in turn increases productivity.
- (e) Computer literacy. Since the system is computer based and not restricted, the users (young and old) have become computer literate. Computers are undeniably a part of the future and this knowledge is therefore of general value.

Where to next

Offcrop planning

The same principles have been extended to offcrop planning, and the reams of photocopied work lists have been eliminated. The planning of future offcrops is greatly improved. Outstanding work can be retrieved at the touch of a button.

Equipment data

Since the databases for all equipment have been generated, a progressive step would be to provide on-line information with regard to these items which can be used for ordering of spares, searching for common equipment, etc.

Operating costs

The plant number has been designed to be used on a purchase requisition form. If utilised on this form, all costs pertaining to a plant item can be retrieved and these can be used as justification for replacement or improvement.

Conclusions

The programme is extremely user friendly. The retrieval of data is accessible to all levels of management at the touch of a button, eliminating the usual delays when requesting information or the progress on a job.

The information age has arrived. Provided useless data is not gathered, information can be of benefit for improved plant performance and cost control, which can be defined as improved productivity.

Since its inception, acceptance of the programme has progressed to the stage that if anyone makes a verbal request for any work to be done, the usual reply is –

“is it in the computer?”

Acknowledgements

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