

PROPER USE AND MAINTENANCE OF SCIENTIFIC INSTRUMENTS

By

L.B.K. SILVA

A wide range of scientific instruments are used in various institutions throughout Sri Lanka. More and more equipment are being acquired by these institutions in order to keep up with the developments taking place in the world of scientific instrumentation. Considering the large amount of foreign exchange that is spent to import these instruments it is very important that maximum use is made of these instruments, by those who acquire them.

Scientific instruments, wherever they are used, should be maintained in the best possible condition for the following reasons :—

- (a) The enormous amount of foreign exchange spent on them.
- (b) Incorrect results from a faulty instrument can mislead scientific workers.
- (c) When equipment failures occur they cause interruption to work.
- (d) In Sri Lanka, trained personnel to carry out basic repairs to scientific instruments are very few.

In order to ensure proper use and maintenance of scientific instruments the following are important :—

(1) Laying the groundwork for proper use and maintenance of the instrument

Attention should be paid to this aspect from the time the need for the instrument is felt. If an instrument lies idle for long periods it is extremely difficult to maintain the instrument in good condition. Therefore a decision to purchase an instrument should be made only if frequent use of the instrument can be ensured.

Once a model that satisfies the particular requirements is selected, the basic needs of the instrument should be carefully studied. The best course of action here would be to study a similar model that is in use. If this is not possible the relevant information should be obtained from the supplier or his agent. Special attention should be paid to:

- (a) Siting of the instrument.
- (b) Electrical supplies required by the instrument.
- (c) Gases, water supply etc.
- (d) Whether airconditioning and dehumidification is required.
- (e) Storage space for accessories and spare parts.
- (f) Power supply stability.

It is absolutely essential that these additional requirements are ready by the time the instrument arrives because any time spent to prepare these, after the instrument arrives, would mean a shortening of the effective guarantee period.

Most instruments carry a guarantee whereby the manufacturer is legally responsible for the instrument malfunctions that occur during a specified period after the instrument is purchased. The reliability of an electronic equipment is considered low during the initial period of its use. This is because of the possibility of the instrument having defective electronic components that can fail after the instrument is in use for a short period of time. This is the main reason why these instruments carry a guarantee period of normally 1 year. These defects, if any, will show up only if the instrument is in use. Therefore, maximum operation of the instrument should be ensured during the guarantee period, so that any manufacturing defects will show up before the guarantee period expires. Hence laying the foundation for early use of the instrument is important so that it is installed and commissioned soon after it arrives and the instrument will be on trial during the entire guarantee period.

If access to a similar model is available, it is advisable to train an operator in handling the particular instrument who will be familiar with the new instrument when it is put to use. If the installation and commissioning is carried out by the supplier or his agent, workers who intend to use the instrument should follow these procedures.

(2) Proper use of the instrument

Instruction sheets

Normally every instrument comes with an instruction manual which should be carefully studied and fully understood by those who intend to operate the instrument. Perhaps due to the decline in the knowledge of English, there is a growing reluctance on the part of most of our workers to read the operating instructions before operating an instrument. Therefore, it is essential that simplified instruction sheets, preferably in Sinhala, be made available to those who wish to use a particular instrument. A competent person should first study the operating instructions carefully and then prepare these simplified instruction sheets. These instructions should then be explained to the users and a demonstration on proper operating procedure should be given. The operation of the instrument should be restricted to those who have received these instructions.

Log books

A log book should be maintained for every scientific instrument. Every time the instrument is used an entry should be made in the log book. Whenever the operator notices any strange or unexpected behaviour in the instrument he should note it in the log book and inform the person who is responsible for the maintenance of the instrument. This will greatly facilitate in rectifying the malfunction. Another advantage in maintaining a log book is that an estimate of the operating time of the instrument could be made. This would be helpful in ordering consumable spare parts such as light sources and detectors at the correct time.

(3) Routine maintenance

This is the most important aspect of looking after scientific instruments but unfortunately we pay the least attention to it. Routine maintenance ensures;

- (a) Continuous use of the instrument minimising the possibility of a breakdown.
- (b) Correct and reliable results from the instrument when it is in use.
- (c) A longer instrument life.

Routine maintenance should take the form of planning and implementing a proper maintenance schedule. Wherever possible the manufacturer's recommendations should be followed in this matter. Generally, routine maintenance would consist of;

- (1) daily maintenance
- (2) weekly maintenance

- (3) monthly maintenance
- (4) annual maintenance

Daily and weekly maintenance would consist of cleaning, levelling, zeroing etc of the instrument and these could be carried out by the operator himself. Monthly and annual maintenance could require such procedures as electronic recalibration using test equipment and therefore should be handled by the maintenance staff.

(4) Repairs to faulty scientific instruments.

The requirements mentioned upto now could be realised through the efforts of personnel generally available in a scientific institution. However repairs to these instruments should be carried out exclusively by personnel with a knowledge of electronics.

Some institutes are fortunate in that they have personnel trained in electronics who can carry out repairs to these instruments. Whenever the services of a qualified engineer or technician are not available it is advisable to obtain such services from outside. Unqualified personnel meddling with a faulty scientific instrument can make the condition of the instrument worse. In the event the services of an electronic engineer are obtained from other sources, the engineer may not be familiar with the working of the instrument. Therefore the operator should carefully study the fault and explain it to the engineer so that the engineer will have a correct understanding of the fault in the instrument before opening it.

The circuit diagrams are absolutely necessary for an electronic engineer to study the electronic circuits in an instrument. Therefore whenever a scientific instrument with complicated circuitry is purchased the supplier should be requested to provide the service manual with the instrument. Some suppliers provide the service manual free of charge but for some instruments the service manual has to be purchased. In the event the supplier refuses to provide the service manual it is most advisable not to purchase the instrument at all.

Spare parts

Some suppliers of scientific instruments recommend the purchase of all electronic circuit boards in the instrument to be stored as spares. This could be very convenient but involves a very high expenditure which could be justified only if the breakdown of the instrument even for a few days would cause a huge loss to the organisation. Under normal circumstances it would be advisable to acquire the spare parts which are most likely to fail. Whenever a fault occurs in an instrument and if the fault is located to a component which is not locally available the only option is to import it. A delay here is unavoidable mainly due to the procedure that has to be followed in order to obtain foreign exchange. A proforma invoice could be obtained in a short time by telex and the item could be imported by airfreight which would take only a few days. Hence if the attention of the authorities could be drawn to the fact that a considerable delay occurs in obtaining foreign exchange for spare parts remedial action is likely to be taken to minimise this delay.