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Achieving and maintaining inventory accuracy in a South African Mrp-ii environment

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the first time around or one estimates the required cycle length until the second recount.

Note that this only has to be done for the beginning of the programme. Thereafter, the system will provide a feedback loop with the new estimate for Pr(error) and cycle length, L, as seen in figure 10.3.

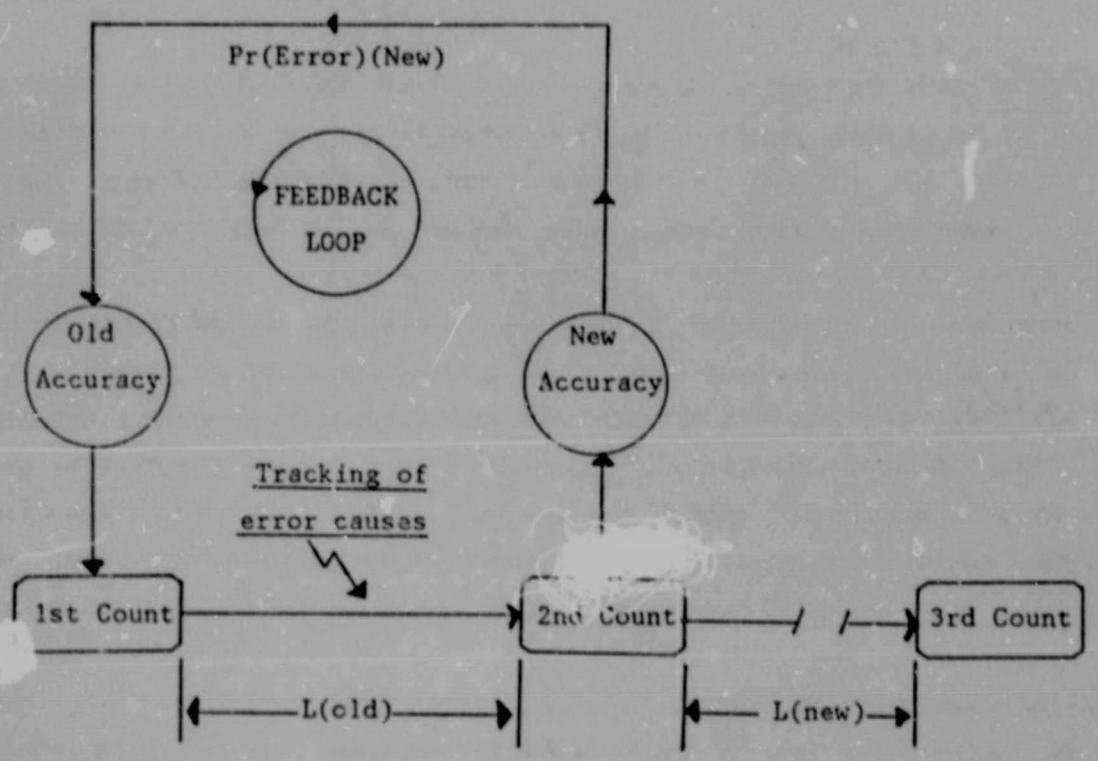

FIGURE 10.3: Cycle Counting Feedback Loop,(5).

This formula for the balancing of the cycle counting programme is theoretically sound and proven to work well in practice when coupled with the effort of rectifying the *causes of error*. It clearly reduces the amount of counting needed, thereby saving money and time. No cycle counter or inventory control manager should start a cycle counting programme without this framework. Without it, he may be counting an area three or four times per year unnecessarily, when in reality twice a year would be sufficient to achieve inventory balance.

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11.0 CAUSES OF ERROR IN INVENTORY RECORDS

Inventory accuracy as defined by Thompson(4) is *"The exact quantity of an item identified by a part number in the exact location to match the computer record. The correct quantity in the wrong location is defined as an error."*

At Sulzer, an extension to this definition includes the fact that an incorrectly identified item is considered to be an error, even if it is in the correct location and in the correct quantities. These errors can only be picked up by a cycle-count auditor with a good product knowledge.

The measurement of errors is a vital part of cycle counting, but more important still is to detect and fix the causes of errors. The level of inventory accuracy, will not show any significant progress until the causes of errors are found and eliminated. Without this, says Plossl(1), *"cycle counting becomes simply a method of finding and fixing more records, rather than making fundamental improvements in the accurate handling of data"*

This chapter presents common causes of errors, both directly and indirectly responsible for the lowering of accuracy levels. Information is gathered from the relevant literature (1),(2),(4),(6) and (8), and from the author's own experience. Techniques for the elimination of these errors are also discussed.

11.1 UNPLANNED TRANSACTIONS

80% of all transactions must be of the pre-planned type (8). The remaining 20%, consisting of all unplanned transactions, is a very common

source of errors. The main reasons for issuing unplanned material, outside the allocation system, are shown in the table 11.1.

TABLE 11.1: Unplanned Material Issues,(8).

Departmental Requests

1- Sales: for show samples.

2- Engineering: for drawing samples.

3- Inspection: for re-identification purposes.

4- Customer Service: for emergency spares.

Production Floor

5- Incorrect bills of material.

6- Scrap replacement.

7- Incorrect material issue.

8- Material delivered to the incorrect point of use.

9- Borrowed items.

10- Rejected material waiting disposition.

The above causes of unauthorised stock movements give origin to so many errors, that some companies choose to cycle count every such withdrawal the next day to confirm accuracy (4).

The reason behind unplanned transaction errors, is the uncertainty associated with which procedures to use for each specific case. Because of the lack of trained stores personnel, and a lack of appropriate procedures, a lot of confusion exists as to whether to transact, lend or just substitute material, when unplanned stock movements take place.

When dealing with the types of unplanned issues listed in table 11.1, the most error-prone situations to be aware of, are:

- People tend to take parts, promising to forward the necessary paperwork for the transaction, and never do so.

- Items may be borrowed, on the promise that they will be returned in the next few hours. These items may never be returned or alternatively, if returned could be placed in the wrong stock location.

- Outsiders may have "connections" inside the storeroom, who will secretly exchange items which were scrapped or incorrectly issued. These actions by outsiders, result in the "apparent lack of problems" in areas under their responsibility whilst causing inventory record errors.

The absence of a locked storeroom makes it more difficult to control these unauthorised movements. To implement a working procedure and leave the storeroom accessible to production operators, fitters, planners and salesmen, is a guaranteed failure.

In the case where only a controlling procedure is missing, the following steps must be considered:

1. Make a rule for all departments, that without exception, requests to withdraw material will be done only with an official "*stock requisition Card*". An issue transaction is then done to that department's cost centre, thus resulting in the cost centre's budget carrying the costs for the requested stock.

2. If the requested unplanned material is later converted to a normal planned material issue, the debited cost centre will then have that cost reversed to stock, where it is then handled as a normal planned transaction. A typical example would be in the case of emergency spares, where the paperwork is processed only after the items are handed over to the customer.

3. Unplanned stock movements to the Production Floor (see table 11.1), are handled in a similar manner, the only difference being that the

transaction can be done either to the cost centre or to the Job Number needing the stock.

The simplicity of this technique, where no unplanned items are issued without a simultaneous stock transaction being made to the cost centre, will ensure its success. Nevertheless, it must have Top Management support, as initially a lot of resistance from managers responsible for departmental budgets, will be encountered.

When the reason for unplanned stock movements is not material issues, but returns to stock, the same discipline and procedure must apply. The only difference is the use of a "*Stock Return Card*" in conjunction with a special item transaction from a cost centre to stock, for the unplanned returns.

11.2 PART IDENTIFICATION

Poor part identification results from incorrect article number markings on components or bins. Finished items must enter the stores with sufficient identification marked in such a way that it forms a permanent part of the item. Prior to storage, the final inspection must take place at a quality control point in the workshop. The same applies to all raw materials, which must also pass a quality control point at goods receiving prior to storage.

Items picked by the cycle counting auditor as incorrectly identified, for example, stock having identical dimensional characteristics, but of different materials, like bronze and steel, must be re-inspected and corrected as follows:

1. Transfer stock to the Quality Control department.

2. An Inspection Report is issued stating which article number correctly identifies which articles, and the items are then remarked and sent to stores.

3. The Material's Handling manager uses the Inspection Report to adjust these items' records. This involves writing off those incorrectly identified items and then "creating" stock records for the re-identified items.

Another error-prone situation arises when two identical parts have different article numbers. Since only one of them should be accepted as the true representative number for that item, the Design department, where the double numbers originate, must submit a list of all equivalent numbers to the Materials Handling manager. This list is then used to make the required adjustments, until all stock is found under one common article number.

Finally the third type of "poor part identification errors" is the "unit of measure" conversion. In computer based systems, like MRP-II, each article number has its own "Master Record". The Master Record is simply a file containing all information, such as description, unit cost, unit of measure, number etc., relevant to that article number.

If a department, like Engineering or Purchasing, changes the unit of measure from say "cm" to "mm", the current balance-on-hand must be multiplied accordingly by a factor of 10, otherwise the stock record would be in error. Another common conversion is the "each" to "mm" and vice versa.

The departments responsible for modifications of the Master Records must ensure that the following procedures are done in order to minimise errors, every time the unit of measure is changed:

1. The correct article number must apply.

2. The corresponding new unit cost must be entered.

3. The corresponding current balance-on-hand must be adjusted to reflect the correct quantity under the new unit of measure.

Incomplete follow-up of points (1) and (3) result in future stock errors and lower accuracies. No follow-up of point (2) very often leads to large write-off costs, which mostly affect the Materials Accounting Department.

11.3 INVENTORY SECURITY

As mentioned in section 11.1, the implementation of many well-meaning procedures intended to improve stock accuracy, cannot be successful if the storeroom is left open to people from outside of the Materials Handling Department. This means that lockable doors together with "restricted area" signs have to be installed at all access points. "*The purpose of security is not intended to prevent theft or pilferage, but to communicate the importance of stock record accuracy to everyone*" (4).

At Sulzer's warehouse, all doors have been installed with electronic locks, which are only opened with a specially coded magnetic card. Even though these cards are only given to some of the warehouse personnel, this security measure proved to be only partially effective. Due to the lack of discipline, once doors were opened, people neglected to close them. This was finally resolved by installing self-shutting mechanisms on every door.

Other areas of stock, besides the main warehouse, are in the form of open yards containing raw materials. Due to a factory layout problem, these areas cannot be fenced off without obstructing vital manufacturing paths. As a result lower stock accuracies were to be expected, but instead, they were just as high as the locked finished goods. The fact that these raw

materials are not regarded as "worthwhile to remove", counter-balances their lack of security.

11.4 UNTIMELY TRANSACTIONS

In section 7.4, various techniques of cut-off control were presented. Their purpose is to get around the delay existing between stock movements and their respective record updating transactions.

Many errors in cycle counting are due to late transactions, that is, transaction which do not adhere to the procedures set out for the various cut-off control techniques. For instance, an item picked but transacted four days later represents one of the most common causes of error.

This problem can be improved on by educating and training the workers and by setting up some form of document control as will be explained in section 11.5.

11.5 DOCUMENT CONTROL PROCEDURES

A major cause of errors, is the loss or diversion of important untransacted documents after the items have been stored or retrieved. Reconciliation of these errors becomes very difficult since the documents that are being searched for, may never be found.

There are two techniques that are used to trace working documents, namely:

1. Computer Generated Printouts

2. Manually controlled sequence books

The choice of method to use, depends very much on the sophistication of the computer system being used.

11.5.1 COMPUTER GENERATED PRINTOUTS

The workflow between Goods Receiving and Stores is a good example where the use of a control point in the form of a computer printout is applicable (see figure 11.1).

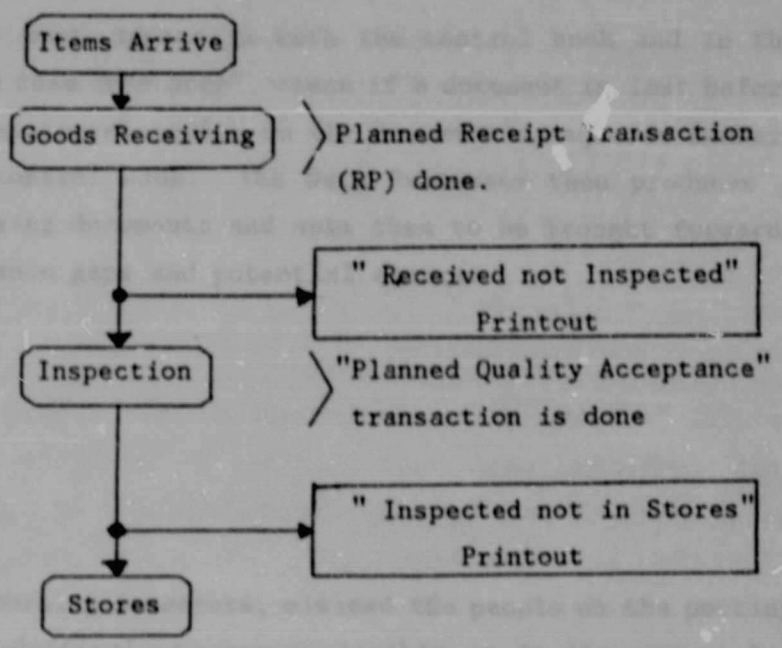

FIGURE 11.1: Computer Generated Control Printout

These two printouts reflect the amount of work being pushed on to the next department. The entries are prioritised by date and controlling clerks

can easily pick entries with "suspect" dates, that is, dates older than the allowed processing lead times. This automatically triggers a search for both goods and documents, ensuring as Plossl puts it, "*that the physical movement of materials is locked into step with the flow of information in the system*"(1).

11.5.2 MANUALLY CONTROLLED SEQUENCE BOOKS

In the event of not having an integrated computerised system, the only control possible between two departments is by means of manually entering each document in a control book utilising serial or sequence numbers.

The sequence numbers must appear in both the control book and in the document. This "*locks them into step*", since if a document is lost before it is transacted, a gap corresponding to the document's sequence number, will be seen in the control book. The Data Processor then produces a daily list of all missing documents and asks them to be brought forward, thus eliminating sequence gaps and potential errors.

11.6 FORM DESIGN

Poor form design for working documents, mislead the people on the posting of data and makes it difficult to report legibly or in the proper locations (1).

Many documents such as Purchase or Manufacturing Orders, have attached to them documents referred to as "travellers". The purpose of travellers is to pass information about that order, from department to department. In many cases, when the traveller reaches its final destination, usually

a Data Processor, the information needed to update stock records is not legible, neat or presented in a logical manner, thus causing errors and misinterpretations.

Well designed forms must include spaces for the recording of information in the logical sequence of events, as they are likely to occur, from department to department. When it is too expensive to redesign the existing form, a stamp is an ideal substitute.

Forms must also differ for different types of stock movements, using colour codes, different sizes or some other distinguishing feature. For example, different forms should be developed for *stock withdrawals* to accommodate unplanned material requests, *stock deposits* for unplanned deposits or material returns, and *stock transfers* for moving material inside the stores from one location to another. Trying to use one common form for all of the above different transactions can only cause confusion and errors.

11.7 WORKING HABITS

Even with well designed forms, as described in the previous section, people will still be careless. Plossl (1) attributes the carelessness and lack of discipline in the handling of data as the "*greatest single source of error*" in inventory records. The author has found that in his environment, this lack of discipline is responsible for 40% of all cycle counting errors, thereby also making it the greatest source of error.

The most distinguishable form of poor working habit in the warehouse, is the "right quantity, wrong location" error. For example, a worker removes stock from one location in the correct quantities, but carelessly records another location, that is, that item's balance-on-hand is transacted from

location B, when in fact it came from location A. This causes causes two simultaneous errors, one in each location.

There is no easy solution in solving bad working habits. A man can be trained and reprimanded and still be unable to work accurately. In such cases, good job descriptions containing the requirements for accuracy and discipline, can help remove these individuals from work areas sensitive to high stock accuracies.

11.8 FLOW OF INFORMATION AND TRAINING

Poor information flow is an indirect cause of error. Unnecessary procedures coupled with complicated work techniques give rise to confusion and errors, thus making training a more difficult task. The simplification of the "paper flow procedures" and the implementation of a "training programme" for the stores personnel will be discussed in chapter 13.

11.9 HOUSEKEEPING

Poor housekeeping is not conductive to good inventory control and accuracy. A disorganised and untidy workplace lowers the workers' initiative to be self-disciplined and provides many excuses for not having accurate records. Orderliness and discipline are as necessary in the handling of physical material as in the handling of paperwork.

Ongoing housekeeping exercises are important to maintain the floors clean, replace broken or damaged pallets, keep aisles clear, and to look for "forgotten" stock ieft lying around as a result of careless work.

Periodically, this "forgotten" material which has no identification or computer records, is collected for re-identification. The re-identification of these lost items is a major task. If the warehouse is kept very neat, then the "dumping" of these items can easily be picked up on a daily basis.

Other important aspects of good housekeeping are the maintenance of safety and product quality levels. Rules have to be formulated as to the maximum weight to be packed in the order picker shelves, or in the pallet racks. The packing methods must take into consideration the nature of the items, like items with highly polished surfaces which must be protected from scratches. Packers must also be educated to pack items in a way, which allows for easy and fast counting. This speeds up the time required to do a cycle count considerably.

11.10 TRANSACTION SECURITY

Transaction security, through the use of passwords, is necessary to restrict general access to the computer system's transaction screen. This security measure is as important for the success of inventory accuracy as the "locked storeroom" requirement.

Initially, the way Sulzer's Materials Handling department was established, every section controller was allowed to process transactions. This meant that a terminal was installed for every supervisor, in sections like pumps issues, spares, material receivers, etc.. Although these supervisors were adequately trained, this method failed because error accountability was difficult to trace, and paperwork was spread across all these data collection points, making it difficult to control.

The transaction system was modified to the present layout, where all documentation is channelled to one central data processing centre inside

the warehouse. This is manned by two full-time operators, who became experts at doing all 17 types of inventory processing transactions. Because of this familiarity with the system, there is a decrease in the number of errors due to incorrect transactions, and when an error does occur, accountability is narrowed down to two people.

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12.0 THE AUDIT TRAIL OF ERROR RECONCILIATION

Error reconciliation is a vital part of the cycle counting programme. When done correctly, it makes the various causes of errors visible, and establishes the best way to eliminate these causes.

The disadvantage of doing a thorough search, down to the root of the error, is the time taken by the people employed in the cycle count team, and the cost associated with their functions. This expense will not be wasted if the total cycle counting system is well designed.

For an efficient cycle counting system, one needs to be able to reconcile the stock errors without guesswork, but rather with an intelligent searching method called the Audit Trail. Reconcilers must therefore be familiar with each of the sub-systems which form part of the Audit Trail, in order to follow a problem through until its cause is found.

Reconciliation of the physical counts with the computer book records is a cumbersome task. This was also observed by Powell (6), who also identified the need for developing an Audit Trail system for his job environment.

The Audit Trail method herein described, is strongly related to the specific MAPP-II modules existent in the author's business environment.

For each record in error, the reconciler must follow a trail path through the various sub-systems until he collects enough information to determine the causes of errors. With this evidence, the reconciler must then report his findings on the "Reconciliation Feedback Report" (see chapter 9, figure 9.4). This report is later used to rectify the source of error, be it a working procedure, or a person in need of training.

12.1 OPEN ORDERS

The Inventory Management inquiry option called "Open Orders" shows all those orders which are currently open or in progress. These orders can be both Manufacturing orders from the workshop, or Purchase orders from the suppliers. The Inventory Management module allows for an enquiry to be done by article number, against which all open orders will be displayed.

This facility can be used when the actual stock quantity found is greater than the computer record. The reconciler must investigate any Manufacturing or Purchase orders which may not have been fully transacted, yet could already have been stored.

12.2 MANUFACTURING OR SPARES ALLOCATION

This Inventory Management sub-system shows all the current reservations or allocations against an article number, for either the final Assembly Manufacturing orders or for the Customer Spares orders.

This facility can be used when the actual stock quantity found is smaller than the computer record. The reconciler must look for possible missing issue transactions.

12.3 TRANSACTION HISTORY REPORT

This is perhaps the most valuable and trusted auditing document in the Audit Trail. SLALOM's daily transactions are retrieved by the Inventory

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