4.2 Justification of Inventory Models Chosen

4.2.1 Inventory systems can be classified into four broad categories and a number of specific categories. The broad categories are listed below:

	ORDER QUANTITY INDEPENDENT OF DEMAND	ORDER QUANTITY DEPENDENT ON DEMAND
CONTINUOUS REVIEW [Transactions Reporting Systems]	(s;Q) Systems	(s;S) Systems
PERIODIC REVIEW	(R;s;Q) Systems	(R;S) Systems (R;s;S) Systems

Where:

s = Maximum quantity that is expected to be issued in a lead time.

S = Maximum stock level = stock on hand + stock on order.

Q = Quantity of stock ordered.

R = Review interval. The time that expires between stock reviews.

The author decided upon the (s;Q) System for the following reasons:

- The presently used mainframe computer system continuously monitors inventory levels (on hand + on order quantities) and so no development and programming would be neccessary.
- Personnel had previously been exposed to a continuous review type system.
- Continuous review systems generally have lower average annual costs than the periodic review systems. (Even though more computer monitoring is required).
- More simple than, say, the similar (s;S) systems which can yield the lowest costs if optimum s and S values are used (found by means of simulation).
- Facilitates understanding of the concept of an "optimum order quantity".

With the (s,Q) system decided upon, detail decisions had to be taken on how to calculate values for s and Q.

4.2.2 The order quantity, Q (See page 1 of handout notes - App A).

The EOQ model was chosen for the following reasons:

- Simple
- Widely used
- Robust
- Yields optimum Q
- Relatively easy to implement
- Facilitates understanding the concepts of "balancing inventories", ie. (the holding and ordering costs).
- Forces the user to get some idea (at worst) of what his ordering and holding costs are, so that he can make more intelligent purchasing decisions.

- Massive savings over the previously used system.
- More scientific.
- Forms the basis of price break theory.

4.2.3 Refinement to the EOQ. (See page 6 of notes-App.A).

A refinement to the EOQ was introduced for the following reasons:

- To show that there is no one right answer or way to approach inventory management.
- To introduce the concept of standard deviation to the user.
- To impress the user and illustrate that there was more to inventory management than simple rules of thumb.
- To provide better order quantities than the EOQ model could for very irregular demand items.

4.2.4 Price breaks.

Price breaks were introduced (See page 6 the handout notes) because this scenario is often encountered in Escom (because of bulk contracts used in Escom). This decision was generally left up to the buyer in the past who, knowing no better, would buy in such a manner so as to obtain the lowest price - regardless of the quantities involved. The price break concept is also relatively easy to introduce once the EOQ concept is understood. Although the calculations (if done manually) are time consuming, the potential savings make this a worthwhile exercise.

4.2.5 When to reorder stock. (See page 9 of notes)

Traditional order point calculation was introduced and explained in some detail. As previously stated, most users had previously been introduced to the concept of an order point since the computer system made use of this technique for all replenishment decisions.

An attempt was made to stress the importance of lead times and some advice given.

The importance of including safety stock in the order point calculation was also stressed.

4.2.6 Safety stock calculation. (See page 10 of notes)

The safety stock formula was chosen for the following reasons:

- Helped the user understand the role of safety stock.
- Introduced the concept of a service level.
- Introduced the concept of standard deviation (A simple "quick and dirty" method was also given to calculate standard deviation.)
- Stressed the importance of having a handle on lead times (especially in the future when MRP would be run).
- It would, unbeknown to the user, give a slightly inflated value of safety stock, thereby increasing his service levels and hence his confidence in the system.

4.2.7 Service level calculation. (See page 11 of the notes-App. A).

The equation chosen to calculate an optimum service level was chosen because:

- It performed better than other equations to determine optimum service levels.
- It introduced the concept of a stockout cost and its importance.
- It helped the users understand the role of safety stock for all items.
- It required the use of and understanding of standard normal distribution tables. This in turn easily demonstrated the effect of increasing and/or decreasing service levels on safety stock levels.

4.2.8 Inventory costs. (See page 12 of the notes-App. A)

The main aim of introducing the calculation of inventory costs per annum was to allow the user to see his inventories and his associated decisions in terms of rands and cents.

By creating an awareness of the magnitude of the savings (in rands and cents) he could achieve, it is hoped that this would increase his concern and awareness.

4.2.9 Stockout costs. (See page 16 of the notes-App. A)

The method chosen to calculate stockout costs was the only sensible method known to the author for which all the required data was available.

4.2.10 Examples. (See page 21 of the notes- App. A)

The importance and the use of examples in this exercise cannot be over emphasized. Due largely to the fact that the average level of education of those attending courses is less than standard 10, equations on their own tended to baffle and confuse.

The examples were designed to:

- Stress the important concepts.
- Lead the user slowly from the simpler to the more difficult techniques while stressing that he did not have to understand all the more complicated issues to be able to address the more simple techniques and make savings.
- Illustrate the use of and workings of the equations.
- Prove that the equations work.
- Prove that the equations if used properly would result in savings.
- Facilitate the discussion of any problems.

5. INVENTORY OPTIMISATION COMPUTER PROGRAMS

5.1 Introduction

A lotus spreadsheet program has been developed to aid inventory optimisation personnel to more effectively and speedily carry out (some of) the analysis necessary to optimise their inventories in the short term.

The package is available in two forms; - the first being aimed at users with some knowledge of LOTUS 123 and the second being aimed at users with no knowledge of LOTUS 123.

The packages run on LOTUS release 2 and should run on any IBM compatible personal computer (PC) with a memory of at least 640 kilo bytes. Although the design was done on a dual floppy disc 640 Kb Zenith P.C, the programs should run on IBM compatible hard drive P.C's (preferable) as well.

5.2 The Program

The program is a typical spread sheet application. Data entry fields include the following (per item):

- item number (13 characters)
- unit of measure code (UMC)
- stock category (CAT)
- holding cost fraction
- ordering cost
- quantity on hand + date
- item price
- 3 price breaks ie. 3 extra prices and the corresponding 3 discount quantities
- up to 6 item lead times
- the last 12 monthly demands
- the stockout cost

With the required data the program will calculate and display the following information (per item):

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- up to 6 item lead times
- the last 12 monthly demands
- the stockout cost

With the required data the program will calculate and display the following information (per item):

- the average lead time
- the average demand (per month)
- the annual usage value
- the months supply of inventory on hand
- the on hand value
- the optimum order quantity
- the optimum months supply of inventory
- inform if surplus stock is being carried or not

  if surplus stock is being carried
  - the quantity
  - the value
- the order point
- the standard deviation of demand
- the desired service level
- the safety stock quantity
- the safety stock cost per annum

Further compulsory data entry fields include the following:

- average lead time (manual)
- average demand (months)
- service level percentage desired
- safety stock quantity (manual)

When calculating any values the program will always use the above input values, (when necessary) rather than the system calculated comparable values. The reason for this is so that the operator is forced to use his judgement when deciding what, for example, the average demand or safety stock quantities should be. He is, however, encouraged to make good use of the system's calculated value as a guide but, if he knows better, or the data used by the program to calculate the values is inadequate for any reason, he should use his judgement and input reasonable values.

The formulae used for the spreadsheet calculations are, where applicable, the same as those presented in the "Inventory Optimisation" seminar notes. Also, where possible only the necessary information or answers have been shown. An example of this is the price break calculations. The only information the operator requires is the optimum order quantity; - he does not need any of the intermediate answers since they are of little use to him.

New formulae used - not discussed in the notes are:

- usage value (year)
  where usage value = (average demand per month) x (12) x (price)

- supply on hand (months)
  where supply = (qty on hand)/(average demand per month)

- surplus qty
  where surplus = (on hand qty) - (optimum order qty) - (safety stock)

Due to the nature of the usage value equation used, the usage values given by the P.C. system will differ slightly from the mainframe values. This is no cause for concern, since no attempt is being made to calculate the exact usage values (the mainframe does so admirably). The reason for calculating the usage value is more to give the operator a qualitative feel for the importance of the item.

Another difference to be noted is the calculation of surplus stock. Presently the mainframe system identifies an item as being surplus if there is more than 12 months supply available for issue, regardless of the item price, whereas the equation used in the spread sheet takes the price into account. The spread sheet surplus calculation is also more severe for most items and identifies an item as being surplus once more than the theoretical optimum quantity is being held. It also does not take preallocations into account, unless one inputs the available for issue quantity in place of the on hand quantity. Thus, if stocks were to be preallocated it would be preferable to input the available for issue quantity.

As stated previously, the program can take up to four price breaks into account and always takes them into account. This means that, even if no price break data is available the four price and quantity fields must be input.
(The prices can be any number greater than or equal to the item price, and the associated quantities any number greater than or equal to the last price break quantity or, for no price breaks, any number greater than or equal to 1).

Another feature of the program is the display of the following graphs:

- (1) A plot of the monthly issues for each item - also showing the average demand per month. This graph is most valuable since it quickly gives the user a picture of the last 12 months usage, also showing the average. Based on what is seen, as regards trends etc, the operator can decide if he wants to override or accept the system calculated average demand.

- (2) A sensitivity analysis of the EOQ total cost equation. This graph shows the total cost plot with the y - axis indicating the sum of the ordering and holding costs in rand and the x - axis showing various order quantities about the EOQ. This graph should be consulted if the program suggests a quantity to be ordered which is not practical to order. The graph would then be used to indicate what quantity should, in fact, best be ordered. The graph does not take price break quantities into account since it is assumed that one can purchase these quantities. (If one can't - why get the quote for that price/ quantity).

- (3) A safety stock graph showing the effect of various service level percentages on safety stock quantities and costs. This enables the user to make a decision regarding how much he is prepared to invest to achieve a certain service level.

A printout is also available - for all items, showing all relevant fields.

The printer settings are built into the program, so it is not necessary to set them prior to each print. It is necessary, however, to initially configure the printer and the P.C. prior to use. The printer is programmed to accommodate computer paper with a width of 240 characters.

(If the NEC pinwriter P3 printer is used, - font 7 should be selected. If the NEC pinwriter P5 is used, - font 17 should be selected).

The capabilities of the two versions of the lotus 123 spreadsheet programs are identical in that they both do the same calculations. The only difference is that the program for the user friendly version - aimed at people with no lotus experience - takes up more disk space because of the macros that have been written to achieve the automation. The implication of this is that the user friendly version can only hold ± 45 items per floppy disc, (double sided double density floppies of 360 kilo bytes), whereas the other version - aimed at people with lotus experience - can accommodate just over 100 items.

The two versions are now discussed in more detail.

5.3 Lotus Spreadsheet Version 1-(For Lotus Users)

How to start (for dual floppy p.c.)

1. Switch on p.c.
2. Insert DOS disc in drive A.
3. Depress "Ctrl" and "Alt" keys and simultaneously strike the "Del" key.
4. Then hit "enter" twice and wait for the A> prompt.
5. Insert LOTUS SYSTEM DISK in drive A.
6. Type "123" next to the A> prompt and hit "enter"
7. Insert data disk in drive B.
8. A spreadsheet outline will appear on the screen and the flashing "wait" in the upper right hand corner will be replaced by "ready".

When this happens type in "/" (slash), and a list of commands will appear at the top of the screen.

Then type in "f" for file and "r" for retrieve. The system will respond with a file name - "COLIN, WK1" in this instance. Hit the "enter" key. When the file has been retrieved the spreadsheet will appear on the VDU screen. The spreadsheet may now be operated.

All fields except those highlighted are protected and will not allow data entry.

Another feature of the spreadsheet is the use of the "calc" function. All input should be done and then the "calc" key (PF9) depressed. This will then initiate the calculations.

Another function stored in the memory automatically is "/" "W" "T" "B". This fixes the column headings at the screen top and the item number column to the left side of the screen, regardless of the cursor position in the spreadsheet. To clear these settings input "/" "W" "T" "C".

5.4 Lotus Spreadsheet Version 2-(User Friendly Version)

How to start (dual floppy)

1. Follow steps 1 - 8 for version 1.

8. Instead of retrieving "COLIN, WK1", the system will now display
"COLIN 2, WK1", and "COLIN3, WK1". Hit enter to continue. A menu should now appear at the top of the screen.

The cursor position is indicated by a hatched square, - usually on the menu's 1st option. Below the menu a description of the option is indicated. By moving the cursor (using the keys marked " " and " ") to the next menu option, the option description indicated below will change accordingly.

To communicate menu option choices (to the system) either:

- hit "enter" when the cursor (hatched area) is over the menu option desired, or,
- key in the 1st character of the menu option desired, eg.

A	B	C
view/update	add new item	quit

In order to view/update key in "A", or hit "enter" when the cursor is on "A".

To halt the program - (for what ever reason) hit "Ctrl" and simultaneously "Break". To restart hit "Alt" and simultaneously "A". (This automatically restarts the program.)

The version 2 spreadsheet differs from version 1 in that it consists of 2 files, COLIN 2 and COLIN 3. COLIN 2 is essentially the data input file (shown on page 33) which, when appropriate, gets combined with COLIN 3 to report the data output (shown on page 34).

For a schematic showing the menu configuration of the input file, see page 33 and for the output file see page 34.

If option A of the 1st menu on page 33 is chosen, (once the item number has been entered) the programme will do a search to locate that item record. To input or change data, simply key in the relevant data when the cursor is over the appropriate field. To move the cursor to the various fields, make use of the "→" and "←" keys. Movement in either direction is possible but only at the rate of one field at a time.

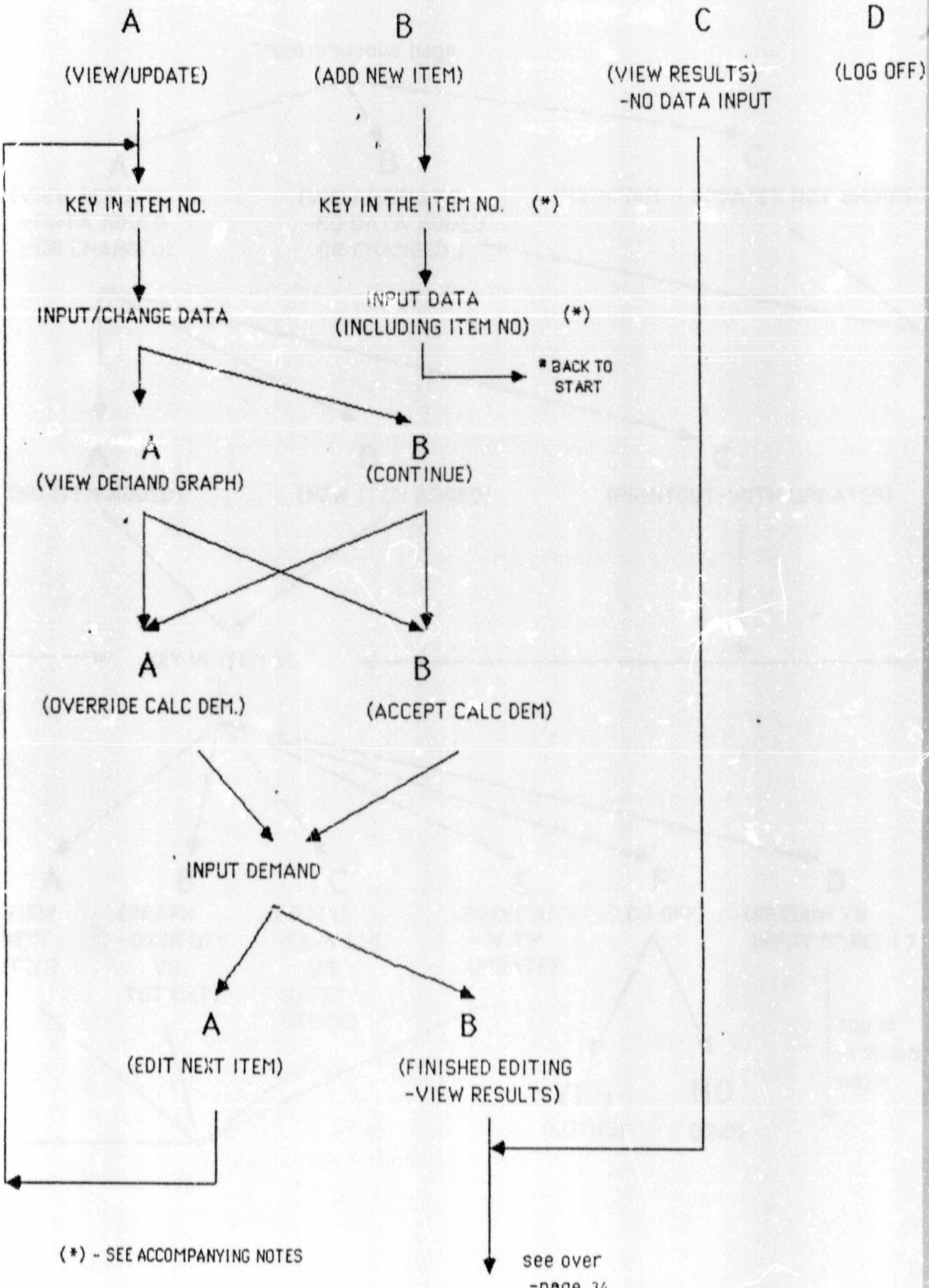
The output file (COLIN3, WK1 on page 34) does not allow any data input. To view the results, ie. move from field to field, once again make use of the "→" or "←" keys. Movement in both directions is permissible.

Because of the time taken by the system to copy file 2 to file 3 and then do the calculations it is advisable to do as much of the data input as possible, before viewing the results.

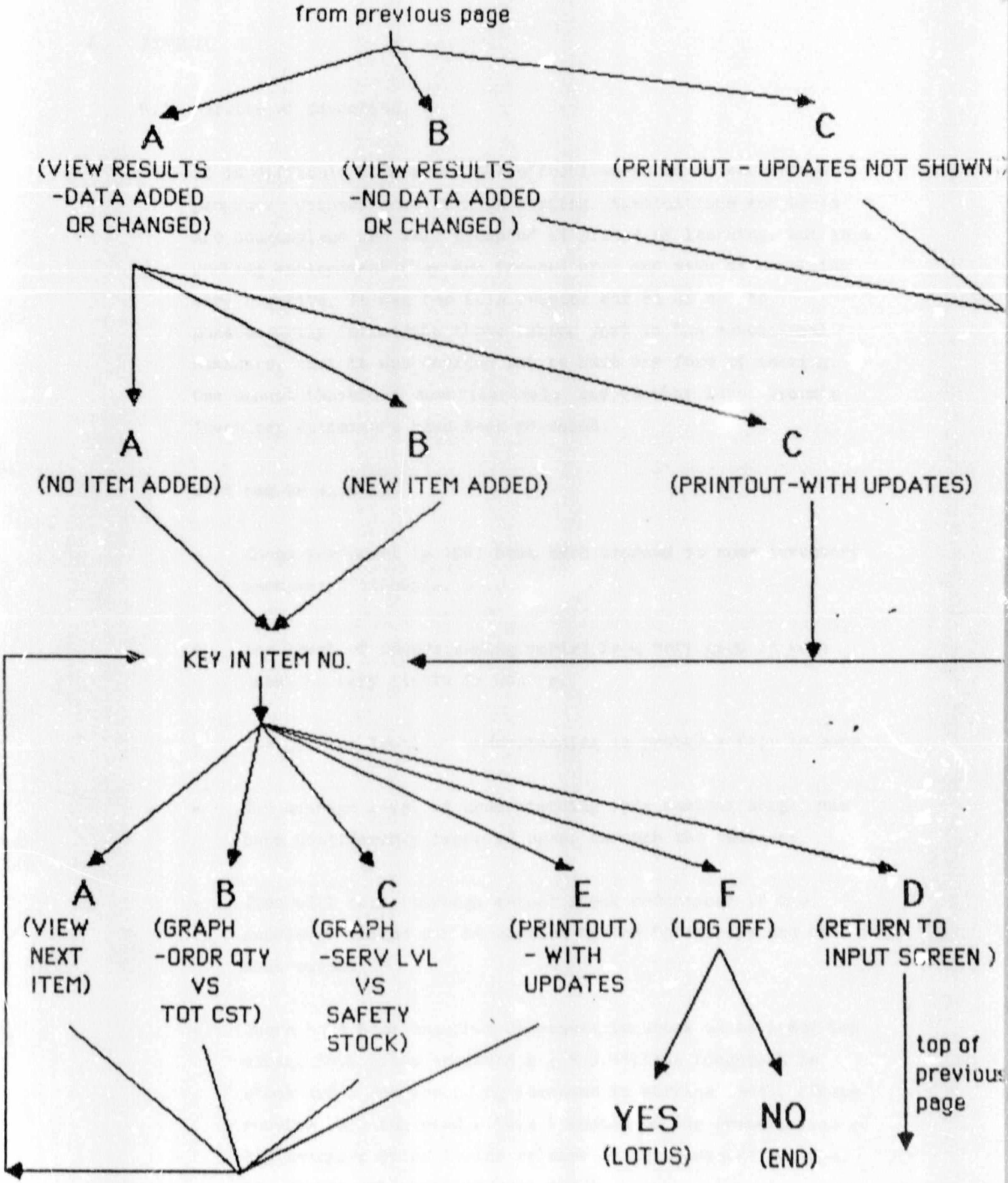
When adding a new item to the data base, ie option B of COLIN2, WK1, (see page 33) the programme will search for the 1st empty space after the last item number. When inputting the item number into the spreadsheet field, enter the "'" (apostrophe) key before the numeric characters are input. Also, the number must be input each time the item number field appears. The system will then ask for the item number to be input again (outside the spreadsheet fields this time), - this time enter only the number, - no "'" (apostrophe). In other words only when inputting a new item into the spreadsheet itself, is it necessary to enter the "'" before the 1st character. This is done twice for each item.

NOTE: The apostrophe must be used when inputting any data as a label (as explained above). Examples are category and date.

The system also makes no check to see if the same item is already in the data base, and will therefore allow item record duplications - resulting in a wasted record.



see over
-page 34


from previous page
A
(VIEW RESULTS -DATA ADDED OR CHANGED)
B
(VIEW RESULTS -NO DATA ADDED OR CHANGED)
C
(PRINTOUT - UPDATES NOT SHOWN)
A
(NO ITEM ADDED)
B
(NEW ITEM ADDED)
C
(PRINTOUT-WITH UPDATES)
KEY IN ITEM NO.
A
(VIEW NEXT ITEM)
B
(GRAPH -ORDR QTY VS TOT CST)
C
(GRAPH -SERV LVL VS SAFETY STOCK)
E
(PRINTOUT) - WITH UPDATES
F
(LOG OFF)
D
(RETURN TO INPUT SCREEN)
YES
(LOTUS)
NO
(END)
top of previous page

6. RESULTS

6.1 Results of Education.

It is difficult to measure the effectiveness of an educational programme without some form of testing. Examinations and tests are commonplace and well accepted at places of learning, but in a working environment they are frowned upon and seen as something very negative. It was for this reason, and so as not to unnecessarily intimidate those taking part in the educational seminars, that it was decided not to have any form of testing. One cannot therefore quantitatively say to what level Escom's Inventory Optimisors have been educated.

What can be said is:

- Escom personnel (± 100) have been exposed to some inventory management concepts.

- The level of understanding varies from very good in some cases to very little in others.

- The average level of understanding is probably fair to poor.

- The average level of understanding (pre seminar stage) has been considerably improved upon, through the seminars.

- Time will tell (through actual stock reduction) if the knowledge gained can be applied by the Optimisors and to what extent.

- There have been measured decreases in stock at at least two sites. Both sites achieved a ± R 3 million reduction in stock and a corresponding increase in service level. (These results were achieved within 3 months of the presentation of the seminars prior to the release of the computer package, ie. manual calculations were done).

- During subsequent follow-up seminars, many Optimisors were able to show savings of several hundereds of thousands of rand - for a few items they analysed. (Since only a few items (2 or 3) were analysed this has almost no impact on the store as a whole.)

- There has been an incredible increase in awareness with regard to inventory management in Escom, which can only be seen as a positive step.

- A foundation has been laid, upon which the proposed integrated materials management system can build, both in terms of education and also action.

- Hopefully the Optimisors have been stimulated sufficiently to start reading and learning about materials management on their own.

6.2 Results of Inventory Computer Package Implementation.

The time elapsed from the release of the inventory optimisation packages to the writing of this dissertation has not been sufficient to enable measurable inventory reductions to be achieved by the users. It is however possible to say what could be achieved if the system is used effectively, since the author has carried out an analysis on two different stores. Although the users/Optimisors do not have (on average) the same degree of knowledge with regard to inventory management per se and also the computer package, these results should be (able to be) achieved by all.

6.2.1 Summary of results of inventory analysis of Duvha Power Station store.

The Duvha store has a stock holding of R37,4 million and issues roughly R25,3 million of material annually. This gives the store a stock turn ratio of 0,68 which is well above the Generation average of 0,36 stock turns per annum.

The inventory analysis was done using the micro computer based spreadsheet programmes developed for this purpose.

The analysis was carried out on the top 100 ABC usage value items and top 100 ABC on hand value items respectively.

The results of the top 100 ABC usage value items analysed are:

- 100 items were analysed out of the store's total of 21145. (This represents 0,47% of the items.)
- the annual usage value of these items amounts to R17,6 million out of the total of R25,3 million.(70%)
- their on hand value is R6,75 million out of the total of R37,4 million. (18%)
- this gives an average stock turn ratio for these items of 2,61. (Well above the store average - as expected).
- the average inventory levels required to meet various service levels are shown below together with the stock level reductions possible and the respective stock turnover factors.

	SERVICE LEVEL %	AVERAGE INVENTORY LEVEL	STOCK TURNS RATIO	INVENTORY REDUCTIONS
POSSIBLE	95%	R6,85 MILLION	2,57	- R0,1 MILLION
	99%	R9,47 MILLION	1,86	- R2,72 MILLION
	99,9%	R13,22 MILLION	1,33	- R6,47 MILLION
PRESENTLY	± 80%	R6,75 MILLION	2,61	-

- roughly 40% of the items account for the surplus stock found of ± R4 million.
- statistically speaking a service level of 95% should yield a stockout every 20th month. 99% every 100th month (8,3 years) and 99.9% every 1000th month (83,3 years).
- of the items under consideration
  65% are category 14 items
  2% are category 15 items
  6% are category 12 items
  and only one is a category 10 item, ie. no strategic stock.
- the average lead time for these items is 4 months.
- simply by ordering in economic lots (EOQ's) an annual saving of just over R500 000 can be achieved. (Presently 3 months stock is ordered, each order).

The results of the top 100 ABC on hand value items analysed are:

- 100 items were analysed out of the store's total of 21145. (This represents 0,47% of the items.)
- the annual usage value of these items amounts to R14,4 million out of the total of R25,3 million.(57%).
- their on hand value is R14,4 million out of th total of R37,4 million. (38%)

- this gives an average stock turn ratio for these items of 1,0. (Above the stores average - not as expected, and also above the Generation average of 0,36).
- the average inventory levels required to meet various service levels are shown below, together with the stock level reductions possible and the respective stock turnover factors.

	SERVICE LEVEL %	AVERAGE INVENTORY LEVEL	STOCK TURNS RATIO	INVENTORY REDUCTION
POSSIBLE	95%	R1,4 MILLION	10,3	R13,0 MILLION
	99%	R1,9 MILLION	7,6	R12,5 MILLION
	99,9%	R2,6 MILLION	5,5	R11,8 MILLION
PRESENTLY	± 80%	R14,4 MILLION	1,0	-

- roughly 95% of the items account for the surplus stock.
- once again, a service level of 99% will only yield a stockout roughly every 8,3 years.
- of the items under consideration
  82% are category 14 items
  13% are category 12 items
  5% are category 15 items
  ie. no strategic stocks.
- the average lead time for these items is 7,2 months.

The following conclusions can be made:

- The total inventory reduction possible (for the 200 items under consideration) not only depends on the service level % required, but also on the number of items that fall into both the on hand value list as well as the usage value list. At best, this will be the sum of the two surplusses - if no duplication exists and, at worst, the value of the greater - if duplication is 100 percent.

- As can be seen from the analysis, some of the rand savings from the inventory reduction of the on hand value items, must be invested in the usage value items, so as to improve the probability of better service. The nett result is, however, a significant reduction in inventory levels. The reductions are as follows:

SERVICE LEVEL %	REDUCTION IN RAND
95%	R12,90 million
99%	R 9,78 million
99,9%	R 5,33 million

and only 200 items were analysed.

- Over R500 000 p.a. can be saved by ordering economic quantities.
- Other factors to be taken into consideration are:
  - the 100 on hand value items analysed only contribute 38% to the total on hand value of the store, so 62% of the on hand value inventory has been overlooked.
  - to illustrate how high the safety stock level is for a service level of 99,9% consider the following; if the inventory level for the usage value items was held constant at the level of the highest months demand, the inventory level for the 100 items would also be R13,2 million.
  - the data accuracy is that of the present ICL mainframe data base.
  - the average inventory level was a summation of half the EOQ and the Safety Stock quantity. The lead time term of the Safety Stock formula was also ignored.

6.2.2 Summary of results of inventory analysis of Colenso Distribution store.

The Colenso store has a stock holding of R23,9 million and issues roughly R44,8 million of material annually. This gives the store a stock turn ratio of 1,87 which is well above the Distribution average of 0,95 stock turns per annum.

The inventory analysis was done using the micro computer based spreadsheet programmes developed for this purpose.

The analysis was carried out on the top 100 ABC usage value items and top 100 ABC on hand value items respectively.

The results of the top 100 ABC usage value items analysed are:

- 77 items were analysed out of the stores total of 6571. (Only 77 different items fell into the top 100 because of duplications due to sub-stores). This represents 1,17% of the items.
- the annual usage value of these items amounts to R33,89 million out of the total of R44,8 million.(76%).
- their on hand value is R8,23 million out of the total of R23,9 million. (34%)
- this gives an average stock turn ratio for these items of 4,12. (Well above the store average - as expected).
- the average inventory levels required to meet various service levels are shown below together with the stock level reductions possible and the respective stock turnover factors.

	SERVICE LEVEL %	AVERAGE INVENTORY LEVEL	STOCK TURNS RATIO	INVENTORY REDUCTIONS
POSSIBLE	95%	R4,14 MILLION	8,18	R4,1 MILLION
	99%	R5,63 MILLION	6,02	R2,6 MILLION
	99,9%	R7,75 MILLION	4,37	R0,5 MILLION
PRESENTLY	± 80%	R8,23 MILLION	4,12	-

- roughly 50% of the items account for the surplus stock.
- statistically speaking a service level of 95% should yield a stockout every 20th month. 99% every 100th month (8,3 years) and 99.9% every 1000th month (83,3 years).
- of the items under consideration
  87% are category 23 items
  10% are category 24 items
  3% are category 25 items
  ie. no strategic stock.
- the average lead time for these items is 5,9 months.

The results of the top 100 ABC on hand value items analysed are:

- 95 items were analysed out of the stores total of 6571. (Only 95 different items fell into the top 100 because of duplications due to sub-stores). This represents 1,4% of the items.
- the annual usage value of these items amounts to R18,7 million out of the total of R44,8 million.(41,7%)
- their on hand value is R15,3 million out of the total of R23,9 million. (64%)
- this gives an average stock turn ratio for these items of 1,2. (Below the stores average - as expected, but still above the Distribution average of 0,95).

- the average inventory levels required to meet various service levels are shown below, together with the stock level reductions possible and the respective stock turnover factors.

	SERVICE LEVEL %	AVERAGE INVENTORY LEVEL	STOCK TURNS RATIO	INVENTORY REDUCTION
POSSIBLE	95%	R2,99 MILLION	6,27	R12,3 MILLION
	99%	R4,08 MILLION	4,59	R11,2 MILLION
	99,9%	R5,60 MILLION	3,32	R9,7 MILLION
PRESENTLY	± 80%	R15,3 MILLION	1,2	-

- roughly 90% of the items account for t[illegible]rplus stock.
- once again, a service level of 99% will only yield a stockout roughly every 8,3 years.
- of the items under consideration
  85% are category 23 items
  14% are category 24 items
  1% are category 25 items
  ie. no strategic stock.
- the average lead time for these items is 7,06 months.

The following conclusions can be made:

- The total inventory reduction possible (for the 172 items under consideration) not only depends on the service level % required, but also on the number of items that fall int[illegible] both the on hand value list as well as the usage value list. At best, this will be the sum of the two surplusses - if no duplication exists and, at worst, the value of the greater - if duplication is 100 percent.

- Taking the average case (50% duplication) we can thus expect to reduce the stock holding by at least between R12 million and R14 million, depending on the service level required.

- The average stock levels calculated assume independent demand in all cases and the trigger for re-order will be set re-order points and not MRP logic. Obviously even greater savings will be realised when use is made of accurate BOM's, MRP, etc.

- The average inventory level was calculated as before.

7. EPILOGUE

A project in the area of inventory management has successfully been formulated, researched, solutions found and successfully implemented. What makes the project even more successful is that the duration of the project was very short with the total project costs also very low, but the potential savings in monetary terms are immense and achievable immediately.

More specifically it has been found that there is still a place for statistical inventory control in materials management and that the use of well known (perhaps not so fashionable) tried and tested techniques can and will be effective in the optimisation of inventory levels.

It is true that more sophisticated techniques would achieve better results but at some stage the law of diminishing returns becomes the over-riding factor and makes these sophisticated, efficient systems less effective. Besides, who in this country can spare highly qualified graduates to continually monitor and fine tune such a system and at what cost?

8. APPENDIX

8.1 Appendix A

(INVENTORY OPTIMISATION SEMINAR NOTES)

INTEGRATED MATERIALS MANAGEMENT PROJECT
FOUNDATION PROCESSES

INVENTORY OPTIMISATION

(USING THE PRESENT STREP SYSTEM)

COLIN FUNNELL

JULY 86