INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications	Order Processing, Stock Control, Payroll and Sales Analysis
Type of Industry	Corset Manufacturing
Name of User	Co-Operative Wholesale Society, Ltd. Desborough, England

Equipment Used	NCR Elliott 803 Computer
	Westrex Paper Tape Readers (300 char/sec) - Two
	Westrex Paper Tape Punches (110 char/sec) - Two
	Friden Flexowriters - Programatic - Four
	Friden Flexowriter - Non-Programatic - Three
	Friden ACPT Add Punches - Two

Synopsis

Rapid processing of customer orders at the Co-Operative Wholesale Society (C.W.S.) Corset Factory, Desborough (50 miles east of Birmingham) is performed by an NCR Elliott 803 computer system.

The Desborough factory receives orders from over 1,600 C.W.S. affiliated customers located throughout Great Britain, and is able to dispatch most goods within 24 hours of receipt of order.

Orders are coded onto paper tape, and through a series of operations, items are debited from inventory, address labels printed, invoices prepared, stock control maintained and sales analyzed at the end of each orders run. In addition, the 803 processes the weekly payroll and is used in the preparation of records for tax authorities.

Cost was kept to a minimum ($70,000) by careful programing of the 803, making maximum use of its magnetic core memory capacity and so eliminating the need for supplementary magnetic files.

The CWS Desborough factory produces foundation garments for sale in approximately 1,650 retail co-operative C.W.S. stores throughout Great Britain. Additionally, a certain amount is also produced to fulfill contracts and for export. The Desborough plant is an old-established one, and production first began in 1905. Since then customers have expected a "by return" service direct from the factory, with a product range of about 2,000 items -- 300 separate lines in an average of seven sizes.

The Desborough facilities, although providing a wide selection of products, is only one of over 200 factories under the Co-Operative Wholesale Society. Started in 1863, as the North of England Co-Operative Wholesale Industrial and Provident Society, CWS has raised its scope of operations so that today it is Britain's largest farmer; one of the three largest millers, operating seven flour mills; and the second largest producer of margarine. CWS also has a considerable export trade, particularly to the Middle East. The Society also maintains a number of manufacturing facilities abroad.

The Desborough factory can sell only to Society outlets; these same Societies are, however, under no obligation to buy corsetry from CWS Desborough, they can buy any make of garment they choose. This means that the factory must keep prices, quality and service as competitive as possible to hold its share of the market.

The NCR Elliott 803 has now been operational for over two years at Desborough. Delivery took place only weeks after placing the order and careful planning carried out at Desborough enabled the management to put the computer to work two months after the date of order.

The price of the installation was kept to approximately $70,000 by making maximum use of the unit's high capacity magnetic core memory and, thus, eliminating supplementary magnetic files. The Desborough factory management has found this perfectly satisfactory for undertaking such routines as order processing, stock control and payroll, as well as for the production of management reports on sales and expenditure.

With such an organization and product mix within the fashion industry, Desborough is faced with the problem of keeping its stocks at a minimum so as not to be left with unsaleable garments as styles change. On the other hand, the need for "by return" service would seem to contradict such a policy. The goal, of course, is to keep just the right balance between these two requirements.

Other CWS factories deal with a central depot which then distributes the goods to Co-Operative Societies, but Desborough's main business is done directly with Societies (retail outlets) throughout the country, although some business, in Scotland, for example, is done through a CWS depot. Therefore, the factory is faced with the problem of selling its goods in relatively small quantities. The answer to this problem was electronic processing of orders to ensure that most goods are dispatched within 24 hours of receipt of an order.

Preparatory to Desborough's decision to purchase an NCR computer, the management had very detailed costings prepared. These compared the cost of the existing system of punched cards, the cost of a more modern punched card system and the cost of a system based on the 803 computer.

The basis of this comparison was the capital cost of the installation, to be written off over a period of seven years, and included all interest and maintenance charges. Here the distinction between capital cost and operating cost is important. A punched card system has a lower initial cost than a system based on a computer but the latter has a lower operating cost. It was found that the cost of operating a punched card system included a charge of $2,400 per annum for punched card stationery whereas the computer needed $700 per annum for paper tape requirements. On the basis of a combination of capital costs and operating cost the CWS decided that the 803 offered a much better job at the same price.

The absence of magnetic tape to the 803 has kept the cost at a low level, but this originally posed a problem for CWS. One of the applications to be transferred to the customer necessitated a

sorting routine, and this gave rise to some doubt on the part of the CWS as to whether the computer could sort without magnetic tape. However, this problem was solved by programing and the 803 now satisfies all requirements.

In August, 1963, an NCR Elliott 803 computer together with associated equipment was installed at Desborough to supersede the existing 40-column punched card equipment. The intention was to take over existing tasks performed by punched card methods, speed up documentation and preparation of control information, and to use the computer to undertake other important tasks which were at the time done manually, or not undertaken due to pressure of work.

Equipment

The NCR Elliott 803 (Series B) is a stored program solid state digital computer containing a 4,096 word magnetic core store, each word comprising 39 binary digits. The computer is fitted with two Westrex paper tape readers (300 characters per second) and two paper tape punches (110 characters per second). Peripheral equipment includes four programatic eight-channel tape Flexowriters, three non-programatic eight-channel tape Flexowriters, and two Friden ACPT add punches.

THE SYSTEM

Invoicing

Orders received at Desborough from individual stores or through representatives are met from factory stocks and invoiced directly to the customer. Items supplied from CWS area depot stocks are also invoiced by Desborough, this being initiated by the depot sending a stock issue slip to the factory in respect to all garments sold. Replacement of depot stocks is controlled by the factory, based on analysis of sales made.

Preparatory Clerical Routines

Each order is examined upon receipt. Discontinued lines or non-suppliable sizes are deleted and the customer is notified accordingly. Non-standard items are extracted from the order and passed to the works office to initiate production.

A consecutive number is stamped on each order and this, together with a prefix denoting source and type of order, forms the consignment number. Commodity codes are endorsed on the orders, which are then batched according to dispatch priority. The batches are passed to a comptometer operator who prepares a hash total comprising (a) the commodity code (b) size, and (c) quantity of each order. This hash total is then entered onto the order.

Stock issue slips are similarly, but separately, treated. Order batches together with control totals are then passed for tape preparation.

Preparation of Input Tapes for Invoicing

Two tapes, CR-01 and CR-02, are prepared. The first contains customer address, account number and other static information, together with variable information such as consignment number and delivery instructions. This tape is prepared as a by-product of an operation during which either a four-part set for postal dispatch (urgent orders) or a six-part set for deliveries by carrier, is produced. This is achieved by using a Flexowriter which reads a selected prepunched card for each order. The card controls the printing of addresses, codes and other related data, at the same time punches the information into a paper tape. The card also instructs the machine to stop so that the operator may insert variable information at the appropriate point. On completion of a batch of orders, the documents produced are checked and the orders, together with the by-product tape, are passed to an add punch operator.

The second tape (commodity details) is then prepared by the Friden add punch and contains a Society code number (retail outlet) and consignment number. Additionally, this input tape contains certain codes which indicate end of line, end of order, validity check, error or continuation o invoice signal. These codes comprise a single character, and are punched automatically by the add punch, instructed by its plugged program.

Entries of each order are made by the operator, entering quantity, size, and commodity code. A hash total of these is accumulated within the machine. When all lines have been entered in this manner, the consignment number and Society code are entered and, finally, the comptometer hash total is entered in credit. If the total thus entered agrees with that accumulated from individual line entries within the machine, a "zero proof" is achieved, and a validity code punched into the tape. Thus, the validity code is the first code read by the computer in respect to an order, and indicates that following data may be accepted as correct.

In the event of a non-agreement in the hash totals, a check is made -- using the tally roll -- to ascertain whether the discrepancy is caused by an error in the computed total, or in the add punch entries.

Computer Routine

The two input tapes are then passed to the computer room. A translation input routine is stored in the computer together with necessary sub-routines for alphanumerical input/output and currency conversion. These programs are standard sub-routines supplied by NCR. A description tape containing style, name, color, size range, prices and store index references of stock location is input; each item of description data occupies three words of store. The invoicing program is then read in and stored, followed by the stock tape containing the current stock balance for each style and size.

The two data input tapes are then placed in tape readers and computer processing begins. The related segment of the address tape and commodity tape of each order is matched by the computer by
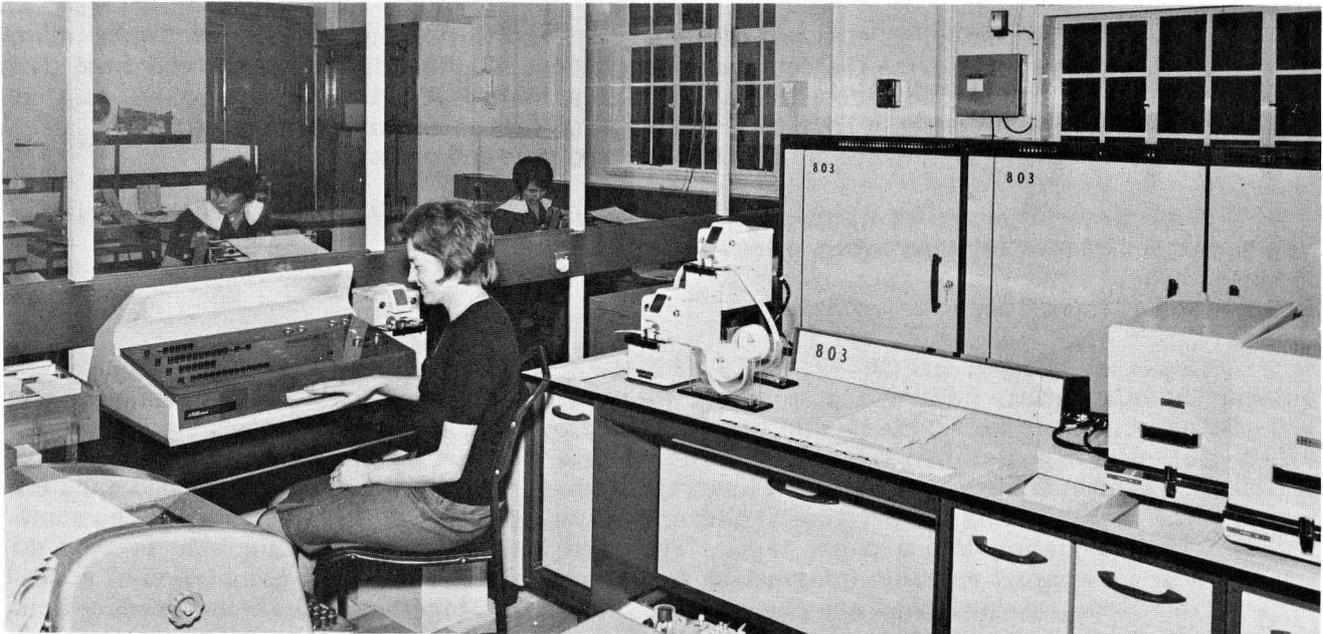
NCR ELLIOTT 803 COMPUTER AT C.W.S.

reference to the consignment number. As matching takes place, customer address details are input on a reader and stored pending determination of stock availability.

The first commodity code is then read by the computer and the relevant three-word commodity data located and transferred to the working store. The garment size is then input and stored, followed by a computer test to determine that the size input is valid.

Another function of this processing is to code the ultimate output printing tape produced by the computer. This will locate the Flexowriter in the appropriate printing area of the size/quantity section of the invoice.

All this processing is effected within the computer by modification of the size digits, and subsequent arithmetical functions.

The quantity ordered is then input and checked against available stock. If stock is available, the balance is reduced accordingly. The quantity supplied is also added to the daily total for that item.

Successive order lines are read from the commodity input tape and processed. When a code signifying a new order is detected in the input tape, the computer first finalizes the invoice line and the invoice from the accumulated totals. The Society code is located and tested to determine the basic rate of quantity discount, and whether any special tax adjustments need to be made.

Up to 12 lines of commodity information can be printed on each invoice. As each invoice line is processed, the computer updates a line count with the total quantity invoiced and the total value (less trade discounts) punched.

The appropriate stored sales values are netted by the proper discount rate and the total discount stored for invoice total and grand total summary. Purchase tax is calculated on the invoice gross total less cash and trade discounts. The amount of the purchase tax is punched into the printing tape and also stored for the grand total summary. The net totals are added to the purchase tax figure to give the invoice total which is punched into the tape, with an appropriate symbol under the discount heading on the completed invoice printed by the Flexowriter.
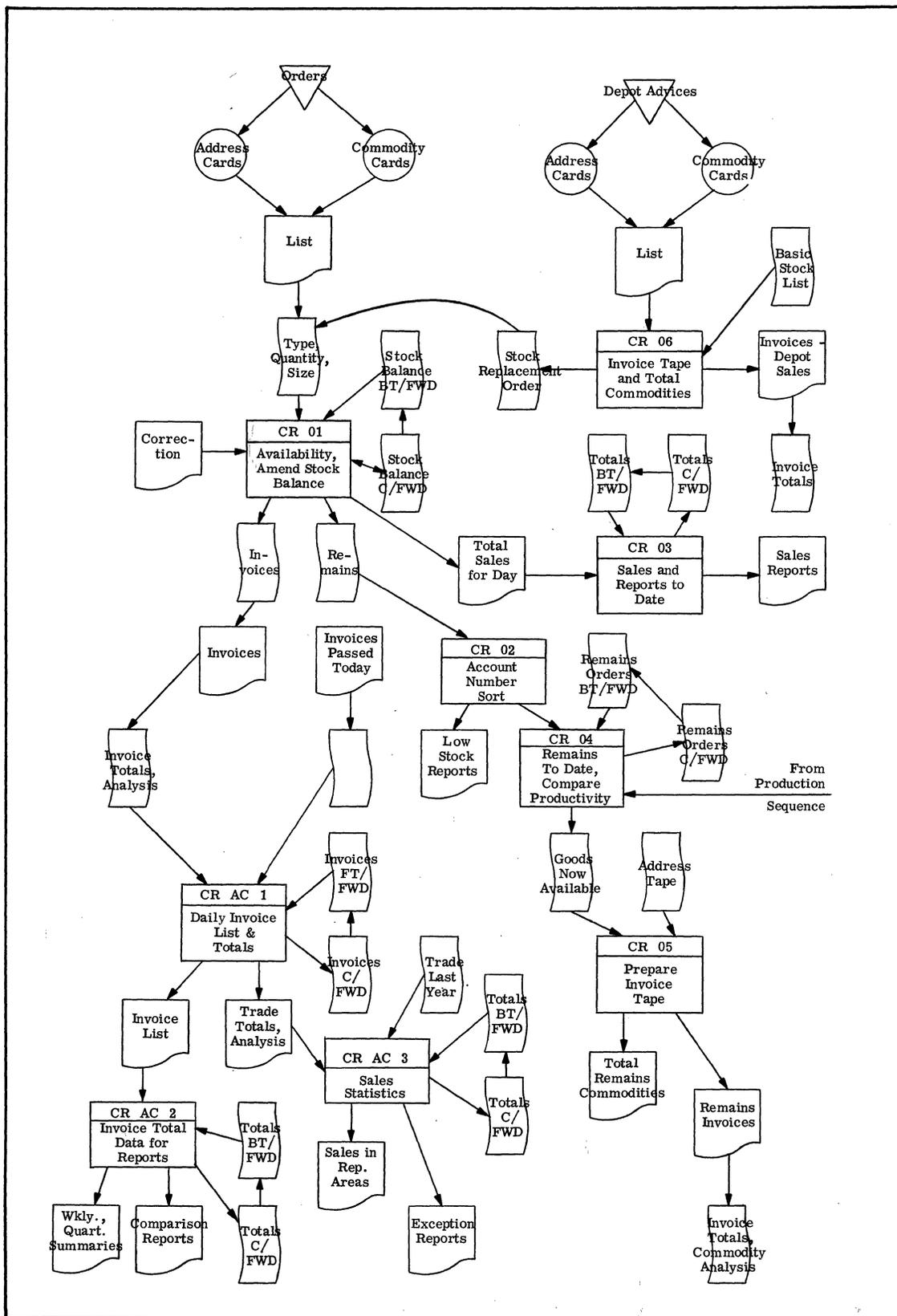
When the stock availability test reveals an out of stock condition, the stored address details are output followed by details of the item which cannot be supplied -- commodity code and size.

The information output forms the "remains" tape which is subsequently combined under the control of the "remains" sort program with previous "remains" data to form a consolidated tape ready for immediate processing whenever production is added to stocks. In addition, the daily "remains" tape is printed by a Flexowriter and passed to the sales office. As further stock becomes available, stock slips are completed in the boxing room for all items transferred from production to finished stocks, and input prepared and processed. When production has been added to stocks, the consolidated "remains" tape is placed in a reader and processed.

Although a separate "remains" invoicing program is used, with the exception of the routine for adding production to stock, the program differs from the main invoicing program only slightly. Inevitably, stock shortages still occur, in which case details are punched into tape for re-processing as "remains" when production is next added to stock.

Invoice Print-Out
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The invoice tape produced during the computer run is passed to the Flexowriter section for preparation of a four-part continuous stationery set. The invoices and packing slip making up this set are visually checked against the original order during print-out by the operator. The operator either endorses the first copy of the urgent order set or the sixth copy of the normal delivery set with the total quantity invoiced against the order.

Orders

Address Cards

Commodity Cards

Depot Advices

Address Cards

Commodity Cards

List

List

Basic Stock List

Type Quantity, Size

Stock Balance BT/FWD

Stock Replacement Order

CR 06
Invoice Tape and Total Commodities

Invoices – Depot Sales

Correction

CR 01
Availability, Amend Stock Balance

Stock Balance C/FWD

Totals BT/FWD

Totals C/FWD

Invoice Totals

In- voices

Re- mains

Total Sales for Day

CR 03
Sales and Reports to Date

Sales Reports

Invoices

Invoices Passed Today

CR 02
Account Number Sort

Remains Orders BT/FWD

Remains Orders C/FWD

Invoice Totals, Analysis

Low Stock Reports

CR 04
Remains To Date, Compare Productivity

From Production

Sequence

Goods Now Available

Address Tape

CR AC 1
Daily Invoice List & Totals

Invoices FT/ FWD

CR 05
Prepare Invoice Tape

Invoices C/ FWD

Trade Last Year

Totals BT/ FWD

Invoice List

Trade Totals, Analysis

CR AC 3
Sales Statistics

Totals C/ FWD

Total Remains Commodities

Remains Invoices

CR AC 2
Invoice Total Data for Reports

Totals BT/ FWD

Sales in Rep. Areas

Wkly., Quart. Summaries

Comparison Reports

Totals C/ FWD

Exception Reports

Invoice Totals, Commodity Analysis

ORDER HANDLING SEQUENCE

Alternative Routine - Standard Stock Items

When the computer is engaged on other work (payroll, for example), it is the practice to prepare typewritten documentation for any order received where delivery is extremely urgent.

Necessary adjustment of computer held stocks and data storage is achieved by preparing a pseudo-stock record slip from which input tapes are prepared. These are processed by the computer when invoicing is next undertaken.

Contracts, exports and sundry sales are non-computer areas and are dealt with manually. Where standard stock items are involved, these are deducted from the computer held stocks by again raising a pseudo-stock record slip.

Other Invoicing - Special Items

A carbon master sheet is prepared in the work office for any special cuts abstracted by the sales office at the order examination stage. Cutting tickets are produced from the master using a spirit duplicator. Later, the master is priced and extended and then used to prepare three invoices and an advice note. Additionally, typewritten invoices are prepared for special cuts which require a fitting, any repair work which is chargeable and for sub-standard items.

SUMMARY OF INVOICING ROUTINES
STANDARD METHOD

FED INTO THE COMPUTER	OUTPUT FROM THE COMPUTER	FLEXOWRITER ROUTINES - DOCUMENTS PRODUCED
1. Descriptions and prices tape.	1. Invoice print-out tape.	1. Either a four-part dispatch note set for postal deliveries or a six-part dispatch note set for carrier deliveries.
2. Stock balances.	2. "Remains" tape for output of stock items which is merged with other "remains" data to produce the consolidated tape (No. 5 under input)	
3. Program and sub-routines.		2. A four-part invoice set including packing slip.
4. For normal invoicing, data tapes for addresses and commodity details.	3. Binary stock balance, tape and special stock report tapes. (a) Summary of sales by styles. (b) Summary of orders processed.	3. A print-out of the "remains" tape to provide data for the sales office.
5. The "remains" invoicing; a single data tape containing both addresses and commodity details.		

Stock Reporting

The computer configuration at Desborough does not include a magnetic tape. Consequently, as each different application is to be processed, it is necessary to input and store the appropriate sub-routines and instruction program. This preparatory work is increased whenever information has to be updated in connection with the job on hand, as it is also necessary to input and store "brought forward" data.

PUNCHED TAPE BEING PREPARED AT C.W.S.

This situation arises with invoicing, involving as it does, a stock availability test. To retain the current stock position following the day's invoicing, a binary tape containing the final stock balance is produced. In this way, essential data is preserved and the computer core storage is freed for other processing requirements. Before further invoicing can be undertaken, the binary tape is read into the computer to restore stock balances.

In addition to the binary stock tape, special stock report tapes -- which are subsequently printed on the Flexowriters -- can be obtained while the stocks and commodity description details are still in store. These are obtained either by using the stored invoicing program in conjunction with keyboard operations, or by storing the relevant special instruction programs. Depending on the program used, the following variations in stock information, including description, size and quantity, can be obtained:

(a) Stock balance for each commodity size
(b) Stock balance for a certain range of sizes
(c) Stock balance for any single commodity
(d) Stock balances below a certain level

SALES STATISTICS - ACCOUNTING

On return from the warehouse, the second and third copies of the invoice are combined with the first copy, sorted into districts and sequentially numbered. The third copy is filed in the sales office and the first and second copies sent to the comptometer operators to carry out checks and compile control totals.

The second copies are then filed in invoice folio order in the general office and the first copies sent for tape preparation.

PRODUCTION

RAW MATERIALS

Receipts

Charges

Orders

Commodity Cards

List

List

List

List-Production

Raw Material Orders

CR RM 1
Modify Order File, Check Receipts and Charges

CR RM 2
Update Order File, Check Price

To Orders Sequence

Raw Material Orders

Stnd. Cost Variations

Raw Material Charges Lists

Order Balances

Issues

Raw Material Stock

CR RM 3
Raw Material Stock Control

Raw Material Stock

Raw Material Stock

Goods in Process C/ FWD

Goods in Process BT/ FWD

Raw Material Stock

Free Bal- ances

CR P 4
Check Raw Material Available

Low Stock Reports

CR P 1
Production Checked with Goods in Process

Daily Progress Report

Stock Reports

Raw Material Orders

Standard Materials

CR P 2
Compute Production List

Production List

Amend- ments

Stock Bal- ance

Commodity Sales

Labor & Materials Cost

To Labor & Materials Cost

FLOW DIAGRAM SHOWING PRODUCTION AND RAW MATERIALS SEQUENCE.

Preparation of Input Tape for Invoice Balancing and Listing

The balancing and listing input tape is prepared by a Friden add punch and contains the Society code and shop number, invoice folio, CWS net value, merchants net value, purchase tax and packages for each invoice. Codes comprising a single character are punched into the tape to identify each item. This is carried out automatically by the add punch which is instructed by the plugged program panel. A hash total of CWS, merchants, purchase tax and package values is accumulated within the machine. The hash total is entered in credit and compared with the accumulated total, to obtain proof of correct punching. If incorrect punching has occurred, the tally roll is checked against the invoices. When located, the invoice containing the error is re-punched in full.

Computer Routine

Data tapes are initially input for verification by the check invoicing totals tape program. The principal purpose of this particular task is accomplished by the invoice totals and balancing program. This produces from the verified balancing and listing input tapes an invoice listings print-out tape. Other functions are to sort, collate, accumulate and store selected items of information contained in the input tapes as a basis for the creation of a district totals tape.

For each invoice, two packed words are formed from the stored information. The first contains Society code and shop number and the second, CWS sales and merchant sales values. Before a further segment of tape containing details of the next invoice is input for processing, it is necessary to transfer the packed words to a section of the core storage, where the information is stored in Society/shop sequence.

The computer is programed to compare each new Society/shop code reference, with those previously stored. The computer test, using the formula, "stored code reference minus new code reference," enables the computer to establish the relationship of the codes and to carry out a sorting process which results in the new word pair being stored in Society/shop sequence.

After the packed word pair has been stored in the correct sequence, the holding stores are cleared and details for the next invoice are input via a reader and treated as before. The routine is repeated until all the input data for a district has been processed. The invoice listing tape for the district is now ready for print-out by the Flexowriter.

District totals, which are accumulated within the computer, are subsequently punched into tape and printed by the Flexowriter to form the basis of a daily report.

SUMMARY OF SALES STATISTICS PRODUCED TO MEET STATUTORY ACCOUNTING DEMANDS		
FED INTO THE COMPUTER	**OUTPUT BY THE COMPUTER**	**FLEXOWRITER ROUTINES - INFORMATION PRINTED FROM TAPES**
1. Instruction programs and sub-routines.	1. Invoice listings print-out tapes.	1. Daily ledger lists by district showing sales, purchase tax, packages and invoice totals.
2. Balancing and listing input tapes.	2. District totals print-out tape.	2. A daily report containing district totals, used to complete daily totals of sales debits and is built-up to provide details for the grand summary of net total supplies.

SALES STATISTICS - MANAGEMENT

A binary summary tape containing the quantities invoiced (by commodity size) is punched out following completion of the day's invoicing. These daily tapes are filed for weekly processing when they are combined with the previous week's "carried forward" tape to produce a binary tape of sales by commodity to date.

One of the earlier functions of the invoice totals and balancing program was the formation of two packed words for each invoice from the details punched into input tapes and then to store these word pairs within the computer in Society code and shop number sequence. Once this task has been accomplished, the program undertakes the task of updating the Societies trade tape.

The Societies trade tape, which contains a cumulative record of sales in Society/shop sequence, is read into the 803. Basically, the procedure involved in updating this tape is to feed the file tape through the computer, merge the tape items and stored items whenever these coincide, and to re-punch and up-date the tape. However, when the tape reference is higher than the store reference, the tape reference and related values are re-punched into the output tape. Finally, when the store and tape references are the same, the Society code and shop number are punched into the output tape.

As each item (word pair) of stored information is punched into the output tape, a modifier (initially zero) is increased by two. This modifier is used to locate the next stored Society code and shop number for comparison with tape references. In view of amalgamations and changes which occur from time to time in respect of retail outlets, the updated Societies trade tape is scrutinized by an edit program which amends Society codes as required, to produce a "clean" tape. By storing the "clean" trade tape and employing file tapes containing either a list of Societies or representatives, information is punched into tape and then printed by Flexowriter to provide reports containing retail outlet name, shop number and sales analyzed items.
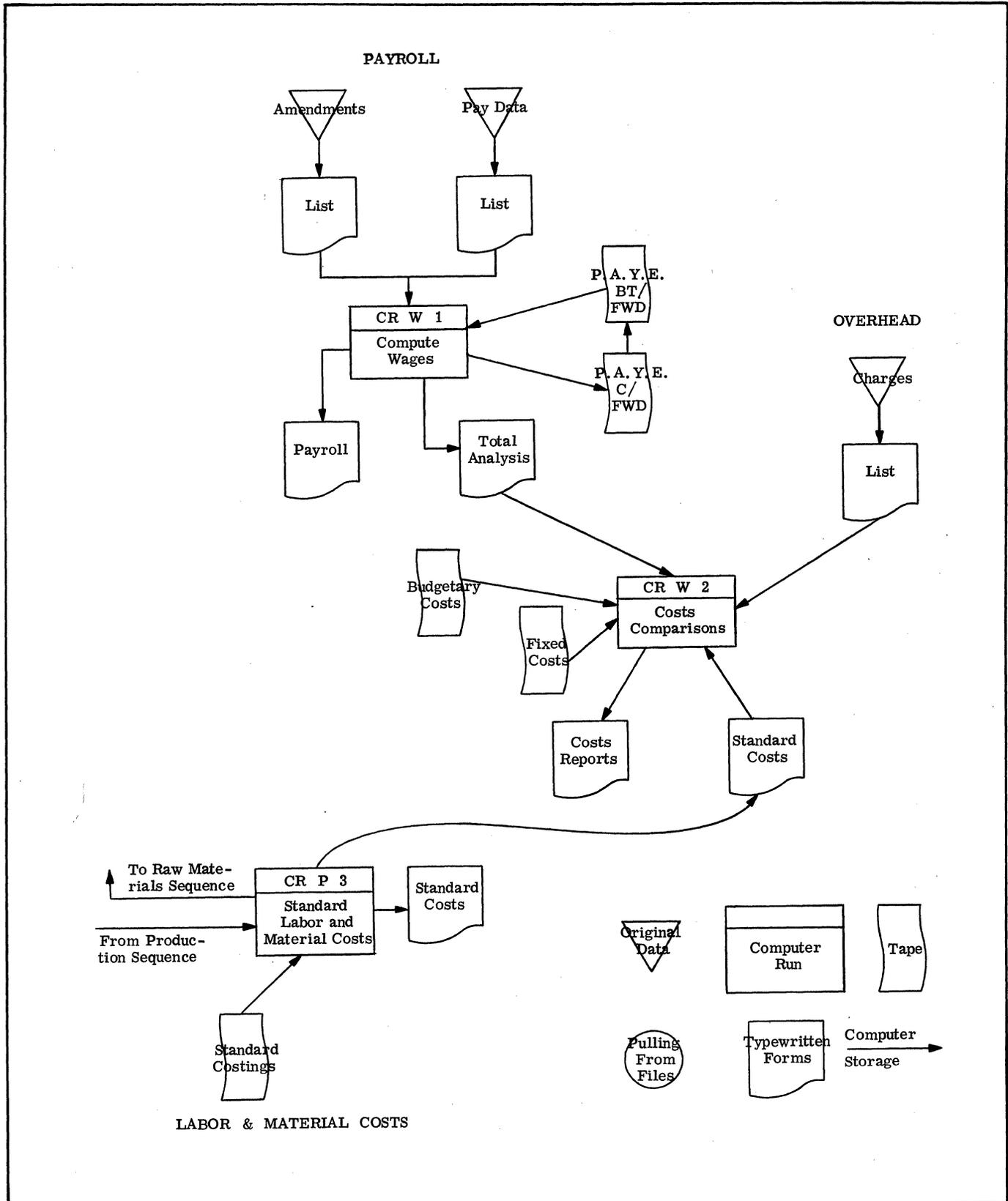
PAYROLL

The wage structure at Desborough, and its accompanying Corby factory, provides for both piecework and day work rates. Provision is also made for the payment of a learner's incentive allowance, and a cutter's bonus.

Piecework

Work completed at piece-rates is entered on a piecework ticket by the employe, checked by the section supervisor, and entered in a piecework record book. The entries on the ticket and in the book are separately calculated using a comptometer and the results compared. Any daywork undertaken is reported by a supplementary payments sheet. This is calculated and checked and the amounts added to the basic earnings of the employes concerned.

Daywork

Gross earnings for dayworkers are not calculated by the comptometer section as the computer is programed to achieve this. Clerical action is confined to checking the time cards, entering the total hours worked, evaluating any overtime premiums and recording the total hours payable.

PAYROLL

Amendments

Pay Data

List

List

P A.Y.E.
BT/
FWD

CR W 1

Compute
Wages

OVERHEAD

P.A.Y.E.
C/
FWD

Payroll

Total
Analysis

Charges

List

Budgetary
Costs

CR W 2

Costs
Comparisons

Fixed
Costs

Costs
Reports

Standard
Costs

To Raw Mate-
rials Sequence

CR P 3

Standard
Costs

From Produc-
tion Sequence

Standard
Labor and
Material Costs

Original
Data

Computer
Run

Tape

Pulling
From
Files

Typewritten
Forms

Computer
Storage

Standard
Costings

LABOR & MATERIAL COSTS

PROCESSING SEQUENCE OF PAYROLL, LABOR AND MATERIAL COSTS AND OVERHEAD.

Hours and Wages Tape

Hours and wages tapes are prepared on Flexowriters from details entered on piecework tickets and time cards. The information contained in the program tapes is classified as data which is re-punched into the new input tape, and control codes which cause the Flexowriter to stop so that the operator can insert variable information (gross earnings for pieceworkers and hours payable for dayworkers).

Employe File Tapes

File tapes are maintained for each of the eight categories of employes at the Desborough and Corby factories. These tapes contain the following data:

1. Personal details (name, etc.).
2. Works number.
3. Hourly rate of pay (dayworkers only).
4. Standard deductions.
5. Withholding tax details (Pay as You Earn -- P.A.Y.E.).
6. CWS pensions program rate and contributions to date.
7. Factory savings program, weekly deposit and balance of account.
8. Net wage round-up balance.

Amendment Tapes

Alterations to file tape details necessitated by changes in the personal status of employes, are carried out by means of an amendment tape for each group of employes. These are prepared on a Flexowriter from coded amendment sheets, each code on the sheet representing a specific amendment.

Computer Routine

The payroll program and the necessary sub-routine are input and stored. The first file tape and the corresponding amendment tape (if any) are then input on separate readers. During input, the file details are amended as necessary and the details stored in successive ten-word blocks of packed information per employe.

The related hours and wages tape prepared by a Flexowriter is then placed in a reader, each segment of the tape containing data for one employe. Although the employe sequence in this tape follows that of the stored file data, its compatibility is checked by examining the tape works number with the stored equivalent. When the tape data for an employe has been correctly linked with the appropriate ten-word store, this latter data is unpacked and copied to working stores before the computer carries out the first routine to calculate gross earnings (dayworkers only) and to determine the employe's gross pay to date.

The employe's standard deductions are extracted from the working storage and utilized for the determination of the employe's net wage and also to form separate store totals for each deductible item, providing balancing figures and accounting data.

Variable deductions are calculated by reference to the index information sub-routines of P. A. Y. E. (withholding), state graduated pension plan, and the CWS pension program.

At this stage, following adjustment of the employe's gross pay by the standard and variable deductions, a test is carried out on the net pay to ensure that the further deduction of any authorized sum for credit to the employe's factory savings account does not create a negative net pay condition. If this arises, the authorized deduction from earnings in respect to savings is cancelled. The amendments tape is also used to institute any withdrawals from savings, and the amount for re-payment is tested against the employe's account balance to safeguard against over-withdrawal.

The finalized net pay figure is rounded out to the nearest $0.70 -- after adjustment for the previous week's overpayment. The current week's "round-up amount" is stored as a file tape item for use the following week. In addition to accumulating control totals for the various deductions from gross pay, the computer maintains a count of the denominations of National Health Insurance (socialized medical payments scheme) stamps required.

The employe details in the working storage are then copied to the file tape as a re-constructed ten-word block. No transfer of data is made for persons leaving the company, which ensures that they are excluded from the file tape.

The payroll line detail for the employe is then output from the working storage which, with the exception of the control totals storage, is cleared to accept tape file details for the net employe. At the completion of each payroll batch, the stored file tape details -- updated in respect to the current week's processing -- are output for use the following week.

Payroll Print-Out

The payroll printing tape for each group of employes is then printed by the Flexowriters. In addition to producing the official payroll containing gross and net pay, and classified deductions for each employe, the Flexowriter also produces a by-product tape. This subsidiary tape is processed by the Flexowriters to produce the employes' combined pay advice envelope.

Before proceeding with the next payroll batch, a heading tape is read into the 803 to produce a summary of the stored values under the appropriate headings.

EXPENSES AND CHARGES

All expenses and charges with the exception of those for raw materials (trade invoices) are currently subjected to computer processing. The areas of expenditure involved are analyzed on the basis of a domestic code covering 58 main headings with sub-codes being employed to provide a more detailed analysis.

The initial clerical procedures involve verification of invoice prices either by the purchasing or expense and charges clerk. When applicable, other details are checked against the goods received book, followed by verification of extensions and invoice totals. A file number is then entered on the first invoice copy.

An analysis slip is affixed to the second copy and endorsed with various codes and totals. Expenses and charges paid in advance or in arrears are either allocated or apportioned as required.

Invoices are made up into batches of twenty and an input tape is prepared containing the items of information endorsed on the analysis slip. The add punch automatically punches an identifying code for each item, the control being exercised by a plugged programed panel specially set up for this purpose.

Computer Routine

The programs, in connection with expenses and charges, were the last to be written. Features of the program are similar in operation to those connected with the updating of CWS figures and involve sorting data into a numerical sequence and the subsequent merging of this data with brought forward tape details to form an updated record.

The expenses and charges processing program and the necessary sub-routines are input and stored. A binary tape containing merchant descriptions is input and stored in a pre-determined core storage block. Any amendments to this tape are input and incorporated with the store details and an amended tape output for future use.

The merchant's invoices and credits tape is then input into a reader with a marker set for credit items. The invoice/credit note file, merchant's number, invoice date and amount are stored for subsequent output for invoice listing purposes. The accounting period, cost center, main analysis code, sub-analysis code and amount (value) are input and stored sequentially to form a five-word block of information. Where there has been an apportionment of expenses or charges, the sub-divided expenses/charges are input and stored separately in successive five-word blocks.

When a code indicates a new invoice is read, the computer first punches out the merchant's invoice listing details. The actual merchant's name is extracted from the stored description detail by using the previously stored merchant's number in conjunction with a look-up table which forms part of the description details. The invoice date, file number and total invoice amount are retrieved from storage and punched into the output tape along with the necessary codes to position the Flexowriter, ensuring correct tabulation of printed detail. Each invoice amount is added to an accumulator storage and credit amounts, identified by the marker, deducted.

Before details of the next merchant's invoice are input, two packed words are formed for each five-word block of stored information. The first word comprises the main analysis code, sub-analysis code, cost center, period and second amount (value). Where a credit note is involved, the first word is constituted as described but the amount is stored negatively when the second word is formed. The two packed words are then transferred to a section of the core storage, where the information is stored sequentially on the basis of the coded information contained in the first word. When this process is completed the holding stores are cleared, details for the next invoice input and related information punched into the merchant's listing tape.

Through the use of an expenses and charges tape, a division of expenses and charges is made not only by class of expenses but also separately by accounting period. In order to produce a more compact and readily assimilated record, a summary of expenses and charges is produced under the control of a separate summary program with each item of expense identified by name. This is achieved by storing a description tape containing a look-up table to link the codes with the names.

Thus, it is possible to classify data by cost center and to produce a separate analysis of production costs at Desborough and Corby in addition to a distribution cost figure. Similarly, classifi-

cation expenses from various time periods can be merged to form a cumulative figure to date, by each class of expense and type of activity. In addition, the computer preserves the identity of the current period's figures, and these are also output according to class expense or activity.

Other Applications

Capital expenditures are isolated and shown separately on the summary of expenses and charges. Amounts pre-paid are held in a suspense account until the month in which they fall chargeable -- when they are automatically transferred from the suspense account to the correct expense or activity account.

RESULTS AND FUTURE PLANS

The new system at C.W.S. has proved to be cheaper to run, easier to operate and more reliable than the previous punched card system. Once the initial system's problems have been sorted out on a computer, there is virtually no time lost in comparison with a mechanized system. This reliability coupled with the greater speed of operation means that the computer is always ahead of the staff punching input tapes and there is no backlog.

The NCR Elliott 803 does all the jobs which were done on the old installation, plus a number of new ones which could not be done previously. For example, the end-of-the-year-stock-taking used to mean stopping the order processing, but this is no longer necessary and management statements are now much fuller and more accurate than under the old punched card system.

Because of the basic construction of the 803, the Co-Operative Wholesale Society's Desborough factory will be able to expand the system at any time to keep pace with future expansion of business and to better meet customer needs.