

COSTING OF THE SUGAR INDUSTRY.

COST CONTROL—ITS ADVANTAGES OVER HISTORICAL COSTING.

By C. S. EVANS.

In industry to-day the industrial accountant has a very important role to play in the structure of a manufacturing concern. He has moved, or is moving, from the position of a glorified clerk collecting historical data to a position where he should produce information which will serve as a guide to management policy and action, and to achieve this the industrial accountant should acquaint himself with the problems of management and the technical processes in the factory. The industrial accountant is a link between the boardroom table and the factory floor, and because of his efforts these two vital spheres can be brought much closer together. With his knowledge of the factory and its processes, reports should be framed in a language familiar to the person receiving them and not in a language familiar to accountants only.

Broadly, costing may be divided into two main categories, historical costing or predetermined costing.

When designing a costing system the following main objectives should be taken into consideration:

Object 1—To ascertain the cost of the product to ensure that a sufficient profit margin is being received.

Object 2—To provide management with statements of control of actual results, divided into—

- (a) Effect on costs/profits of changes in volume of production analysed to causes.
- (b) Control of expenditure.

Object 3—To provide top-level management with data for planning future programmes.

Historical Costing.

This is the form of costing which is being mainly practised throughout the sugar milling industry in Natal. It may be defined as financial expenditure shuffled into another form and gathered under departmental total costs and departmental unit costs.

Now let us study to what extent this form of costing satisfies the three main objectives of costing.

Object 1—To ascertain the cost of the product to ensure that a sufficient profit margin is being received.

Historical costing in the milling industry does not achieve this objective. The costs or unit costs of any one season are very unlikely to be the true costs of manufacture. For example, it would not be correct

to base industry or mill costs on, say, season 1950-51, which was a bumper crop of 685,798 tons of sugar, as the unit cost of sugar would be reduced below normal because of an abnormally large crop. Nor would it be correct to base industry or mill costs on the current season 1951-52, which will be more than 150,000 tons of sugar less than the previous season, as the unit cost of sugar will be abnormally high.

To ascertain true mill costs, costs must be related or based on a normal production. Again, it is not possible to average past seasons' costs to arrive at true mill costs unless an allowance is made for rising costs of labour, material, services and depreciation from season to season.

Object 2—To provide management with statements of control of actual results, divided into—

- (a) Effect on costs/profits of changes in volume of production analysed to causes.
- (b) Control of expenditure.

(a) In order to anticipate and understand the behaviour of costs under different volumes of production, and (b) to control expenditure, it is essential to classify expenditure as either fixed or variable. This important distinction is not made under the present system of costing. It should be realised that some expenditure, which is fixed, is not influenced by changes in volume of production, whereas some expenditure is sympathetic with changes in volume of production and is thus classified as variable.

Under the present form of costing, elements of expense such as salaries, wages, overtime, stores, administration and depreciation all lose their identity as they are added together to produce departmental total and unit costs. This serves no useful purpose and requires a fair amount of clerical effort and time. These departmental costs (total and unit) cannot be compared with previous weeks, months or seasons with any real benefit to management for control of expenditure. This is so because volume of production changes from week to week because of sucrose per cent. cane, or from season to season because of crop and thus only part of the expenses (i.e. variable) will be influenced by the changes in volume of production. Then again no assessment is made of the effect on profit of these changes in volume of production. The departmental costs do not assist in the control of expenditure and as the product produced moves right through the factory they serve no use. If more than one product was produced, and if some products

did not pass through all the departments, then departmental costs would be necessary.

It should be pointed out that increased costs of labour, overtime, stores, administration and depreciation which warrant an increase in the selling price of sugar, are not readily available from the present costing system.

Object 3—To provide top-level management with data for planning future programmes.

Before a season starts top-level management is faced with the problem of estimating finances to meet, amongst other things, programmes of major equipment replacements; or perhaps of assessing to what extent monetarily the cost of replacing obsolete machinery will be compensated for by the resulting increase in efficiency; or if capital expansion schemes are to be considered, the additional return which may be anticipated therefrom, having regard to all the circumstances surrounding such decisions. Historical costs do not lend themselves readily to such policy decisions, as they do not automatically assess the effect of variations in volume of production on costs, or what the behaviour of costs will be under varying conditions of production.

In other words, as the name implies, such costs are purely historical and have no anticipatory ability, without recourse to considerable investigation and estimation.

Predetermined Costs or Budgetary Control.

One of the main principles of budgetary control involves the setting of standards of performance and budgets of expenditure on normal expectancies, with the object of measuring and assessing departures (variances) therefrom in money value.

The design and tailoring of a scheme of cost control to suit milling, transport, refining and cane growing and the initial installation requires specialised knowledge, research and planning. It follows that the operative staff require to be carefully instructed on the principles involved in cost control with resultant benefit to management. Once, however, the installation has been introduced, routine clerical work is minimised because the financial figures are used for cost control purposes.

The Budget Manual. A budget manual is prepared for each mill, and sets out the following information:

Standard and Estimated Data. The standards embodied in the manual should naturally be set by the technical staff, as they are the persons responsible for controlling the actual performances and expenses against such pre-set standards and budgets.

Normal cane crushed—This is based on previous years to make allowances for climatic variations, and adjusted for changes in acreage, or any other factor likely to affect the average crop.

Normal sucrose per cent. cane—Based on past statistics.

Normal sugar production—This is calculated after standards have been agreed and set for—

- (1) Extraction at a certain fibre per cent. cane.
- (2) B.H. recovery at a certain mixed juice purity and polarization.
- (3) Standard operating usage of available hours to measure mechanical and cane stoppages against expected stoppages.
- (4) Crushing capacity for fibre—Tons fibre per hour.
Crushing capacity for cane—Tons cane per hour.
- (5) Standard tons cane required per ton of sugar—calculated from above data.
- (6) Available crushing hours per week.
- (7) Allowances to standard extraction for weekly changes in the fibre per cent. cane; and to standard B.H. recovery for weekly changes in the mixed juice purity and the polarization. (Tables are prepared for these allowances.)
- (8) The consumption of chemicals per ton of brix in mixed juice. (*See note at end*)
- (9) Prices for cane, sugar and chemicals in detail.

Budget of Expenditure, subdivided as follows:—

Wages. The entire labour strength is budgeted for European and non-European employees, and the wages bill calculated and set out in detail by functions under the following main groups:—

- European wages—Crushing period.
- Non-crushing period.
- Non-European wages—Crushing period.
- Non-crushing period.

Overtime. Expected overtime is budgeted for under the same main groups—

- European overtime—Crushing period.
- Non-crushing period.
- Non-European overtime—Crushing period.
- Non-crushing period.

Stores. Stores consumption budgets are prepared by commodities under the following main group headings:—

- Bagging.
- Chemicals.
- Fuels, oils and lubricants.
- Factory running stores.
- Maintenance stores.
- Electrical spares.
- Building material.
- Railage on stores.

Depreciation. This should be calculated on the estimated replacement value of the buildings, plant and transport divided by the estimated useful life. This figure represents the annual charge, and if divided by the normal production depreciation is reduced to a charge per ton of sugar. Thus seasons with large crops will be charged with higher depreciation costs than seasons with small crops.

Administration. Each item of expenditure falling under this heading is budgeted for separately.

The above main five groups of expenditure (wages, overtime, stores, depreciation and administration) are then summarised on a final form together with the cost of sucrose and railage on cane, and this total cost is deducted from the expected income to arrive at the profit or loss in total and also per ton of sugar.

Control and Measurement of Actual Results against the Budgets Forecast in the Manual.

Control is divided into two separate functions :—

- (1) Control of production performances, reduced to £ s. d.
- (2) Control of expenditure.

Control of Performance. As the cost of the raw material (sucrose in cane) forms a substantial portion of the total cost of milling (approximately 63 to 66 per cent.) it is essential and vital that the emphasis of control be thrown on efficient overall recovery of sucrose from cane.

It is also important to management to know whether to put more emphasis on (a) mill extraction and boiling house recovery or on (b) mill capacity (i.e. tons of fibre per hour) and mechanical efficiency. Under (a) valuable sucrose which has cost approximately 66 per cent. of total cost is lost, whereas under (b) crushing time is lost which in all probability will cost less than the sucrose saved.

On the weekly "Performance Control" sheets it will be noticed that losses due to excessive fibre per cent. cane are classified as uncontrollable. This may be so on a short term basis, but over a long period it might be partially controlled. For example, the loss in extraction due to excess fibre per cent. cane could be 0.5 per cent. and on the production of the industry could amount to over £60,000 per annum. This sum of money warrants time and money being spent, firstly on developing varieties of cane with low fibre content, due consideration being given to the many other problems facing cane growing; and, secondly, on developing still better techniques of extracting sucrose from high fibre per cent. cane. This same problem applies to the purity of the mixed juice.

The loss due to these variables is no new discovery, but what is new is that an assessment of them is made and this forms part of the reports and accounts, thus spotlighting excessive losses for the notice of the management.

Each Monday morning the previous week's results are measured against the standards set out in the manual, and the standard profit for the week and the variations from standards are assessed in money value. This information is set out on "Performance Control" reports and ready for management on the Monday.

The following information is recorded on the "Performance Control" reports each week :—

Actual fibre per cent. cane.
Actual sucrose per cent. cane.
Tons of cane crushed.
Tons of sugar made.
Standard profit for the week £'s.

Total variance for the week £'s, and this total analysed to causes :—

Extraction.
Fibre per cent. cane.
Boiling-house recovery.
Mixed juice purity.
Polarization.
Crushing capacity (i.e. tons of fibre crushed per hour measured against standard).
Mechanical stoppages.
Cane stoppages.
Crop (i.e. the effect of large or small crops on the profit).
Sucrose per cent. cane. (This is a variance to indicate to management changes in profit from period to period as a result of sucrose changing.)

The actual performance results are also expressed as percentages against standard, which shows that a small efficiency drop in extraction or B.H. recovery may mean a substantial £ s. d. loss. These percentages can also be used for graphing results against standards.

Control of Expenditure. Expenditure is controlled against budget under the main elements of expenditure—wages, overtime, stores usage and administration.

Wages. The wages are collected in departmental order, not to arrive at departmental costs, but because management can visualise and control labour more easily under functional classification.

The hours and wages records are maintained in the same order as the budget details for simplification. The actual wage bill is compared with the budget, management being notified only of variations therefrom, which is a time-saving factor for management.

Overtime. The overtime expenditure is kept separate from the wage expense, as this in all probability requires closer control than wages. The actual overtime expenditure is compared with the budget, and again only variations therefrom are disclosed.

Stores. At present stores are charged to departments and no cognisance is taken of the fact that some of the stores should be controlled over short intervals of time, some long intervals of time, and others controlled not by time but by production. Therefore departmental stores allocation provides no control as too many compensating factors can offset excessive usage. Then again, stores are charged to the factory at the latest prices and thus, if prices go up, it is not readily disclosed whether the increased cost of stores was due to price or usage.

It is recommended that stores be controlled by commodities, and budgets be set for each commodity. These budgets are flexible, and budget allowances for each period will be based on time or on production. The actual consumption is measured against the flexible budgets. If it is found that particular commodities are being excessively used, then closer investigation will disclose for what purpose and by whom the stores have been requisitioned. It might be pointed out that a clerical advantage is gained, because requisitions are filed in the same order for booking out of stores and for charging to costs, whereas previously they were sorted out twice, firstly by stores ledger order, and secondly by departments.

Standard prices should be set for each store, and all stores charged to the factory at standard price. Therefore any increase in stores costs will be due to stores consumption only. Payments for price increases or credits for decreases from the standard price are recorded at the time of purchase, and this information, in addition to being submitted promptly and automatically to management, is used immediately for calculating the effect on the profit margin and thus on the adequacy, or otherwise, of the selling price.

Depreciation. This is a charge per ton of sugar and as it is a book entry no variations occur. However, if the replacement value of plant and equipment varies, then the profit margin will vary unless the selling price is adjusted accordingly. This method of charging depreciation has the advantage of increasing this cost during the bumper years, thus allying this important item of cost to the actual quantity produced, and offers a realistic approach to the problem, in that the essence of depreciation is an allowance for wear and tear; the greater the production, the greater the wear and tear.

Administration. The items of expenditure falling under this heading are mainly items of fixed expenditure and thus are not influenced by the volume of

production at all. Each period the actual expenditure is compared with the budget and expense variances disclosed to management.

"Profit and Variances" Report.

This report, produced for top-level management each production month, should be ready within at least two weeks of the close of the production month.

The report sets out the standard profit which, when adjusted by the variances, is the actual financial profit as disclosed by the financial books.

Conclusion.

The industrial accountant, using a form of cost control, should be able to furnish all levels of management with prompt and useful data, to assist top-level management with forward planning, and the technical production heads with control of daily performance. Cost control helps to make production staff more "cost conscious" and non-production staff more "production conscious." It brings the technical men and accountants together more often, and enables them to appreciate each others problems more readily. The industrial accountant should be the liaison officer between production staff and top management. This form of "control by exceptions" should save all levels of management valuable time by sifting out the good from the bad.

The form of cost control designed as above provides management promptly with assessments in money value of each variance. It is these variances that cause costs per ton to vary from period to period and season to season, and therefore it is of no value to management to report that costs have gone up or down without being able to report what has caused these changes and to what degree.

Note.—Since reading this paper, the control of chemical usage has been changed from "chemicals per ton of brix in mixed juice" to "chemicals per ton of impurities in mixed juice."

Dr. G. S. H. Rossouw, at the conclusion of Mr. Evans' paper, remarked that he had found this most interesting and informative from both the economic and accounting aspects. The system of predetermining costs was one largely in use in America, and he cited as examples American motor firms manufacturing parts, and for whose purposes it was essential. It was essential that standard costs be used. He said that Mr. Evans' system would indicate that the performance of one factory was not up to standard, while that of another factory was, and this would serve as an excellent guide to comparison between factories.

Mr. Stewart then gave an indication of the information that Hulett's had obtained as a result of the installation of Mr. Evans' costing system. Every Monday morning the chairman of the Company, mill managers, etc., were advised of the performance

results of the previous week. These results gave in £ s. d. the effect of mill efficiency and variations due to the condition of the raw material. The budgeting of wages and stores had also proved most useful.

Mr. du Toit enquired as to whether the figure of 66 per cent. quoted by Mr. Evans as being the cost of raw material to the millers was constant or whether this fluctuated in various countries. Mr. du Toit also asked a second question: he wished to know how the alterations in standards due to changes in the raw materials, such as fibre and mixed juice purity, were calculated, because he thought that many would disagree with the method used.

Mr. Evans replied that so far as the cost of raw materials is concerned, this was not a constant figure. There were two factors affecting this. The first was the price paid to growers, which changed from month to month, and the second was that the price per ton of sugar was also affected by the extraction and recovery figures of the mills. In any case, the difference between the standard price and the actual price would be reflected as a cane price variance, and the extraction and recovery as efficiency variances. In reply to the second question, Mr. Evans stated that standards were set by technical men and he was prepared to accept the tables given by Dr. Douwes Dekker for adjustments to these standards because of changes of fibre and purity of mixed juice.

Mr. Barnes stated that he was very interested in the paper by Mr. Evans, whom he had met last year and with whom he had discussed the subject. He had been for many years in what he termed as the budget-end of the business and therefore found Mr. Evans' scheme most interesting. At the same time he enquired whether Mr. Evans had as yet worked out any scheme for introducing standard costing to the fields and possibly integrating both field and mill costing.

Mr. Evans said in reply that the installation of the new costing system in all the mills would take from three to five years before it was completely effective, so that at the present he had not given any real thought to the question of the application of the system to cane growing. The approach so far as cane growing was concerned would be entirely different, as the main emphasis would be upon efficient use of labour and fertilizers.

Mr. Walsh enquired whether the costing system would indicate the effects of increased throughput with regard to profit in instances where it was necessary to push large tonnages through a mill and disregard the losses in extraction and recovery in view of the additional profit that would be made.

Both the Chairman and Mr. Grant further clarified the question.

Mr. Evans replied that in order to be able to answer Mr. Walsh's question, it would be necessary for the technical personnel to indicate the degree by which extraction and recovery had dropped as a result of increased throughput. If this could be done the calculation would be a comparatively simple matter.

Mr. Moodie said that his company had introduced Mr. Evans' scheme and that he gave it both his fullest support and approbation. It was both practicable and useful, and he cited as an example the ease with which he was able to check the weekly wage calculations with the budget.

Mr. Barnes at this stage offered to make available, to any members interested, a paper presented by Mr. M. B. Floro in 1949 on the above subject. (Ref. Jamaican Assocn. Sugar Tech. Journal, 1948.)

Dr. Douwes Dekker said that he considered the system an excellent one, but he thought all standards should be set by technical men and that these standards would not necessarily remain constant.

Mr. Seymour said that his company had been using this system since the beginning of the year. It had proved the best system that they had as yet had and that as a result of it all the technical staff were becoming cost conscious. There were certain flaws in the system, especially so far as setting of standards was concerned, but these and other flaws would doubtless be rectified in due course. They were at present working so far as standards were concerned from the reverse position. The losses in recovery comprised losses in molasses, filter cake, and the undetermined losses. They had taken the best result from each factory and were endeavouring to improve the other factories up to this mark.

Mr. Evans stated that standards were set by technical men. To start with standards might be set too low or too high, but in time this would be realised and adjusted. He said it should be noted that it was unwise to set standards too low as results would tend to relax to these standards. He said the scheme was still in its infancy stage, and if changes were made in the technical control methods, then naturally the costing scheme would come into line with such changes.

Mr. Lewis asked how mill standards were set at the beginning of the year. Was it not possible to set a standard for the whole industry? He asked whether it was not possible to differentiate in costs for the various departments, as when drops in efficiency took place it should be possible to know just what department was affected. He claimed that under the historical costing system this information was available. He also asked how the relating of depreciation to output could be reconciled with the Governmental allowance in this respect. He also asked whether the

depreciation was on the straight-line system basis or whether plant was to be revalued from year to year. He also enquired how Mr. Evans would deal with a drop in crop of 20 per cent. on the original estimates for the year.

Mr. Evans, in reply, said that after discussion with Dr. Douwes Dekker and the technical personnel of Hulett's it had been decided that it would be better to set the standards for each mill independently. It would not be fair to expect technical staff using old plant to achieve impossible standards, and therefore the efficiency losses disclosed in the form of red variances would be of no value for management control purposes, thus defeating the whole aim of the cost control system.

Mr. Evans disagreed that historical costing could indicate what particular department was responsible for losses in efficiency. He said that this was best known to the engineer and technical personnel themselves, by reason of their own practical experience.

So far as depreciation was concerned, the question as to the exact method of dealing with depreciation was still under discussion by the industry. The de-

preciation charge allowed by the Receiver of Revenue should in no way influence the actual charge put through the accounts for profit purposes. In a period of rising price levels, which actually exists at the moment, companies will find depreciation reserves and funds seriously inadequate if the depreciation charge is based on the allowance made by the Receiver of Revenue.

Mr. Evans pointed out that by charging depreciation at so much per ton of sugar it was really a modification of the straight-line method by the application of an activity factor.

So far as a drop in crop of 20 per cent. on original estimates for the year was concerned, this meant that there would be a large drop in expected profit due to (i) an under-recovery of fixed expense and (ii) a reduction in the number of expected "profit margins." These amounts would be assessed and shown as a crop variance to management and could be calculated as and when new crop estimates were available.

Mr. Dymond said that this had been a most interesting and informative paper, and asked the meeting to thank Mr. Evans in the usual manner.