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MAY 1, 1922

No. 15

Flour Milling Costs

BUSH TERMINAL BUILDING 130 WEST 42nd STREET, NEW YORK

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BUSH TERMINAL BUILDING
130 WEST 42nd STREET, NEW YORK CITY

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NATIONAL ASSOCIATION OF
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May 1, 1922

National Association of Cost Accountants

FLOUR MILLING COSTS'

The modern miller, for the most part, can hardly be likened unto the "dusty miller" of old. The science of milling in recent years has advanced to a marked degree in comparison with the cruder and hit-or-miss methods that were used in former years. To-day large flour mills are located in the northwest, Minneapolis being the centre of the milling industry; and also in Kansas, where

mills of several thousand barrel capacity are operated.

The wheat flour milling industry has long been one of the most important in the United States. The value of its flour output alone, in the eight months ending March, 1920, considerably exceeded a billion dollars. In the year 1919-1920 about 122 million barrels were produced, the consumption in the United States being about one barrel per capita. The industry is concentrated to such an extent that ten of the larger milling companies can produce over 50% of all the wheat flour used in the United States.

In the year 1918-1919, Minnesota produced 28,273,000, Kansas 12,668,000 and New York, principally Buffalo, 8,690,000 barrels.

According to the report of the Federal Trade Commission, the Washburn-Crosby Mills have a capacity of 60,000 barrels per day; Pillsbury, over 30,000; Standard Mills, 30,000, and the Kansas Flour Mills Company, over 15,000.

The northwestern mills use hard spring wheat almost exclusively, whereas the southwestern mills use a high percentage of hard winter wheat. It is well acknowledged that the best flour

is produced from hard spring wheat.

To keep pace with the improved milling methods and machinery used, radical changes and improvements in the accounting systems have been imperative. However, the methods of computing costs by all flour millers are by no means uniform. The scope of this article does not make it feasible to go into detail with regard to the merits or demerits of a variety of systems of cost finding. It is the purpose of this article rather to deal with certain phases of cost accounting that may be said to be peculiar to the milling industry, leading up to the system that is used by some of the larger milling companies, which through use has demonstrated its practical character.

FOOD ADMINISTRATION CONTROL

During the war, from September, 1917, to June, 1918, all flour millers were regulated by the government through the agency

This article is based upon a paper read before the New York Chapter.

of the Food Administration. With few exceptions voluntary agreements were entered into by each flour miller, throughout the country, whereby they agreed to limit their profit on flour to 25c. per

barrel, and 50c. per ton on feed.

At the beginning of the food control period, there were possibly not ten per cent of the millers of the country who maintained records that, by any stretch of imagination, could be called good accounting records. An attempt was made by the milling division of the Food Administration to induce the flour millers to install systems whereby they could be provided with results of operations with little additional expense and clerical help. At that time the writer examined the accounts of quite a number of mills of varying barrel capacity, and was impressed with the obvious improvement in the matter of keeping records that had been attained within the preceding year.

The main objects of the control by the Food Administration were: Limitation of wheat grind, regulation of the quantity of wheat that could be used in the manufacture of one barrel of

flour, and limitation of the price charged for flour.

Many peculiar matters arose during the control period. During normal times the miller makes his profits between July or August to January of the following year, which, in large measure, is owing to the prevailing practice of taking up a profit on sales booked for future delivery, on the theory that the grain has been bought to cover, the cost thereof being thus known and the milling expenses being determinable by experience. From February to June the sales are relatively small with the result that the miller

does little more than break even.

During the control period, therefore, the miller with the experience he had gained during the normal years, actually expected to make, and did make, more than the allowable profit of 25c, per barrel, during the first five months, having in mind that there would be little or no profit on operations from February on. The anticipated reduction in sales, however, did not occur and the miller thus found himself selling flour over the entire period at a margin of profit in excess of the allowable profit. This condition resulted in recoveries being made by the Food Administration from the millers of excess profits, of many millions of dollars. In the case of one very large mill, it was found that they had made excess profits of approximately a million dollars, which was finally dissipated by selling to the Government at a price considerably below cost. In the light of developments the application of the maximum profit of 25c. per barrel to all mills can hardly be said to have been a success. It was found that in the case of large operators the allowable margin resulted in very big profits on the capital invested, whereas in the case of the smaller millers with, say, 100 barrel mill capacity, the profit was entirely inadequate.

¹ See Appendix.

PURCHASE AND RECORDING OF GRAIN

Before going into the actual system, which is to be described later, it might be well to lay the ground work in a broad manner, upon which the system is based. Let us consider the questions relating to the purchase and recording of grain, etc. Wheat is produced seasonly during a few months in the year, and it therefore becomes necessary for the miller to provide for his grain requirements by making purchases of wheat for future delivery. wheat is the only commodity that enters into the manufacture of flour and represents practically 90% of the cost thereof, it will be obvious that the flour miller must first of all be a thoroughly experienced grain man and must be ever-watchful of the grain market, inasmuch as the fluctuations in the price of wheat are frequently very considerable. The stabilizing of wheat prices throughout the year is regulated to a large extent by dealing in "futures" commonly termed "options." This whole question comes under the term of "hedging." How this works out is somewhat as follows: At the time the wheat begins to come in to the country elevators, an option is sold by the elevator owner, which simply means an agreement to deliver at a future date. On the other hand the miller buys the option in order to safe-guard his supply. When, at a later date, assumed to be prior to the date of the option, an actual contract for the sale of wheat is made by the elevator, an option is bought to offset the one previously sold by him and again. per contra, at the time the miller desires to take delivery of grain at his elevator, he either exercises his purchase option or, in the event of his requiring wheat at an earlier date, contracts for the purchase of grain and thereupon sells an "option" to offset the purchase thereof which he has previously made. Another type of "hedge" occurs where the miller finds himself over extended in wheat options and grain on hand in comparison with his sales of flour. Consequently it becomes necessary to sell "options" of an appropriate amount to relieve himself. Unless it is directly related to the requirements of the mill as necessitated by the future flour sales speculating in futures is a hazardous undertaking that is not countenanced by conservative millers. The trading of options is done upon the floor of the various grain exchanges. The principal ones are in Chicago, Minneapolis, Kansas City and New York.

The miller must keep an evenly regulated flow of grain to his mill in proper relation to his milling capacity and with due allowance for the period during which grain is not available, which is just preceding the crop year. His purchases must be of the proper grades and kinds since it is of the utmost importance to maintain a "mixture" that will produce the brand of patent flour that he is accustomed to manufacture. Wheat begins to come into the elevators in the southwestern territory in July, whereas the season in the northwest is later, and it is not before early in September that the wheat starts to move.

The flour miller may be said to be on the other side of the ring to the grain broker. What one loses the other gains and vice versa.

Since there is a constant and continuous demand for flour it is necessary for flour millers to sell very largely for future delivery in order to insure a reasonably steady distribution to the jobber and from him to the retail merchant and ultimately to the consumer.

Because the price quoted for the flour is based upon the prevailing price of wheat at the date the order is booked, the miller must immediately contract for the wheat necessary to manufacture the flour sold. Conservative milling practice demands that purchases be made "to cover" as soon as a sale is made. If this is not done, a subsequent slight increase in the price of wheat is likely to entirely eliminate the profit that had been originally counted on. The failure to "cover" flour sales can only be construed as gambling in the future trend of wheat prices.

It will be readily understood, therefore, that the mill executive must have before him at all times a long and short statement, in which sales of flour translated, for convenience of ready comparison, to a basis of the wheat necessary to manufacture it, are stated on the short side and the purchases of wheat, etc., shown.

This statement sets forth the following information and is prepared daily:

Short:Spot sales, in barrels and wheat equivalent (bushels).

2. Future sales, in barrels and wheat equivalent (bushels).

Flour in warehouse, in barrels and wheat equiva-Long:1. lent (bushels).

2. Wheat in elevator.

3. Wheat in transit.

Wheat contracts undelivered.

Wheat options.

The difference between the total long and short position, in bushels, will naturally show at a glance the excess of wheat over the requirements or vice versa. From this statement the mill executive must decide his buying policy.

At this point it might be we'll to emphasize the importance of maintaining an equitable balance between the sales of flour and feed. This matter calls for the closest supervision by the mill executive and unless carefully watched may result in considerable financial loss.

Briefly, the recording and reporting of grain purchases is

accomplished in the following manner.

Wheat is usually purchased from three sources: grain brokers on the floor of a grain exchange, country elevators and local producers.

In the first two cases the grain is handled in car-load lots, and in the third case wagon-loads are usually brought in by the farmer, and incidentally in many cases are exchanged for flour and feed. It is very important to keep track of the wheat purchased from dealers. This may be done best by numbering and filing purchase orders consecutively. When the wheat to apply thereon is received, the proper entries are made on the purchase record and all papers are attached until the contract is completed. Then the entire record is placed in the permanent alphabetical file. An unloading ticket is prepared by the elevator when the car arrives and is unloaded. The ticket is sent to the accounting department. These tickets form the basis of entries in the stock record, by grades and kinds of wheat such as:

Hard Winter, Nos. 1, 2, 3; Hard Spring, Nos. 1, 2, 3; Soft

Winter, Nos. 1, 2, 3; Soft Spring, Nos. 1, 2, 3; Durum, etc.

There are various classes and grades of wheat, the prices of

course being different.

Account sales are prepared by the flour mill and submitted to the shipper with a check attached. The account sales serve as a basis for the charge to grain purchases and the credit to the shipper.

Since the writer is leading up to the milling of and accounting for grain, it is not within the scope of this paper to go into the mat-

ter of selling grain by mill elevators.

When wheat is unloaded into the elevator, it is inspected and weighed, usually by certified inspectors appointed by the Board of Trade, and is graded by means of samples abstracted. Upon the basis of this grading, the wheat is settled for and the determined percentage of dockage is deducted. The wheat is unloaded into bins and a "Mixture" of various grades is made according to the requirements of the miller. It should be borne in mind that the "mixture" varies among the many mills as does the quality of patent flour produced. This is one of the secrets that is closely guarded by the miller.

When the wheat leaves the elevator for the flour mill it is automatically weighed and the weights recorded are credited to the stock account of wheat and are charged by the accounting depart-

ment to the mill.

MILL REPORTS

The executive should be furnished with a record of daily consumption and output, prepared by the head miller. The statement shows the following information:

1. Wheat used:

(a) Gross weight, bushels.

(b) Less mill screenings, bushels.

(c) Resulting in net weight, bushels.

2. Flour produced:

- (a) Patent or high grade flour, pounds and per cent of total flour.
- (b) Standard flour, pounds and per cent of total flour.

3. Offal produced:

(a) Middlings, lbs. and per cent of total offal.

(b) Bran, lbs. and per cent of total offal.

(c) Screenings, lbs. and per cent of total offal.

The over-run or under-run should also be shown in pounds. This statement is kept on a sheet with one line for each day and at the end of the month the totals and monthly averages are calculated. The statistics derived from this statement are invaluable to the management. From the summarized totals obtained from the record of wheat used and flour and offal produced, the statistics of yield and percentages for cost purposes are computed.

The wheat ground is frequently in excess of the weight of flour and offal produced, resulting in an invisible loss, or underrun, but in many cases, "tempering" of wheat will so increase the weight, after it has entered the mill, as to result in an invisible

gain in pounds of production, or over-run.

The wheat purchase record will show the total bushels and amount and the average cost can be obtained as often as required by the executive.

MILLING IN TRANSIT

One of the details that has to be looked after with considerable care is the "milling in transit" item. This consists of the differential between the combined local freight rates of incoming wheat and outgoing flour, over the through rate. As an illustration, assume that wheat is shipped from point A to a mill located at point B and that the flour manufactured therefrom will later be shipped to point C, all on the same railroad. Let us assume that the local rate between A and B is 10c. and the local rate from B to C is 20c., whereas the through rate from A to C is 25c. At the time the wheat is delivered to the mill, the local rate of 10c. is paid, of which 5c. is charged to "milling in transit" and 5c. to cost of wheat. At the time an equivalent weight of flour is shipped from the mill to point C a reduction of the local rate is obtained of 5c. and the balance of 15c. is paid, which, together with the 5c. charged to milling in transit, is charged to freight outward and acts as a reduction of sales. The whole question of differentials in freight rates has to be very closely watched inasmuch as they are a considerable factor in cost.

Everyone is familiar with the fact that flour is sold in varying sizes and types of packages. A considerable amount of detail work has to be done in order to maintain an accurate inventory of the sacks on hand, by sizes and kinds, and also to state the sacks used in the daily production. These records indicate the purchase requirements.

PROCESSES

The sequence and nature of the various processes of manufacture from the time the wheat enters the elevator to the time the flour is stored in warehouse may be of interest.

The wheat is unloaded in the mill elevator, where it is weighed and graded. 2. Various grades and kinds of wheat are mixed according to the miller's requirements.

3. Wheat is conveyed to the mill, usually on endless-belt conveyors, and

weighed.

The expenses of handling the wheat up to this point are known as elevator

expenses. They may be classified as follows: Handling and wheat testing, insurance, power, repairs, depreciation and mis-

cellaneous. 4. In the mill wheat is passed through large rotating sieves for the purpose of separating the foreign materials, such as barley, oats, etc., which are sold as mill screenings. It may be mentioned that "dockage" will have been deducted in settling for the wheat, to cover the screenings.

The wheat is then conveyed to a scouring machine for cleansing, after which it is passed on to "tempering" bins to be soaked, for a varying length of time, dependent upon the dryness of the wheat, which is largely influenced by the conditions under

which it matured in the field. The last two stages are known as cleaning.

6. The wheat is now ready to go into the process technically known as milling. It is passed through grinding machines, known as "breaks," which consist of steel corrugated rollers, revolving in opposite directions which grind the kernels of wheat to various degrees of fineness.

7. After leaving the break the partially ground wheat passes to a separating machine known as a purifier which extracts the feed. Then the flour and feed are

passed through more breaks for further grinding.

8. The flour, which is by that time quite finely ground, then passes to sifters, consisting of silk bolts, which completes the separation between high grades commonly known as first patent flour and low grades such as standard and first clear flour. In this connection it should be borne in mind that each miller has his own particular brand of patent flour. It follows that the amount of grinding and sifting will vary between mills, because naturally the more the flour is sifted, the lower the extraction.

9. In many mills an electric process of bleaching or whitening the flour is used,

which is said to be quite harmless. Others say it is injurious.

10. The flour is then ready to be sacked, which is done by men holding the sacks over the spouts, the flour being automatically weighed. When filled, the sacks are sewed by a machine and conveyed on a belt, either to the warehouse or to the railroad car, a careful tally being kept of production.

Some miscellaneous features of the flour industry might be mentioned.

Flour is measured by the unit of one barrel of 196 lbs., though it is sold in containers, consisting in some cases of paper, or more usually cotton bags, ranging from 6 pounds to 140 pounds. Feed is measured by the unit of 100 pounds, is quoted on a per ton basis, and is sold in 100 pound jute bags. Samples of the flour coming from the spouts are taken continuously and are analyzed in the laboratory. The laboratory also examines the quality of grain purchased. A bakery is also maintained by the larger millers for the purpose of testing the quality of the flour produced.

From the foregoing brief description of the processes of manufacture it is apparent that machinery plays by far the greater part therein, labor being relatively a very minor factor, up to the packing stage. Mill hands, of course, are engaged on each

floor to see that the breaks and purifiers are in order.

MILLING EXPENSES

The milling expenses may be classified as follows: superintendence, labor, power, heat and light, wheat cleaning, repairs and maintenance, depreciation, insurance, taxes, laboratory and miscellaneous.

The power cost is usually the largest item of direct manufacturing expense. Many mills are favored with water power, how-

ever, which reduces the power cost considerably.

Depreciation is also an important factor on account of the large amount of expensive machinery used. It may be worth mentioning that until recently the percentage of millers who calculated depreciation upon a scientific basis or who considered this expense in calculating their costs was negligible. This could doubtless be substantiated by many accountants and was commented on at length in a report rendered by the Federal Trade Commission on the milling industry.

Of course to-day the mills have improved their accounting methods and depreciation is doubtless charged into costs at as high a figure as the Internal Revenue Department will permit.

SELLING AND ADMINISTRATIVE EXPENSES

The remaining expenses, covering selling, administration, etc., are as follows:

Packages:

Flour Offal

Warehouse and delivery:

Wages

Truck repairs

Truck depreciation

Miscellaneous

Selling:

Salesmen's salaries

Salesmen's expenses

Commissions

Brokerage

Advertising

Bad debts Miscellaneous

Administration:

Officers' salaries

Office salaries

Office expenses, such as telegrams, telegraph, stationery, etc.

Taxes

Insurance

Depreciation on furniture and fixtures

Interest

The large display advertising of certain well-known brands of flour on billboards, in periodicals, etc., is familiar. The advertisements are intended to keep before the public the names of the

brands that are sold by the individual flour mill, and naturally rep-

resent a large item of expense.

The method of cost finding used by many mills is based upon the theory that the miller is engaged primarily in the production of high grade flour which may be termed patent flour and that low-grade flours and what is known as offal, which includes bran, shorts, middlings, screenings, etc., are by-products. The procedure followed is one in which all of the costs entering into the manufacture are charged to the high grade flour produced, which is in turn credited with the total selling value of the by-products.

Method of Computing Cost of a Barrel of Flour¹

- 1. Assume 4.6 bushels, which equals 276 pounds of wheat, yields 196 pounds of high and low grade flour and 80 pounds of offal. It will be noted that no under-run or over-run is considered.
 - 2. Assume also that the 196 pounds of flour is divided into:

75% high grade, or patent flour

15% standard

10% first clear

100%

3. Assume that the 80 pounds of offal are divided into:

32 lbs. middlings

40 lbs. bran

8 lbs. screenings, taken from the wheat

80 lbs.

- 4. Assume further that the true average wheat cost per bushel, including elevator charges, is \$1.50.
 - 5. Then the cost of grind may be stated thus:

\$6.90 .50

\$7.40

6. Which is reduced by the selling price in bulk of the low grade flour and offal produced, thus:

Standard flour, 29.4 lbs. @ say \$7.20 per bbl.. \$1.08
First clear, 19.6 lbs. @ say 5.00 per bbl.. .50
Middlings and bran 72 lbs. @ say 25.00 per ton.. .90

8 lbs. @ say 10.00 per ton..

129 lbs.

Screenings.

¹ The figures used are hypothetical.

Thus making the milling cost of one barrel equiva- lent to	\$6.50
To which add average cost of packages	.40
Also add selling and administration expenses	\$6.90 .70
The total cost of one barrel of first patent flour being	\$7.60

APPENDIX¹

The Milling Division of the United States Food Administration issued in the early part of 1918 a pamphlet of 33 pages—10¾ x 8 entitled "Suggested Accounting System for Wheat Flour Millers." This pamphlet contains the following information: 1. List of asset, liability, earnings and expense accounts; 2. suggested chart of accounts for small millers; 3. books, records and forms used; 4. monthly operations of a small mill, and 5. the following exhibits (without figures): balance sheet, statement of profit and loss, manufacturing cost of sales, monthly closing journal entries, purchase record, cash receipts, cash disbursements, journal, specimen showing entries to general ledger accounts, manufacturing statement, statement of profit and loss, summary of wheat flour and feed for the month, and monthly cut-off cost card with complete instructions as to its use.

The Millers' National Federation has issued a chart containing a list of items to be considered in calculating the selling price of flour. This chart was prepared by a committee of millers of the Association, assisted by the Federal Trade Commission.

¹This Appendix was prepared by the Research Department of the National Association of Cost Accountants.

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