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Manufacturing on an extensive scale is of recent origin in the Philippine Islands. Prior to the world war most of the islands' products were exported in their raw state, with the exception of cigars and hand embroidery. The principal exports have always consisted of hemp, sugar, copra and tobacco. While there are a few rope and twine factories in the islands the greater portion of the hemp is still exported in its raw state. The sugar crop is now being handled by a number of large centrals of recent erection and the cigar and cigarette factories employ thousands of laborers.

The cocoanut oil industry might be considered a "war baby," although a few factories were in operation prior to the outbreak of the war. The world's demand for edible oils and fats was such that prices soared to such a height that men lost their heads overnight and a wild speculation began, which, with probably the exception of the rubber speculation in the Straits Settlements, has not been equaled in the Orient. Factories sprang up like mushrooms, notwithstanding the high cost of building materials and fabulous prices of machinery. In some cases oil stocks were sold at four hundred per cent. premium before the mill was even erected. Some mills which paid dividends of seven hundred per cent. are now hopelessly insolvent. Very few mills are now operating at a profit and the great majority are closed down. Many of them will not resume operations for the simple reason, if for no other, that the copra supply is not sufficient to keep all the mills in operation. Only the efficient ones will be able to continue in business and they will have to be content with a manufacturer's profit, for war-time prices are now a matter of history in so far as cocoanut oil is concerned.

There are no unusual features in the manufacture of cocoanut oil which may not be met in many other manufacturing industries. The principal element of cost is in the raw material, or copra, which is the meat of the cocoanut; hence the efficient and successful factory will first look for

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a cheap supply of copra and since there are so many grades and classes of copra only experienced copra men should be employed in the purchasing department.

Chinese speculators practically control the local copra market. Their control, however, is being seriously threatened by the establishment of buying agencies in all the copra districts by the larger factories. English and French mills are also quite a factor in the copra market, especially in the high-grade sun-dried copra. There is a question as to whether the local mills can compete with the European mills even with a freight handicap, owing to the more efficient European labor and better market for the by-products. The copra meal or copra cake which is the residue after the oil has been extracted is a very good fattening food for cattle and hogs and there is a ready demand for it in Europe. In fact the European mills utilize all the by-products, while for the local mills the disposition of the by-products is at times a serious matter.

The high dollar exchange rate has greatly favored the Philippine oil exporter and frequently represents his entire profit, but now that the dollar is only at a four per cent. premium, he must look elsewhere for dividends. The industry has now reached the stage of the survival of the fittest and it remains to be seen whether or not the local manufacturer can hold his own.

When large profits were being made the manufacturers paid very little attention to efficiency, but now that they are threatened with disaster they are giving more and more attention to efficiency in all departments. They have learned to their sorrow that they did not heed the advice of the accountant. The same mistakes are not likely to be repeated. Experience has taught them a bitter lesson.

There is a certain ratio between the price of oil and the cost of copra which the manufacturer will do well to heed. The chemist and the accountant are the drive wheels in the factory, the rest is more or less automatic.

Copra varies from 1 per cent. to 20 per cent. in shrinkage and from 50 per cent. to 70 per cent. in oil extraction, with a cake residue of about 33 per cent. as a general average. With proper chemical treatment and analysis on the part of the chemist and with cost charts from the accounting depart-

ment, together with close attention to market quotations, or supply and demand, the manufacturer should be able to keep off the rocks of failure on which so many have been wrecked.

The ideal location for an oil mill is such that it can be reached by both water and rail in order to avoid handling charges on inward copra and outward oil and other finished products. Portable conveyors can be obtained which will take the sacks of copra from ship, lighter or car, convey them to the warehouse and stack them and also convey the sacks to the grinder, empty them and by means of magnets throw out all metal which the dealers are prone to put in the sacks so as to increase their weight and thereby increase their profits. Pipes carry the oil through the process of manufacture to the settling tanks, thence to the storage tanks and if the latter are properly located the oil is carried by gravity through pipes to the steamers' tanks. The copra meal is likewise carried by means of conveyors from expellers to presses and containers or furnace as desired. The entire process of manufacture is mechanical and the labor element need not play a large part if the plant is properly designed and equipped.

The sacks from which the copra is emptied are inspected and repaired by a force of women and are then stored, sold or returned to copra buying agencies to be again filled with copra. When copra is purchased the sacks are included in the weight and paid for at the prevailing copra price. In arriving at the cost of copra milled the cost of sacks should be deducted and since the market price of empty sacks is approximately the same if sold by weight as the average price of copra, fair results may be obtained by deducting the weight of the sacks emptied.

If the copra has been in storage for any length of time shrinkage in weight due to evaporation of moisture is an important element and must be taken into consideration in calculating the cost of copra milled. I know of one mill which carried large stocks of copra and met failure through overlooking the important item of shrinkage.

The principal by-product in the manufacture of cocoanut oil is the copra meal which should be deducted from the total manufacturing cost. The majority of the mills use an arbitrary figure and vary it in accordance with the market value of copra meal.

The price at which the copra cake or meal is taken up and deducted from the manufacturing cost is at a figure which when cost of handling and selling expenses are added will leave a small margin of profit on final sale. If the copra meal could be disposed of at once, the net proceeds might properly be deducted from the manufacturing oil cost. The true cost of the copra meal would be the proportional cost of manufacturing based on net weight of finished products but since the cake or meal weight is about one-third of the total, a cost price based on weight would be considerably above the market price and a loss would result in the disposition of the copra meal.

The prime object of the mill is the extraction of oil and, therefore, the oil should carry all cost less that which might be covered by disposition of by-products, such as copra meal, foots, etc.

I shall not go into detail relative to other by-products which may be manufactured, such as soap, butter, lard, etc. Suffice it to say that separate stock, manufacturing and trading accounts should be kept with each product, so that the profit-and-loss account may accurately reflect the various operations. Inter-departmental charges or transfers should be put through the books on the basis of cost.

In the selling end of the cocoanut oil industry the general rules govern as with most other commodities. An important feature, however, is the quality of the oil. It is usually sold not to exceed a certain percentage of free fatty acids, and if the margin of profit is small and the quality of the oil does not conform to the specifications, the sale may result in a loss, even though a profit had been expected. In exporting oil on a c. i. f. basis subject to analysis and weights at buyer's tanks, a reserve should be set up to cover quality guarantee as well as loss through shrinkage or leakage. If shipments are made in barrels on sailing vessels the loss through leakage is apt to be a considerable item. I have known it to be as high as $80,000 on one shipment, though 5 per cent. will usually be sufficient to cover. Insurance policies usually do not cover the first 3 per cent. of leakage.

Copra meal does not keep in good condition much longer than six months and unless disposed of within that time a serious loss may result. Copra likewise deteriorates after six

months in storage and care should be exercised not to become overstocked. The same applies to soap and other by-products if stored in the tropics. Proper storage facilities, however, may minimize losses when it becomes necessary to carry stocks for a considerable time.

One unusual financial feature of the cocoanut oil industry is that it is necessary to advance large sums of money to cocoanut growers and dealers in order to be sure of a constant supply of nuts or copra. These advances for a mill of say 36 expellers sometimes run as high as $500,000. The losses on such advances are usually small though the money may be tied up for several months.

Very few mills own cocoanut groves or manufacture the copra from nuts. A new industry could be created by converting the husks and shells into various finished products, but so far capital has been timid and the potential value of the cocoanut has not been realized to its full extent.

As competition becomes greater in the oil markets, more attention will be paid to the utilization of all by-products, which will result in the lowering of oil manufacturing costs and place the cocoanut oil industry in a position where it can more easily compete with cotton-seed oil, which now governs the market.

The following classified exhibits show the more essential operations of a cocoanut oil factory:

COPRA MANUFACTURING ACCOUNT:			
Cost of cocoanuts	No.		$
Operation of drier plant			
Fuel—			
Husks and shells		$	
Wood			
Labor			
Supplies			
Maintenance			
Supervision			
Miscellaneous expenses			
Depreciation of drier plant			
Total cost of copra produced, kilos		@ $	$
Less—Husks and shells produced, kilos		@ $	$
Net cost of copra produced, kilos		@ $	$

The copra manufacturing account is closed monthly to the copra stock account. The unit cost should be compared with that of like grade purchased during the month for purpose

of determining whether or not it is more economical to buy copra or to buy the nuts and manufacture the copra. The loss through evaporation is always greater in the copra which is purchased than it is in that which has been manufactured, and it is an important element to be considered.

OIL MANUFACTURING ACCOUNT:

				Cost per kilo of oil produced
Cost of copra issued to mill, kilos			$	$
Power:				
Power purchased		$		
Fuel:				
Copra cake	$			
Husks and shells				
Other fuel				
Labor				
Supplies				
Maintenance—power plant				
Supervision				
Miscellaneous expenses				
Depreciation of power plant				
Insurance of power plant				
Total cost of power			$	
Labor:				
Conveyors		$		
Cookers				
Expellers				
Hydraulic presses				
Filter presses				
Total labor			$	$
Supplies:				
Conveyors		$		
Cookers				
Expellers				
Hydraulic presses				
Filter presses				
Fuller's earth				
Total supplies			$	$
Repairs:				
Conveyors		$		
Cookers				
Expellers				
Hydraulic presses				
Filter presses				
Total repairs			$	$
Depreciation:				
Conveyors		$		
Cookers				
Expellers				
Hydraulic presses				
Filter presses				
Total direct depreciation			$	
Miscellaneous direct manufacturing expense			$	
Total direct manufacturing costs			$	$

			Cost per kilo of oil produced
Factory overhead expense:			
Salaries:			
Factory—manager	$		
Superintendents			
Engineers			
Chemists			
Storekeepers			
Timekeepers			
Foremen			
Watchmen			
Total salaries	$		
Laboratory expenses			
Machine-shop operation			
Ice-plant operation			
Transportation			
Welfare and recreation			
Medical attendance			
Injuries and damages			
Miscellaneous factory overhead expenses			
Depreciation of factory building			
Insurance of factory buildings and equipment			
Real-estate tax on factory site and improvements			
Total factory overhead expenses		$	$
GENERAL OVERHEAD EXPENSES:			
Salaries of executives	$		
Salaries—general office			
Printing and stationery			
Office supplies			
Postage			
Cables and telegrams			
Light and telephone			
Legal expenses			
Audit fees			
Office rent			
Fidelity insurance			
Traveling expenses			
Gratuities and donations			
Experimental expenses			
Miscellaneous general expenses			
Real-estate taxes			
Repairs and maintenance:			
Office buildings and equipment	$		
Residences and equipment			
Miscellaneous buildings and equipment			
Total general repairs and maintenance	$		

				Cost per kilo of oil produced
Depreciation:				
Office buildings and equipment	$			
Residences and equipment				
Miscellaneous buildings and equipment				
Total general depreciation		$		
Insurance:				
Office buildings and equipment	$			
Residences and equipment				
Miscellaneous buildings and equipment				
Total general insurance		$		
Total general overhead expenses			$	
Total cost of manufacturing—kilos of oil @			$	

After deducting the by-products from the total manufacturing cost the net cost of oil is closed to the oil stock account.

TRADING ACCOUNT:

Sales	Kilos @	$	$
Less—cost of oil sold			
Gross trading profit			$
Deduct—selling expenses:			
Salaries of salesmen		$	
Commissions			
Brokerage			
Labor			
Supplies			
Containers			
Storage			
Lightering			
Piping to tankers			
Trucking			
Customs charges			
Wharfage			
Freight			
Insurance			
Cables and telegrams			
Printing and stationery			
Postage			
Advertising			
Export duty			
Sales taxes			
Collection expenses			
Interest and exchange			
Foreign handling charges			
Bonuses to ships' officers			
Proportion of general overhead expenses			
Total sales expenses			$
Net profit on trading to profit and loss			$

I shall not go into detail as to the general books or accounts carried therein, but shall only mention that by properly ruled purchase and sales books it is a very simple matter to keep control accounts in the general ledger as to quantities and values of finished products as well as copra and other raw material.

Great care should be taken in measuring the oil produced. The automatic measuring apparatus does not always give correct results and has been the cause of considerable losses. The oil is usually stored in large steel tanks of from 500 tons to 12,000 tons capacity and unless the temperature and cushion are taken into consideration at time of measuring the contents of the tanks serious errors are likely to occur, especially in the large tanks.

I know of one company which had a 500-ton tank constructed by a certain construction company, filled the tank with oil and then sold the oil as 500 tons and some time later received an additional check of over $10,000 to cover the oil which had been delivered in excess of 500 tons. The tank had been constructed to hold 500 tons of water, which is quite different from 500 tons of oil. Specific gravity had not been considered, neither had the tank been measured for purpose of verifying its capacity.