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FOREWORD

This brochure is one of a series of reports resulting from overseas technical inquiries on factory or commercial establishments, operation, management, and engineering. The report is designed to provide only a general picture of the factors that must be considered in establishing and operating a factory of this type. In most cases, plans for actual installations will require expert engineering and financial advice in order to meet specific local conditions.

Mention of the name of any firm, product, or process in this report is not to be considered a recommendation or an endorsement by the International Cooperation Administration, but merely a citation that is typical in its field.

The original report was prepared by Foster and Snell, Inc., New York, New York.

Technical information, as well as review, was provided by R. Poliakoff, Industrial Consultant, 126 Eleventh Avenue, New York 11, New York.

* * * * * * * * * * * *

This report has been revised and rewritten by George H. Andrews Engineering Associates, Inc. 411 Southern Building, Washington 5, D. C.

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For further information and assistance, contact should be made with the local Productivity Center, Industrial Institute, Servicio, or United States Operations Mission.

Code Number
PR-79

September 1961

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D E H Y D R A T E D M O L A S S E S

INTRODUCTION

The purpose of this report is to present basic information for establishing a by-product plant to produce dehydrated molasses from blackstrap molasses.

Blackstrap molasses is a by-product of the sugar refining industry. Practically since the inception of this industry, the molasses has been used as the principal raw material for the production of alcohol. However, through the introduction of modern technology, most alcohol currently is produced synthetically from ethylene. Thus, blackstrap molasses is available in tremendous quantities and presents the average sugar refiner with a serious disposal problem.

The molasses has a high food value and can be used advantageously as a diet supplement in animal feeding. Many other uses are also potentially economic, if the molasses can be economically shipped and stored as a powder, instead of as a liquid.

The equipment should be installed by a sugar refining company at its refinery. This would provide a profitable by-product from blackstrap molasses, which as stated above usually presents a serious disposal problem.

While this dehydrated molasses plant could be established by an individual company, it should in any case be installed at the sugar refinery in order to eliminate freight and storage costs of the blackstrap molasses which would occur if the plant were located elsewhere.

GENERAL ASSUMPTIONS

In order to make realistic estimates in this report, certain assumptions are made. These are:

1. The costs of the building and general facilities are based on United States prices.

2. Material costs are based on sizes and specifications of materials used in the United States.

3. Labor costs are based on the average for the industry as recently published by the United States Bureau of Labor Statistics.

4. Adequate power and water are available at the plant site.

5. Adequate transportation facilities are available at the plant site.

6. The plant operates eight hours a day, five days a week, two hundred and fifty days a year.

7. No special provision is made for the training of new personnel. It is assumed that learner's rates are paid in such cases.

8. The following items cannot be estimated realistically:

   A. Land value.
   B. Distribution and selling costs.
   C. In-freight and out-freight.
   D. Administrative costs.
   E. Taxes.

   While general estimates will be made of each of these items, for the purpose of completing cost estimates, adjustment should be made in accordance with actual local costs.

   In fact, all cost estimates contained in this report should be adjusted to conform to local conditions.

9. Columns are provided in the tables included in this report to facilitate the conversion of cost figures to conform with local costs.

PRODUCT SPECIFICATIONS

Blackstrap molasses will vary in water content from 10 per cent to 25 per cent. A typical analysis is:

Water	19.60 per cent
Invert sugar	22.53
Ash	6.53
Sucrose	37.87
Undetermined organic	13.47
	100.00 per cent

PRODUCTION CAPACITY

The production capacity of this plant based on operating two hundred and fifty days per year is 11,024 pounds a day or 2,755,000 pounds a year. This amounts to about 1,250 metric tons a year.

MANUFACTURING UNIT

The manufacturing unit for dehydrated molasses is one metric ton.

MANUFACTURING OPERATIONS

Many types of processing and equipment can be employed for molasses drying, including atmospheric and vacuum drum dryers, pan dryers, belt dryers and spray dryers. The drum, pan and belt dryers are more costly to operate and require subsequent grinding of the dried

molasses to produce the desired particle size. Unless carefully controlled, such dryers will produce excessive caramelization of the molasses. The finished product, being solid granules in form, is difficult to redissolve should subsequent use require it.

The spray dryer is by far the most economical process for dehydrating molasses. The entire process, from liquid blackstrap, to packaged dehydrated product is automatically controlled, and takes only a matter of seconds. A properly designed spray dryer, operated in accordance with the manufacturer's instructions, should produce a product particle having a hollow bead form. In such a form, the dehydrated product may be quickly redissolved, if required. For dehydrating molasses, a pressure nozzle, co-current air and product flow type of dryer is recommended. A picture of the spray dryer equipment is shown on the last page of this report.

DIRECT MATERIALS

Blackstrap molasses and packaging materials are the only direct materials required.

If the plant is owned by the sugar refinery the cost of blackstrap molasses would be nil, since it is a by-product of sugar that presents a disposal problem.

If the plant is not owned by the sugar refinery the blackstrap molasses should not cost more than $2.50 per ton delivered.

For the purpose of this report a charge of $2.50 per ton will be included for blackstrap molasses.

About 3,168,250 pounds or 1,437.50 metric tons of blackstrap molasses will be required annually.

On this basis the annual cost of blackstrap molasses would amount to 1,437.50 x $2.50 or about $3,600.

The cost of packaging molasses is estimated at about $3,400. On this basis the total annual cost of direct materials would be as follows:

Item	Annual Cost Estimated	Actual
Liquid blackstrap molasses	$ 3,600	_____
Packaging materials	3,400	_____
TOTAL	$ 7,000	_____

* * * * * * * * * * *

SUPPLIES

The principal supplies for this industry are maintenance materials and spare parts.

Item	Annual Cost Estimated	Actual
Lubricants and hand tools	$ 100	_____
Sanitary materials	100	_____
Maintenance materials and spare parts	3,200	_____
Office supplies	200	_____
TOTAL	$ 3,600	_____

PLANT LAYOUT

No plant layout is included in this report. A picture of a model spray dryer is shown on the last page of this report. This picture includes the principal equipment of a plant for dehydrating molasses. The actual plant layout will depend on local conditions where the equipment is installed.

PLANT SITE

The plant should be located, if at all possible, at a sugar refinery. This would eliminate shipping and storage costs of blackstrap molasses, since it could be pumped direct.

If the sugar refinery establishes this plant, there should be no cash expenditure other than the land preparations.

If this plant were installed by another company land would have to be purchased. The cost of purchased land is estimated at $1,000.

BUILDINGS

Here again the same conditions exist. If the plant is installed by a sugar refinery, the property would have space for some of the equipment and the refinery could erect a building for the additional equipment needed for the dehydration process.

For the purpose of this report the floor space requirements are estimated at 6,000 square feet. The estimated cost per square foot of floor space is $5.00. Based on these estimates the cost of the building would amount to about $30,000.

POWER

About 480 kilowatt hours per day or 120,000 kilowatt hours per year are required. The cost of power is estimated at about $2,100 per year.

WATER

Water is required for steam, sanitary purposes and fire protection. The cost of water is estimated at $300 per year.

FUEL

About 45 gallons per day of light fuel oil or 11,250 gallons per year are required. The cost of fuel oil is estimated at $1,000.

PRODUCTION TOOLS AND EQUIPMENT

A photograph of a model Packaged Spray Dryer unit is shown on the last page of this report.

These plants are designed and installed in accordance with existing local conditions and are sold as packaged plants with or without installation costs. It is recommended that these plants be purchased on an installed basis.

Because these plants are sold on a packaged plant basis, no cost of individual prices of equipment is shown in this report.

A typical installation would consist of the spray drying tower, cyclone separators and necessary auxiliary equipment. A typical specification for such equipment follows:

Sample Spray Dryer Specifications

Production: 1,024 pounds/8 hour day

Drying Chamber

One (1) - Structurally rigid drying chamber, with all product contact surfaces of stainless steel, will be provided. This chamber consists essentially of five flanged cylindrical sections, each approximately 14 feet in diameter by eight feet high; a top cover; flanged openings for hot air inlet duct; a flanged cone bottom section with flanged

bottom opening. A port with removable cover is provided in the top cylindrical section for spray nozzle access and tower wash down, and a bolted manhole in each of the other sections for access. Light ports are provided at top and bottom of drying chamber for visual observation. All companion flanges are match drilled for bolting together, all pieces are match marked for easy assembly. Unit is furnished complete with necessary supporting lugs, located to suit purchaser's structural steel supports.

Cyclone

Four (4) - Cyclone collectors, with all product contact surfaces of stainless steel, will be provided, approximately five feet in diameter by 25 feet high, with a bottom flanged outlet; flanged opening for duct connection to the drying chamber; as well as a flanged opening for the duct connection to fan. All companion flanges are match drilled and all sections are match marked for easy assembly. Unit is furnished complete with necessary supporting lugs located to suit purchaser's steel supports.

Air Heater

One (1) - Direct fired air heater, suitable for burning gas or fuel oil. Unit is complete with steel supports, fire tile or brick if necessary, insulation, burners, and all necessary safety and operating controls, including temperature recorder-controller. Unit is normally

furnished with a spark ignition and gas pilot.

Spray Nozzle Assembly and Piping

One (1) - Spray nozzle manifold of stainless steel, complete with all necessary shut-off and control valves and sufficient stainless steel pipe to connect feed pump, strainers, preheater, and spray nozzle manifold. All piping except that on manifold proper will be furnished in random lengths. One set (6) of stainless steel hydraulic atomizing nozzles, plus two sets of spares, will be provided.

Feed Preheater

One (1) - Tubular type steam heater exchanger, with all product contact surfaces of stainless steel, or, alternatively, adequate steam tracing of spray dryer pump discharge line will be provided. Method of preheating feed solution prior to its entry into spray dryer will be specified by the manufacturer after the client has submitted representative samples of his feed liquor.

Feed Strainer

One (1) - Strainer for feed solution, with cast iron body and stainless steel perforated metal screens, will be provided.

Fan and Drive

Two (2) - Centrifugal fans, complete with motor and variable speed drive. Purchaser is to specify the electrical power characteristics.

Tower Feed Pump

One (1) - Reciprocating positive displacement pump, with stainless steel liquid end, complete with motor and variable speed drive. Purchaser is to specify the electrical power characteristics.

Connecting Ductwork

One (1) - Lot of steel and stainless steel ductwork, as required to connect the various components of the spray-drying system. Sufficient lengths of duct and fittings in each size will be furnished to permit reasonable variation in purchaser's actual installation.

Ducts coming in contact with product will be of stainless steel. Each length of ductwork will have flanged ends match drilled for bolting to preceding and following lengths. Necessary curved sections will be provided. If the spray dryer is to be installed in a proposed or existing building, the purchaser shall submit complete plan and elevation drawings of the proposed location for installation of the spray dryer in order to facilitate specification of all necessary ductwork and determination of equipment layout, erection and support requirements.

Instruments

One (1) - Remote recording thermometer, with sensitive element located to read top tower temperature.

One (1) - Remote recording thermometer, with sensitive element located to read bottom tower temperature.

One (1) - Remote reading pressure gage at spray nozzle manifold.

One (1) - Direct reading pressure gage at feed pump discharge.

One (1) - Remote reading dial thermometer at feed preheater discharge.

All remote reading instruments are furnished for centralized mounting.

The cost of the packaged plant complete is estimated at about $55,000. Installation of the plant is estimated at $11,000.

Based on these figures the total cost of the plant installed would amount to $66,000.

FURNITURE AND FIXTURES

Item	Number Required	Unit Cost	Cost Estimated	Cost Actual
Desk and chair	1	$150	$ 150	
File cabinets	2	75	150	
Typewriter	1	150	150	
Adding machine	1	150	150	
TOTAL			$ 600	

DIRECT LABOR

Occupation	Number Required	Hourly Rate	Annual Cost Estimated	Annual Cost Actual
Skilled operator	1	$2.50	$ 5,000	
Semi-skilled operator	1	2.00	4,000	
Unskilled operator	1	1.50	3,000	
TOTAL	3		$ 12,000	

INDIRECT LABOR

Occupation	Number Required	Hourly Rate	Annual Cost Estimated	Annual Cost Actual
Manager	1	Salary	$ 8,000	
Office staff	1	Salary	5,000	
TOTAL	2		$ 13,000	

DEPRECIATION

Description	Estimated Cost	Years Life	Annual Cost Estimated	Annual Cost Actual
Building	$ 30,000	20	$ 1,500	
Production tools and equipment	66,000	10	6,600	
Furniture and fixtures	600	10	60	
TOTAL			$ 8,160	

MANUFACTURING OVERHEAD

Item	Annual Cost Estimated	Actual
Depreciation	$ 8,160	_____
Indirect labor	13,000	_____
Power	2,100	_____
Water	300	_____
Fuel	1,000	_____
Supplies	3,600	_____
TOTAL	$ 28,160	_____

MANUFACTURING COSTS

Item	Annual Cost Estimated	Actual
Direct materials	$ 7,000	_____
Direct labor	12,000	_____
Manufacturing overhead	29,160	_____
TOTAL	$ 48,160	_____

FIXED ASSETS

Item	Cost Estimated	Actual
Land	$ 1,000	_____
Building	30,000	_____
Production tools and equipment	66,000	_____
Furniture and fixtures	600	_____
TOTAL	$ 97,600	_____

WORKING CAPITAL

Item		Cost Estimated	Actual
Direct materials	(available at plant)	$ 300	_____
Direct labor	30 days	1,000	_____
Manufacturing overhead	30 days	2,300	_____
Reserve for sales collections	30 days	7,100	_____
TOTAL		$ 10,700	_____

CAPITAL REQUIREMENTS

Item	Cost Estimated	Actual
Fixed assets	$ 97,600	_____
Working capital	10,700	_____
TOTAL	$ 108,300	_____

SALES REVENUE

The annual capacity of this plant is 1,250 metric tons of dehydrated molasses. Based on a selling price of $66.00 per ton the annual sales revenue would amount to $85,000.

RECAPITULATION OF COSTS, SALES AND PROFITS

Item	Estimated Cost		Actual Cost
Direct materials	$ 7,000		
Direct labor	12,000		
Manufacturing overhead	28,160		
Total manufacturing cost		$ 47,160	
Interest on loans	3,000		
Insurance	300		
Legal	300		
Auditing	600		
Unforeseen expense	2,640		
Total administrative costs		6,840	
Sales commissions		4,000	
Travel, bad debts, discounts and allowances, freight-out		2,000	
Profit before taxes		25,000	
Total annual gross sales		$ 85,000	

If this plant is owned by the sugar refinery the only direct materials cost would be $3,400 for packaging material.

BUDGET CONTROL:

A requisition form designed to provide accurate records of procurement and indicate the purpose of procurement with the least amount of time and effort is shown on the following page.

This form has an account number for each type of the various expenditures which the manager will review in detail, monthly or oftener, in order to control his expenses. Some items, such as power and water, are usually under contract and are easily checked by reference to monthly bills. For simplification, items (marked with an asterisk below) are omitted from the purchase requisition. Variations in the labor costs are easily reviewed by examination of the payroll vouchers. The simplified type of control thus provided makes certain that the manager can control expenditures promptly.

Following the requisition form, a sample voucher check is shown. Voucher checks should be used for the payment of all expenditures and the appropriate book account number placed on each voucher.

At the end of each month the manager will receive a statement of all expenditures broken down by budget accounts. If the expenditures exceed the budgeted monthly allowances of any of the accounts, the bookkeeper will furnish the manager with a break-down of all expenditures relative to the budgeted accounts exceeded. All these supporting data can be secured by reference to the purchase requisitions and the check vouchers. This reference will enable the manager to determine what caused the over-expenditure and take corrective action.

If at any time during each month it becomes apparent that expenditures will exceed any of the budget accounts, the bookkeeper will bring this to the attention of the manager for his information and action.

BUDGET CONTROL ACCOUNTS:

Account Number		Monthly Expense	Monthly Budget	Annual Budget	Actual
10	Administrative	$_____	$ 350	$ 4,200	$_____
20	Sales	_____	500	6,000	_____
30	Direct Materials	_____	583	7,000	_____
40	Supplies	_____	300	3,600	_____
51	Power*	_____	175	2,100	_____
52	Water*	_____	25	300	_____
53	Fuel	_____	833	1,000	_____
60	Unforeseen Expense (Reserve Account)	_____	220	2,640	_____
71	Direct Labor*	_____	1,000	12,000	_____
72	Indirect Labor*	_____	1,083	13,000	_____
80	Depreciation (Reserve Account)	_____	680	8,160	_____

PURCHASE REQUISITION	COMPANY NAME	DATE

☐ 10 ADMINISTRATION ☐ 40 SUPPLIES

☐ 20 SALES ☐ 50 UTILITIES

☐ 30 MATERIALS ☐ 60 UNFORESEEN EXPENSE

INDICATE BELOW THE USE OF MATERIALS

☐ DIRECT MATERIALS ☐ MAINTENANCE SERVICES

☐ MAINTENANCE MATERIALS ☐ OPERATING SUPPLIES

	PLEASE ORDER THESE MATERIALS OR SERVICES	DELIVERY WANTED	
QUANTITY	DESCRIPTION	UNIT	TOTAL

QUOTES FROM		REQUISITIONED BY	
QUOTES FROM		APPROVED BY	
QUOTES FROM		ORDER NO.	ORDER DATE

R. W. MITCHELL MANUFACTURING COMPANY

1422 BOSWORTH STREET, S. E.

65-22
514

ANYWHERE, U. S. A. _____ 19___ No. 10000

PAY _____ DOLLARS $ _____

TO THE ORDER OF

R. W. MITCHELL MANUFACTURING COMPANY

TO FIRST NATIONAL BANK
ANYWHERE, U. S. A.

BY SAMPLE CHECK
VICE PRESIDENT

ACCOUNT NUMBER

Sample voucher check to be used for the payment of all expenditures in connection with Budget Control.

R. W. MITCHELL MANUFACTURING COMPANY

ENGINEERS:

The services of professional engineers are desirable in the design of this plant, even though the proposed plant is small.

A correct design is one which provides the greatest economy in the investment of funds and establishes the basis of operation that will be most profitable in the beginning and will also be capable of expansion without expensive alteration.

The addresses of professional engineers who specialize in industrial design, some of whom may be willing to undertake such work on low cost projects overseas, can be secured by reference to the published cards in various engineering magazines. They may also be reached through their national organizations, one of which is the

National Society of Professional Engineers
2029 K Street, Northwest,
Washington 6, D. C.

Manufacturers of industrial equipment employ engineers familiar with the design and installation of their specialized products. These manufacturers are usually willing to give prospective customers the benefit of technical advice by those engineers in determining the suitability of their equipment in any proposed project.

The equipment manufacturers also know, and can recommend, professional engineers in private practice, who are willing and able to provide appropriate consulting services.

TRAINING:

Manufacturing an inferior quality of product during the training period could create sales resistance that might be difficult to cope with later. To avoid such possibilities, the quality of the product should be maintained at all times, including the training period.

In some areas skilled operators may be available locally. In other areas all the operators may have to be trained.

If skilled operators are not available, adequate training would be assured by using one or more of the following methods:

A. If the plant is designed and installed by a competent engineering firm, the contract should be negotiated, if possible, on a turn-key basis. On this basis the contractor agrees to operate the plant and produce the quality and quantity of the product stated in the contract for an agreed period of time. Such a contract would assure adequate personnel training, since full quantity and quality could not be produced with an untrained organization.

B. The engineering firm that designs and installs the plant can usually make training arrangements to have key personnel placed, for training purposes, in a foreign industry that produces the same type of product. This would provide training for the key personnel while the plant is being installed.

C. If neither of the above methods is possible, then qualified and experienced individuals should be employed for the key positions, either permanently or temporarily, to perform the key operations and assist in training the organization, even if they must be secured outside the country.

D. The manager should have years of successful experience in this type of business and be fully qualified in all phases of management, including the training of employees.

SAFETY:

There is always danger of accident and injury in any industrial plant. Because of this, the manager should take specific action to bring to the attention of each employee the importance of safety precautions and intelligent first aid.

Practically all machines have safety appliances, and the manager should see that these are in good working condition and that the operators are making full use of them.

In addition to constant watchfulness to make sure that all practicable safety precautions are taken, first aid supplies should be readily available. One complete first aid kit should be maintained near the manager's office, and others at appropriate places throughout the plant. Some of the employees should be trained to provide first aid service.

The use of accident posters in the plant have proved to be of value in reducing accidents. It is recommended that such posters be used, and that some direct special action be taken by the manager, at least once each month, to bring to the attention of all personnel the importance of safety precautions.

A fire brigade should be established and each member trained as to his responsibility in case of fire. Fire drills should be conducted periodically.

It is recommended that the employees be encouraged to offer suggestions or recommendations relative to prevention of accidents, removal of fire hazards and maintaining general interest in all safety factors.

OTHER CONSIDERATIONS

There are other important subjects, shown below, that should be fully investigated and considered. Information on these subjects is usually available from such sources as banks, government agencies, exporters and importers, wholesalers, retailers, transportation companies and manufacturers.

MATERIALS AND SUPPLIES

1. Are all materials and supplies available locally?
2. Is the local material market competitive?
3. Is satisfactory delivery of local materials assured at reasonable prices?
4. What materials and supplies must be imported?
5. Are they available in world markets at competitive prices?
6. Would prompt delivery of imported materials and supplies be assured so that large inventories would not be required?

MARKET FACTORS

1. Is there already a demand for the product?
   - A. Who are the principal consumers?
   - B. Who are possible new consumers?

2. How is demand for the product now satisfied?
   - A. By local production? If so, what is the volume of annual production?
   - B. What percentage of consumption is filled by local production?
   - C. By imports? If so, what is the volume of annual imports?
   - D. What percentage of consumption is met by imports?
   - E. From what areas are imports derived?

3. What is the estimated annual increase in local consumption over the next five years?
   - A. How were such estimates made?
   - B. By reference to official figures on population growth, family budgets, imports, etc.?
   - C. By consultation with trade or industry, ministries, associations, bankers, commercial houses, wholesalers, retailers, industrial consumers, etc.?

4. If the product is already being manufactured, can the existing and estimated future local market absorb production of the new plant without price-cutting or other dislocations?

5. Would the estimated sales price and quality of the new product make it competitive with an imported equivalent?
   A. After adjusting cost to local conditions, is the estimated sales price of the product so high that tariff protection is necessary to protect it from imports?

EXPORT MARKETS:

1. Could the product compete in export markets on the basis of price, quality and dependability of supply?
2. Can export markets for the product be developed?
3. If so, in what areas and in what annual volume?
4. What procedures would be necessary to develop export markets?
5. What would it cost?

MARKETING PROBLEMS:

1. In calculating costs of the product, has adequate allowance been made for the expense of a sales department, advertising and promotion that might be required?

2. Do consumer prejudices against locally manufactured products exist?
   A. If so, why?
   B. Would they apply to the new product?
   C. If so, how could they be overcome and what would it cost to do so?

3. Do marketing and distribution facilities for the product exist?
   A. If not, can they be set up?
   B. What would it cost to do so?

4. Will the product be sold to:
   A. Wholesalers?
   B. Retailers?
   C. Direct to consumer?
   D. Other industries?
   E. Government?

ECONOMIC FACTORS:

1. How much foreign exchange (and in what currency) is required to import machinery, equipment and supplies:
   - A. How much foreign exchange (and in what currency) is required for annual interest payments and amortization of any loans contracted to import machinery and equipment, or for payment of royalties and technical services?
   - B. How much foreign exchange (and in what currency) is required for annual import of raw materials and supplies?
   - C. What are estimated annual foreign exchange earnings and in what currencies?
   - D. Has careful consideration been given to the possibility of depreciation in the foreign exchange value of the local currency?
   - E. Has careful consideration been given to the possibility of import controls, or restrictions on availabilities of foreign exchange necessary to operate the business?
   - F. What benefits would the new business bring to the economy in the use of local raw materials: in employment and in technology?
   - G. Do dependable facilities exist for transportation, power, fuel, water and sewage?
     - (1) If not, can existing deficiencies be eliminated satisfactorily?
     - (2) What would be the cost to do so?

PERSONNEL:

1. Is there an adequate labor supply near the plant location?
   - A. If not, how can the problem be solved?

2. Can the problem of training competent management and supervisory personnel be solved?
   - A. Also, the training of skilled labor?
   - B. Is technical advice available in the locality?
   - C. If not, where can it be obtained and what will it cost?

LAWS AND REGULATIONS:

1. Do existing labor laws, government regulations, laws and taxes favor establishment of new business?
   - A. If not, can existing obstacles be removed?
   - B. If so, how and when?

FINANCIAL FACTORS:

1. Technical advice on selection of machinery and equipment.
   A. In selecting the machinery and equipment for the new plant, have reputable and competent engineers and technicians been consulted?
   B. Have they been asked for advice on the most suitable types of machinery and equipment for the process and locality?
   C. Have they carefully compared costs of various suppliers?
   D. Credit terms offered purchasers?

FINANCIAL REQUIREMENTS OF THE PROJECT:

1. In estimating the cost of the project, has careful consideration been given to:
   A. The effect on costs of delays in construction schedules?
   B. In delivery and installation of machinery and equipment?
   C. In import of essential raw materials and supplies?

2. In calculating cash flow and working capital requirements, has careful consideration been given to:
   A. Maintaining adequate inventories of raw materials?
   B. Supplies and spare parts?
   C. Seasonal fluctuations in the business?
   D. The time required to liquidate credit sales to customers and bad debts?
   E. The period necessary to get the plant into production?
   F. Cash required to amortize its principle loans?

3. If the economy is in a period of inflation, has full allowance been made for the influence of rising prices and wages on the cost of the project and on working capital requirements?

SHORT TERM BANK CREDITS:

1. Has it been possible to make arrangements with local banks to finance short-time working capital requirements of the business?

FINANCIAL PLAN:

1. Has a definite plan to finance the project been worked out?
   A. Is sufficient capital available locally?
   B. If not, what is the plan to obtain the required capital?

BIBLIOGRAPHY

There are no known textbooks or periodicals devoted to the subject of dehydrated molasses.

There are several firms in the United States, however, that manufacture spray dryers.

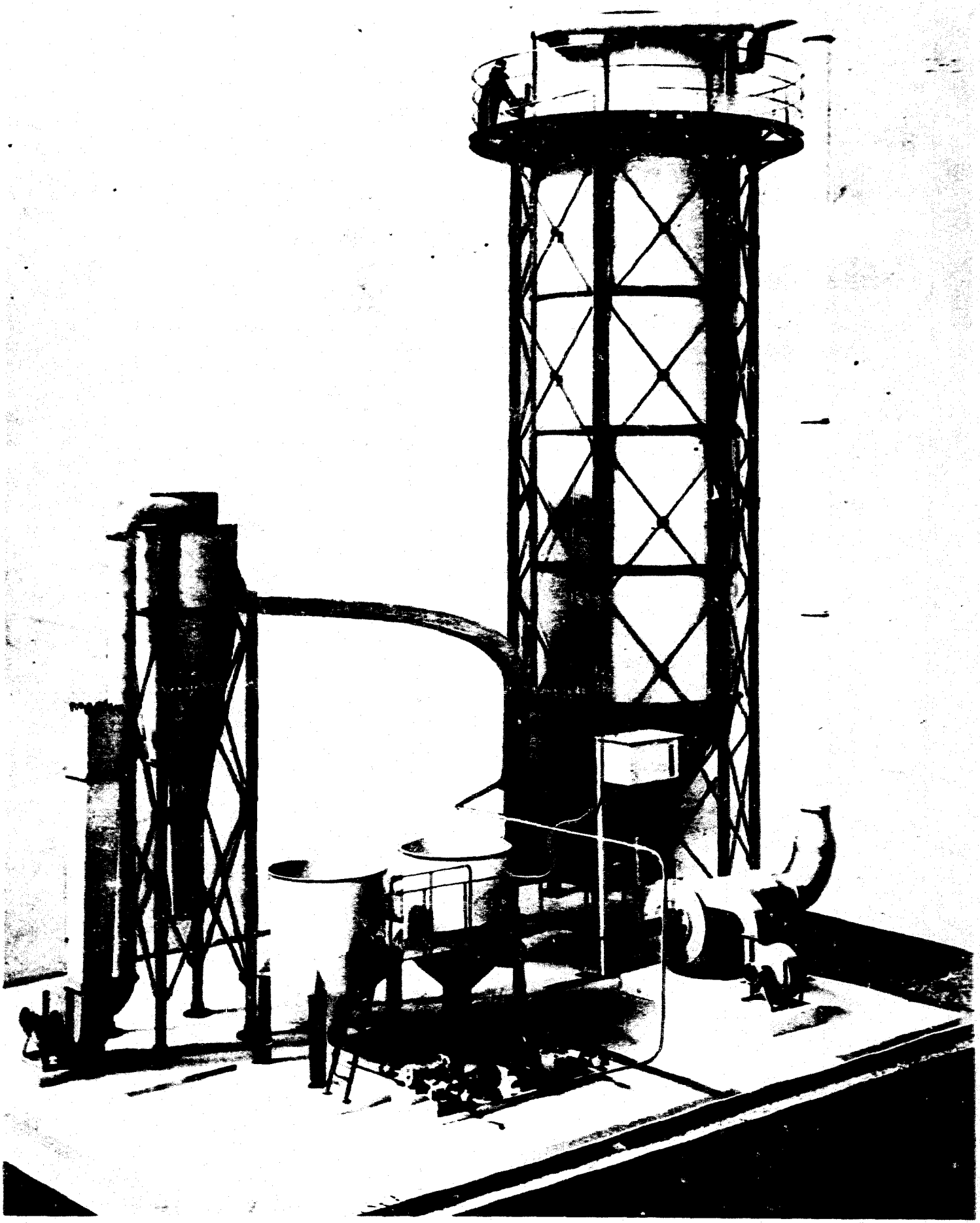
The following firms are representative U. S. manufacturers:

Bowen Engineering Company
Northbranch 3, New Jersey

Nichols Engineering and Research Corporation
70 Pine Street
New York, New York

Foster D. Snell, Incorporated
29 West 15th Street
New York 11, New York

Swensen Evaporator Manufacturing Company
15613 Lathrop Avenue
Harvey, Illinois



Model of a Spray Dryer