PLANT REQUIREMENTS FOR MANUFACTURE OF STARCH

TECHNICAL AIDS BRANCH
INTERNATIONAL COOPERATION ADMINISTRATION
Washington, D. C.

FOREWORD

This brochure is one of a series of [illegible] overseas technical inquiries on factory [illegible] installations, operation, management and [illegible] report is designed to provide only a general [illegible] factors that must be considered in [illegible] a factory of this type. In most cases, [illegible] installations will require expert engineering and [illegible] 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 Thompson and Williams, Pennsylvania Building, Washington, D. C.

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

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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.

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INTRODUCTION

Starch may be made from a number of raw materials. This report is based on the manufacture of starch from corn since 98 percent of the starch made in the United States is made from corn.

The starch manufacturing plant described in this report is small in comparison with American starch plants. It is intended to manufacture pearl starch from which other products can be made. In addition to pearl starch several by-products will be produced in this plant.

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 twenty-four hours a day, seven days a week, and fifty weeks or three 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

The starch produced in this plant will be of the basic type known as "pearl starch." It is an unmodified, powdery or roughly ground starch, produced in continuous driers and containing about 12 percent moisture. It is the basic starch for further processing.

PRODUCTION CAPACITY

The production capacity of the plant described in this report is 80,000 pounds of starch in a day of twenty-four hours, or 14,000 tons of starch a year. The hourly rate of starch production is 3,333 pounds. Some by-products are also produced. The starch production is 32 pounds of pearl starch per bushel of corn. Eight hundred and seventy-five thousand bushels of shelled corn will be required for the annual production of this plant. Pearl starch is produced in continuous driers and contains about 12 percent moisture.

MANUFACTURING UNIT

The manufacturing unit for this plant is one pound of pearl starch.

MANUFACTURING OPERATIONS

In 1841 the United States Patent Office issued a patent for making cornstarch. From this beginning there has been developed a widespread industry using many different kinds of materials and producing many types of starch and starch derivatives. In these industries there are many different manufacturing operations, with specialized equipment and a number of patented methods.

A considerable amount of intricate machinery and equipment is used in the wet milling of corn for the production of starch.

For this report the type of starch considered is known as pearl starch and the process used in its manufacture is known as wet-milling.

The general process used is described below. Variations are possible in the details of the process followed and in the design of equipment used. Steps in the process are as follows:

1. Receiving, preliminary storage, and cleaning. Shelled corn is usually shipped in carload lots (1700 bushels) by rail. It may also be shipped by truck or by barge, depending on the facilities available for transportation. Shelled corn is unloaded from the boxcars with power shovels, air conveyors or other mechanical devices. Samples of the corn are taken and the unloaded corn is weighed and conveyed to silos, where it is stored.

2. Cleaning is done before storing and, if required, again on removal of the corn from storage. The purpose is to remove dust, dirt, pieces of corncob, and other foreign material. Mechanical cleaners agitate the kernels over a series of perforated metal sheets or screens. A blast of air blows away the lighter material, the grains of corn drop through the openings and electromagnets remove bits of metal.

3. Steeping or soaking is done in a series of tanks, where the corn is immersed in circulating, warm water to which a small amount of sulfur dioxide has been added to facilitate the processing and to inhibit fermentation. The steepwater amounts to from

seven to 14 gallons per bushel of corn, or 6,125,000 gallons to 12,250,000 gallons per year. The steepwater, which contains 0.07 to 0.25 percent sulfur dioxide, is heated in heat exchangers to 116° Fahrenheit to 133° Fahrenheit, and is circulated by counter-flow through the steeping corn. This process water is passed through a reheater and is recirculated. Process water at other stages is reused where practical. The steepwater that has been circulated contains soluble proteins and minerals of the corn and these are recovered as by-product material. The steeping swells and softens the kernels, loosens their hulls, and facilitates the separation of the parts. The kernels will have absorbed 45 to 50 percent moisture.

4. Degerminating is done in attrition mills set loosely to avoid crushing the grain. When the kernels pass between the revolving circular plates, protruding teeth tear them apart - hulls, gluten, starch, and germs - which parts are carried away by water flowing through U-shaped tanks. The oil-bearing germs rise to the surface and are skimmed off to be processed as a by-product.
5. Milling the heavier parts of the kernel, screened out from the underflow at the bottom of the germ separators, is done in buhr-stone or hammer mills. A typical buhr mill has one 54-inch circular grinding stone weighing 3,000 pounds which revolves above a stationary stone to rub the gluten and starch from the hulls. The resulting slurry contains only finely dispersed

protein, starch, and some water-soluble material.

6. Screening of the finely ground wet mash from the burh mill is done by washing through a series of sieves, called reels and shakers, to remove any remaining hull fibers. The reels are hexogonal cylinders made of perforated stainless steel sheets. Some are made with nylon cloth stretched over the frames instead of the stainless steel sheet. The slurrey is fed into one end of the reel. As the reel rotates the washer washes the gluten and starch through the screen. Hulls are collected and ejected at the lower open end of the reel. Some of the very fine fibers goes through the screen with the starch and gluten and must be separated out by the shakers. These are rectangular sieves with bottoms of tightly stretched nylon cloth. They are vibrated rapidly back and forth as the mash from the reels flows onto them. The fibers thus screened out are put with the hulls to form abother by-product. The decanted liquid passes to the centrifuge.

7. Centrifuging the gluten and starch mixture separates the gluten from the starch. The gluten is another by-product, the further processing of which is not a part of this report. The starch, after separation, is a thick slurry.

8. Filtering and washing the starch removes any soluble matter that may remain.

9. Drying starch from the filters is done in continuous driers. The moisture is reduced to the desired percentage which may be between

10 percent and 14 percent for pearl starch. The pearl starch contains both fine powder and lumps. It is sometimes ground fine enough to pass a 200 mesh screen.

10. Packaging is done by machine. The pearl starch is weighed, after which it is packed into paper bags holding 100 pounds each. Larger bags may be of jute, burlap, or cotton and may hold 140 pounds of pearl starch. Only the 100 pound bag is used in estimates made in this report.

Approximate Yield of Products from Corn Grain by the Wet Milling Process

Products	Yield, % dry basis
Intermediate	
Table Starch	68.2
Gluten	9.0
Coarse and fine fiber	8.0
Germ	7.3
Steepwater solids	6.5
End Products	
Starch	66.0
Feed	29.8
Oil	3.2

By-products of the cornstarch processing plant may offer an opportunity for additional profitable operations.

Steepwater solubles are useful in the manufacture of antibiotics. Steepwater is used as a food for the molds from which penicillin and other antibiotics are extracted. Steepwater is also useful as a soluble for stock-feed, a yeast food, and inositol, a component of the vitamin B complex.

Gluten and the fiber from hulls are useful as poultry and livestock feeds.

The germ from the kernel is laden with oil. When the oil is removed, the remaining cake or residue is ground into a feedstuff of high nutritive value known as oil meal. The crude corn oil provides soap stock and the refined oils may be used as cooking and salad oils.

Even the hulls are useful as part of gluten feed.

Prospective starch manufactures should consider by-product manufacture and estimate the profit possible through extra capital outlay and operating costs for processing some or all of the possible by-products.

Such estimates are not included in this report.

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DIRECT MATERIALS

The direct materials required for the manufacture of cornstarch include the following:

Item	Annual Requirements	Unit Cost	Annual Cost Estimated	Annual Cost Actual
Shelled corn	875,000 bushels	$ 1.30	$1,137,500	_____
Sulfur	2 tons	22.00	44	_____
Bags, paper (100 pounds)	280,000 bags	.035	9,800	_____
Thread	2,656 pounds	1.00	2,656	_____
Total			$1,150,000	_____

SUPPLIES

Item	Annual Cost Estimated	Annual Cost Actual
Lubrication and hand tools	$ 200	_____
Maintenance and spare parts	2,000	_____
Office supplies	200	_____
Truck, gas, oil, and maintenance	400	_____
Nylon replacement	2,000	_____
Total	$ 4,800	_____

DIRECT LABOR

Occupation	Number Required	Hourly Rate	Annual Cost Estimated	Actual
Operators (degerminating process)	3	$3.00	$25,200	_____
Operators (grinding and filtering process)	6	2.50	42,000	_____
Helpers	9	1.75	44,100	_____
Laborers (warehouse & bagging)	6	1.50	25,200	_____
Total	24		$136,500	_____

INDIRECT LABOR

Occupation	Number Required	Hourly Rate	Annual Cost Estimated	Actual
Manager	1		$12,000	_____
Bookkeeper-clerk	1		5,000	_____
Chemist-foreman	2		16,000	_____
Maintenance	3	$2.50	21,000	_____
Truck driver	1	1.50	3,600	_____
Total	8		$57,600	_____

PLANT LAYOUT

A plant layout and schematic diagram of the flow of work is shown on the last page of this report.

PLANT SITE

In order to provide for future expansion a plant site of two acres will be required. The plant site should be as advantageously located as possible with respect to transportation, power, water, fuel, sources of labor and markets. The estimated cost of the plant site is $1,000.

BUILDING

A one-story building, 40 feet by 90 feet, or 3600 square feet, is required for the cleaning, manufacturing and storing of starch.

Building Use	Square Feet	Feet High	Cost Per Sq. Ft.	Cost Estimated	Cost Actual
Cleaning section	400	12	$ 10	$ 4,000	_____
Process	1,600	33	12	19,200	_____
Storage	1,600	14	4	6,400	_____
* Silo, 17,500 bushel (one week's capacity)				25,400	_____
Total				$ 55,000	_____

* 1,700 bushels = 1 carload

POWER

The connected load requirement amounts to 350 horsepower. The annual cost of power is estimated at about $10,500.

WATER

About 20,000,000 gallons of water will be required. The annual cost of water is estimated at $2,500.

FUEL

Fuel is required for heating the steepwater.

Fuel requirements are estimated at 14,000 tons of coal per year. The cost of fuel is estimated at $70,000.

TRUCK

A one-ton pick-up truck will be required. The cost of the truck is included in Other Tools and Equipment. The wages of the truck drivers are shown in Indirect Labor, and the cost of operation and maintenance is shown in Supplies.

PRODUCTION TOOLS AND EQUIPMENT

Description	Number Required	Cost Estimated	Cost Actual
Steam generating equipment		$ 35,000	_____
Steeping tanks	2	10,000	_____
Degerminating mill	1	5,000	_____
Germ separator	1	600	_____
Hex screen	1	1,200	_____
Buhr mill	1	28,000	_____
Shakers	2	1,500	_____
Reel	1	1,300	_____
Centrifuge	1	15,000	_____
Filter and press	1	10,000	_____
Drier	1	5,000	_____
Conveyors	2	2,000	_____
Sulfur dioxide generator and column		20,000	_____
Other accessories and installations		30,000	_____
Weighing and bagging equipment		3,000	_____
Unloading and loading equipment		12,000	_____
Cleaners, screens, electromagnet		13,400	_____
Total		$ 193,000	_____

OTHER TOOLS AND EQUIPMENT

Description	Cost Estimated	Cost Actual
Welding equipment	$ 400	
Chemical testing equipment	500	
Pick-up truck	2,800	
Hand tools	100	
Total	$ 3,800	

FURNITURE AND FIXTURES

Item	Number Required	Unit Cost	Cost Estimated	Cost Actual
Desks and chairs	2	$150	$ 300	
File cabinets	2	50	100	
Typewriter	1	150	150	
Adding machine	1	150	150	
Total			$ 700	

DEPRECIATION

Description	Estimated Cost	Years Life	Annual Cost Estimated	Annual Cost Actual
Building	$ 55,000	20	$ 2,750	
Production tools and equipment	193,000	10	19,300	
Other tools and equipment	1,000	10	100	
Truck	2,800	4	700	
Furniture and fixtures	700	10	70	
Total	$ 252,500		$ 22,920	

MANUFACTURING OVERHEAD

Item	Annual Cost Estimated	Actual
Depreciation	$ 22,920	_____
Indirect labor	57,600	_____
Power	10,500	_____
Water	2,500	_____
Fuel	70,000	_____
Supplies	4,800	_____
Total	$168,320	_____

MANUFACTURING COSTS

Item	Annual Cost Estimated	Actual
Direct materials	$1,150,000	_____
Direct labor	136,500	_____
Manufacturing overhead	168,320	_____
Total	$1,454,820	_____

FIXED ASSETS

Item	Cost Estimated	Actual
Land	$ 1,000	_____
Buildings and silo	55,000	_____
Production tools and equipment	193,000	_____
Other tools and equipment	1,000	_____
Furniture and fixtures	700	_____
Truck	2,800	_____
Total	$253,500	_____

WORKING CAPITAL

Item		Cost Estimated	Actual
Direct materials	30 days	$ 96,000	_____
Direct labor	30 days	11,000	_____
Manufacturing overhead	30 days	14,000	_____
Reserve for sales collections	30 days	163,000	_____
Total		$284,000	_____

CAPITAL REQUIREMENTS

Item	Cost Estimated	Actual
Fixed assets	$253,500	_____
Working capital	284,000	_____
Total	$537,500	_____

SALES REVENUE

The annual production capacity is 28,000,000 pounds of pearl starch. The current price of this product is $.07 per pound, f.o.b. plant. Based on these figures the annual gross sales would amount to $.07 x 28,000,000 or $1,960,000.

After removal of the starch there are large quantities of material left from which corn oil, corn germ meal, and feeds could be produced as by-products. This would, of course, require additional capital investment for machinery and equipment to process the by-products. However, the by-products could be sold, without proceeding to another firm that has such processing equipment.

The value of the materials left after the starch is removed has not been included in the gross annual sales shown in this report.

RECAPITULATION OF COSTS, SALES AND PROFITS

Item	Estimated Cost		Actual Cost
Direct materials	$1,150,000		_____
Direct labor	136,500		_____
Manufacturing overhead	168,320		_____
Total manufacturing costs		$1,454,820	_____
Interest on loans	$ 16,000		_____
Insurance	1,600		_____
Legal	1,000		_____
Auditing	2,000		_____
Unforeseen expense	11,580		_____
Total administrative costs		$ 32,180	_____
Sales expense		25,000	_____
Travel, bad debts, discounts and allowances, freight-out		25,000	_____
Profit before taxes		423,000	_____
Total annual gross sales		$1,960,000	_____

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	$_____	$ 1,716	$ 20,600	$_____
20	Sales	_____	4,166	50,000	_____
30	Direct Materials	_____	95,833	1,150,000	_____
40	Supplies	_____	400	4,800	_____
51	Power*	_____	875	10,500	_____
52	Water*	_____	208	2,500	_____
53	Fuel	_____	5,833	70,000	_____
60	Unforeseen Expense (Reserve Account)	_____	965	11,580	_____
71	Direct Labor*	_____	11,375	136,500	_____
72	Indirect Labor*	_____	4,800	57,600	_____
80	Depreciation (Reserve Account)	_____	1,910	22,920	_____

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?

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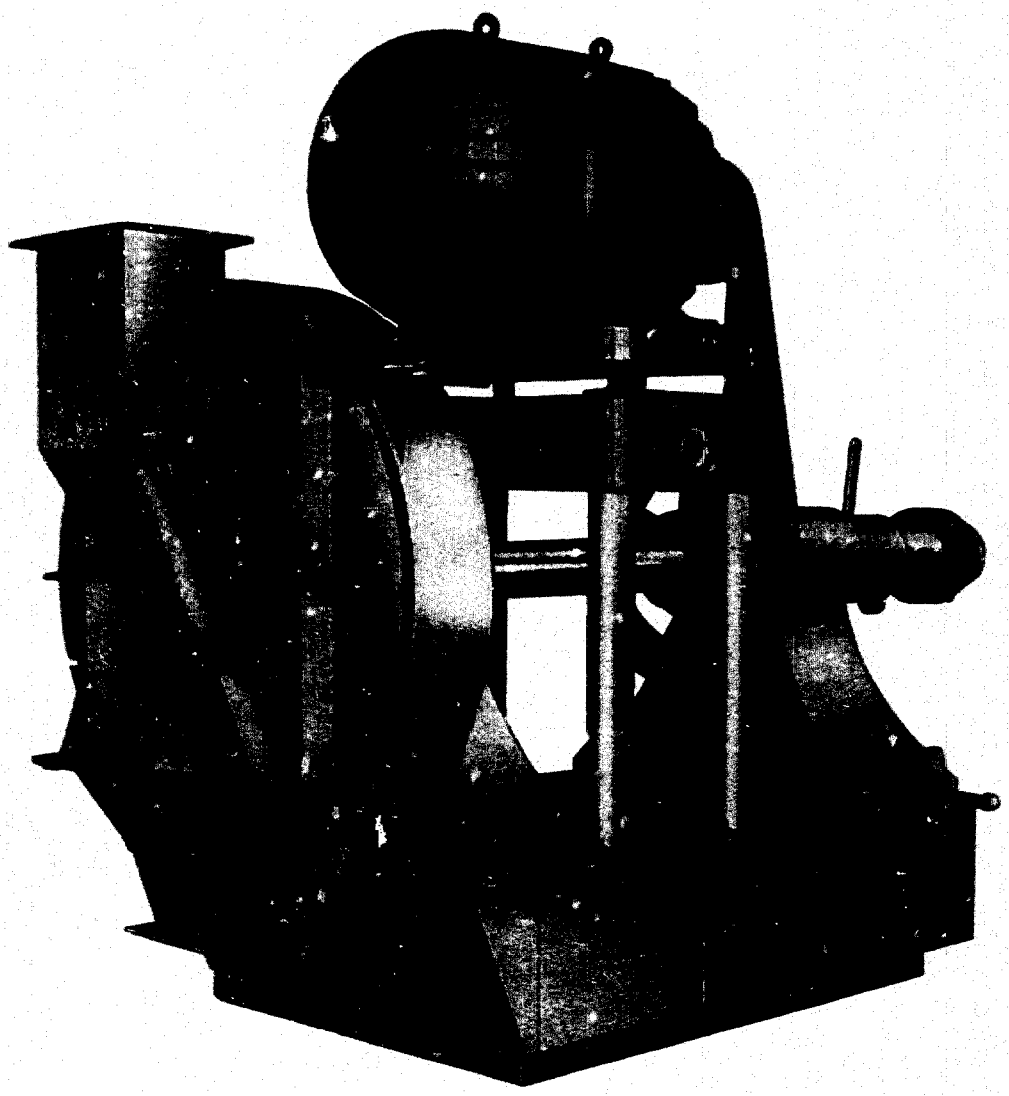

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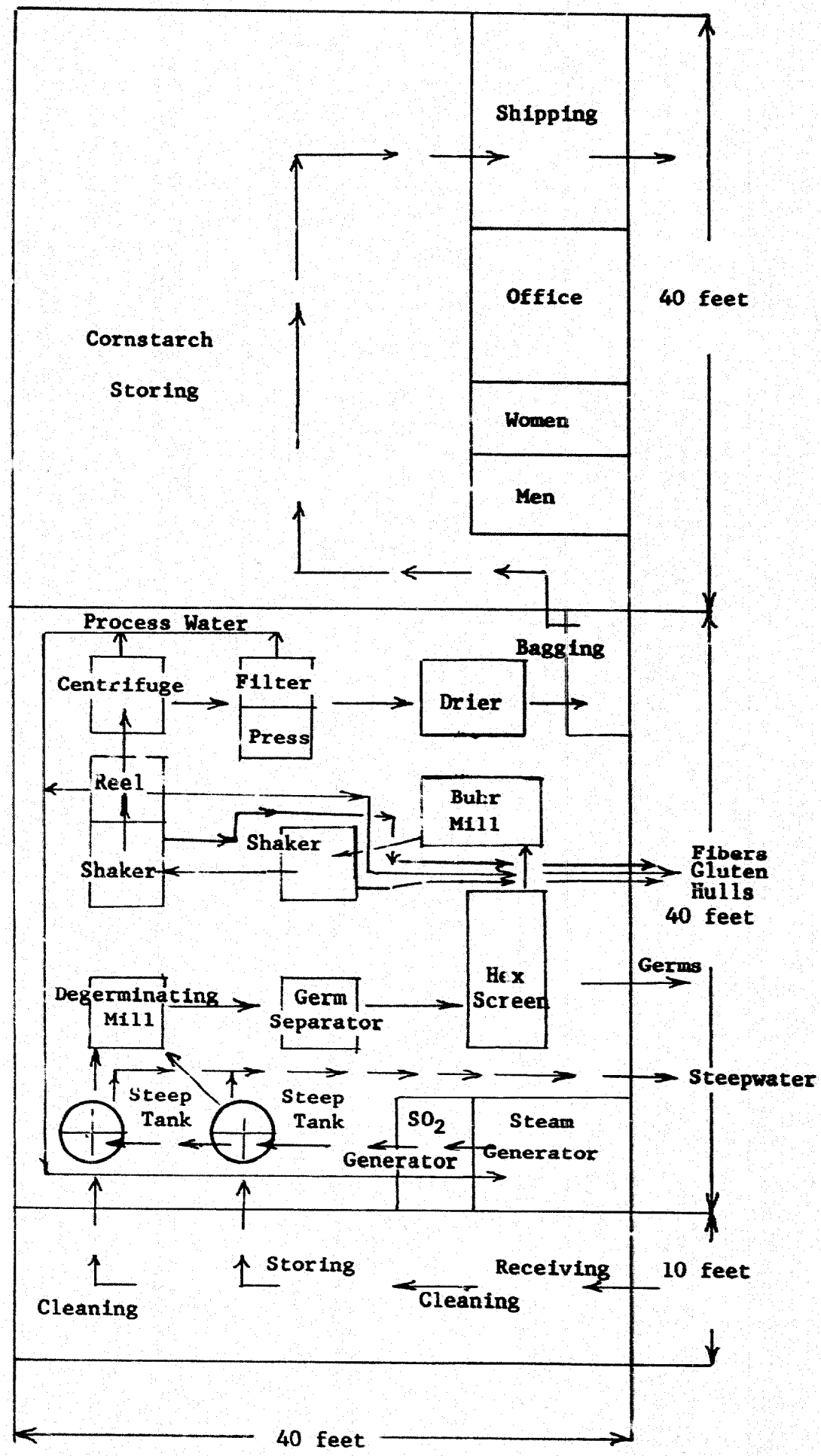
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Receiving
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