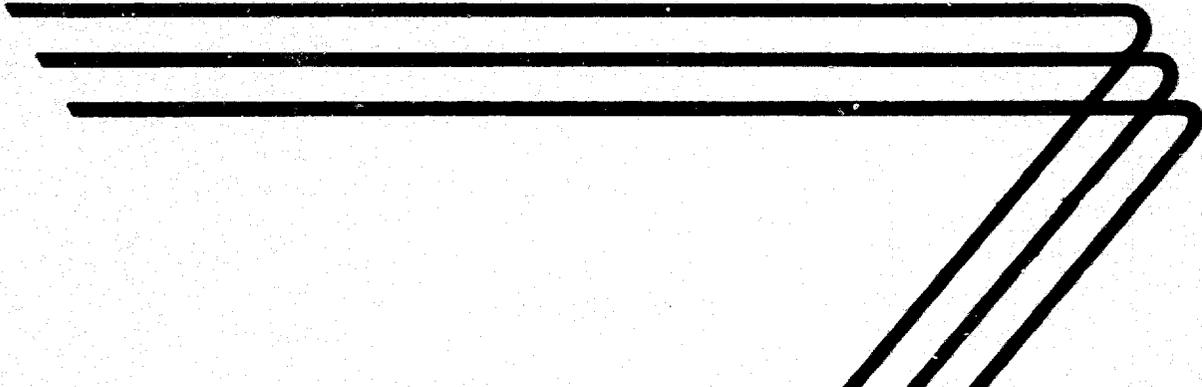


855

PLANT REQUIREMENTS FOR MANUFACTURE OF WALLBOARD FROM BAGASSE



TECHNICAL AIDS BRANCH

**INTERNATIONAL COOPERATION
ADMINISTRATION
Washington, D. C.**



**REVISED
MAY 1959**

FOREWORD

This manual is a revision of an earlier report of the same type issued in 1955. This revised version includes current costs of labor, machinery, equipment and supplies, as well as additional information relative to engineering, training, safety, markets, sales, financial and economic factors.

* * * * *

This manual is designed to provide a general picture of the factors which must be considered in establishing and operating a small-scale factory of this type. It should prove useful in creating interest in the subject and serve to give enough understanding of the related considerations to help government officials, other leaders and businessmen to determine whether the potential deserves more-detailed attention.

However, it is important to note that in most cases plans for the actual development and installation of a plant will require expert engineering and financial advice in order to meet specific local situations. For further information and assistance, readers should contact their local Productivity Center, Industrial Institute, Servicio, or United States Operations Mission.

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

* * * * *

The original report was prepared by the Wolf Management Engineering Company, Chicago, Illinois.

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

* * * * *

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

June 1959

PR-32

ACKNOWLEDGMENT

The author gratefully acknowledges the cooperation and technical information provided as well as the review of this manual by

Mr. H. D. Wells, President
Apmew Incorporated
Post Office Box 1
300 Bay Street
Glens Falls, New York

While this manual includes all new machinery and equipment, good, used, rebuilt paper machinery is available in the United States market.

TABLE OF CONTENTS

	<u>Page</u>
Introduction	1
General assumptions	1
Production capacity	2
Production specifications	2
Manufacturing unit	2
Direct materials	2
Manufacturing operations	3
Direct labor	5
Indirect labor	5
Production tools and equipment	6
Other tools and equipment	7
Furniture and fixtures	7
Supplies	7
Plant layout	8
Plant site	8
Building	8
Power	8
Water	9
Fuel	9
Truck	9
Depreciation	10
Manufacturing overhead	10
Manufacturing cost	10
Fixed assets	11
Working capital	11
Capital requirements	11
Sales Revenue	12
Recapitulation of costs, sales and profits	12

	<u>Page</u>
Budget control	13
Budget control accounts	13
Purchase requisition	14
Voucher check	15
Engineers	16
Training	17
Safety	18
Summary	19
Materials and supplies	19
Market factors	19
Export markets	20
Marketing problems	20
Economic factors	21
Personnel	21
Laws and regulations	21
Financial factors	22
Financial requirements of the project	22
Short term bank credits	22
Financial plan	22
Bibliography	23
Abbreviations	23
Electric starting panel	24
Agitator	24
Pulp washer and thickener	25
Stock pump	25
Pump screen	26
Aquabrusher, pulper and beater	26
Wet board entering press section	27
Press section	28
Wet board cutoff saw	29
Plant layout	30

P L A N T R E Q U I R E M E N T S
F O R M A N U F A C T U R E O F
W A L L B O A R D F R O M B A G A S S E

INTRODUCTION

The purpose of this manual is to present basic information for establishing and operating a small wallboard plant in a foreign country.

GENERAL ASSUMPTIONS

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

1. The plant should be located at or near a cane sugar plant where bagasse is available.
2. The costs of the building and general facilities are based on United States Prices.
3. Material costs are based on sizes and specifications of materials used in the United States.
4. Labor costs are based on the average for the industry as recently published by the United States Bureau of Labor.
5. Adequate power and water are available at the plant site.
6. Adequate transportation facilities are available at the plant site.
7. The plant operates three eight-hour shifts a day, five days a week, and fifty weeks per year.
8. No special provision is made for the training of new personnel. It is assumed that learner's rates are paid in such cases.
9. The following items cannot be estimated realistically:
 - A. Land value.
 - B. Distribution and selling costs.
 - C. In-freight and out-freight.
 - D. Taxes.

While general estimates will be made of each of these items except taxes, 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.

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

PRODUCTION CAPACITY

The plant is designed to produce about 120 boards per hour. Based on current practice, in the United States, this is a small plant. The recommended equipment and production methods are modern and have proven profitable when operated under conditions comparable to those assumed.

PRODUCT SPECIFICATIONS

All information and figures in this manual are based on the production of 4-foot by 8-foot by 1/2-inch wallboard from bagasse.

MANUFACTURING UNIT

The unit used in the manufacturing and in the sale of wallboard is 1,000 square feet.

DIRECT MATERIALS

This manual is based on the use of bagasse to produce wallboard. The length of bagasse fibers averages about 1.70 millimeters. The cost of bagasse at a sugar plant should not exceed \$16.00 per ton including baling. Allowing for waste about 7,000 tons of bagasse per year will be required. On this basis the annual cost of bagasse will amount to \$112,000.

A sugar plant usually operates about five months per year during the sugar cane harvesting season. To simplify the feeding operation as well as reducing storage space the bagasse is baled at the sugar plant.

The cost of chemicals and adhesives is estimated at about \$25 per ton of bagasse or about \$175,000 per year. On this basis, the annual cost of materials would amount to about \$287,000.

MANUFACTURING OPERATIONS

The bagasse is fed into the hammermill and screen where the hammermill breaks up the material to a fineness that allows it to pass through the classifying screen directly into the beater, which is located below the screen.

A water content of approximately 96 per cent is maintained in the beater.

The pulp is then moved by gravity to the thin stock pump where water is added to bring the fiber to about one per cent consistency while the pulp is passing to the screen.

The pulp is pumped from the beater to the recovery thickener where about 11 per cent of the liquid is removed. The liquid removed is returned to the beater.

The pulp is then drawn off by gravity into the digester or pulp refiner where the pulp is cooked. The digester is of special design, which generates about 50 per cent of the heat required and at the same time separates and brooms the fibers, which increases the quality and strength of the finished board and reduces the cost of chemicals required. The operation is automatic and does not require a chemist or highly skilled operator.

The pulp is then moved by gravity and washed twice in two cylinders. The first washing cylinder removes the remaining sugar content. The second washing cylinder completes the washing operation.

The pulp is then moved by gravity to the storage chest. At this stage the pulp contains about five per cent fiber and is rapidly circulated and agitated to maintain uniformity.

The pulp is pumped from the storage chest to the metering stuff box, where chemicals for protection against insects and the required adhesives are added and thoroughly mixed.

The pulp flows from the stuff box by gravity to the flow box of the cylinder board machine. The cylinder machine forms the board and removes much of the liquid.

The board then passes through three presses to remove most of the water and to press the board to proper thickness.

The wet saw cuts the boards to length and they are automatically fed into and through the dryer. The dryer has eight drying sections.

The boards are taken from the dryer and are trimmed to length and width and sent to the shipping department.

There are many other operations that would be required if the boards were fabricated at the plant. For example, the boards could be fabricated into smaller sizes. They could be drilled for nail or screw holes. Also, asphalt could be added to the pulp to produce a waterproof board.

However, fabrication is not included in this report. The report is based on the plant producing 4-foot by 8-foot by 1/2-inch boards.

* * * * *

DIRECT LABOR

<u>Occupation</u>	<u>Number Required</u>	<u>Hourly Rate</u>	<u>Estimated Annual Payroll</u>	<u>Actual Cost</u>
Feeding bagasse	2	\$ 1.50	\$ 6,000	_____
Wet machines	2	1.80	7,200	_____
Board machines	2	1.80	7,200	_____
Truckers	2	1.50	6,000	_____
Utility	<u>1</u>	1.80	<u>3,600</u>	_____
Total one shift	9		\$30,000	_____
Total three shifts	27		\$90,000	_____

INDIRECT LABOR

<u>Occupation</u>	<u>Number Required</u>	<u>Hourly Rate</u>	<u>Estimated Annual Payroll</u>	<u>Actual Cost</u>
Manager	1		\$10,000	_____
Foreman	3		18,000	_____
Bookkeeper	1		5,000	_____
Maintenance	3	\$ 2.00	12,000	_____
Receiving and shipping	2	1.80	7,200	_____
Truck driver	<u>1</u>	1.50	<u>3,000</u>	_____
Total	11		\$53,200	_____

PRODUCTION TOOLS AND EQUIPMENT

<u>Description</u>	<u>Number Required</u>	<u>Estimated</u>		<u>Actual Cost</u>
		<u>Unit Cost</u>	<u>Total Cost</u>	
Hammermill and screen	1	\$ 4,082	\$ 4,082	_____
Double quick pulper	1	19,950	19,950	_____
Centrifugal pump 6"	2	2,188	4,376	_____
Screw press	2	4,906	9,812	_____
Digester pulp refiner	2	14,662	29,324	_____
Centrifugal pump 6"	1	2,188	2,188	_____
Pulp screen	1	7,894	7,894	_____
Pulp washer thickener	1	11,970	11,970	_____
Consistency regulator	2	1,790	3,580	_____
Storage tank	1	3,800	3,800	_____
Agitator	1	2,546	2,546	_____
Centrifugal pump 6"	1	2,404	2,404	_____
Board machinery including cylinder board machine, presses, wet saw and trimming saw			450,000	_____
Boiler, 400 hp., 250 p.s.i.	1	97,000	97,000	_____
Starters, valves, piping and spare parts			<u>112,000</u>	_____
Total			\$760,926	

OTHER TOOLS AND EQUIPMENT

<u>Description</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Welding equipment	\$ 400	_____
Compressor	800	_____
Hand tools	500	_____
Delivery truck	4,000	_____
Total	\$ 5,700	_____

FURNITURE AND FIXTURES

<u>Description</u>	<u>Number Required</u>	<u>Estimated</u>		<u>Actual Cost</u>
		<u>Unit Cost</u>	<u>Total Cost</u>	
Desks and chairs	2	\$ 125	\$ 250	_____
File cabinets	2	75	150	_____
Typewriter	1	150	150	_____
Adding machine	1	150	150	_____
Total			\$ 700	_____

SUPPLIES

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Welding rods	\$ 200	_____
Welding gas	200	_____
Lubricants	200	_____
Maintenance materials	1,800	_____
Spare parts	1,200	_____
Hand tools	200	_____
Office supplies	200	_____
Gas, oil and maintenance for truck	600	_____
Total	\$ 4,600	_____

PLANT LAYOUT

A plant layout is shown on page 30. The manufacture of wallboard is a continuous operation from the raw material to the finished product. After the bagasse is fed into the hammermill, the operations are all automatic and the material is moved by pumps or by gravity. The part of the building containing the pulp machinery will include a basement in order to provide gravity feed of materials for many of the operations.

PLANT SITE

In order to provide storage space for the baled bagasse as well as space for future expansion, about two acres of land will be required. The site should be adjacent to a cane sugar mill, which supplies the bagasse. The cost of the site is estimated at \$2,000.

BUILDING

The building should be 60 feet wide by 300 feet long or about 18,000 square feet. A basement will be required under the part of the building that houses the pulping equipment. The building should be one-story and may be constructed of any suitable local materials. The cost of the building including the basement is estimated at \$4.00 per square foot or about \$72,000.

POWER

It is assumed that a dependable supply of electric power will be available from public power service lines. The total connected load will be about 500 horsepower. Based on this connected load, the cost of power is estimated at about \$15,000 per year.

WATER

About 1,600 gallons of water is used per minute. However, much of the water is returned and reused. The availability of water is important. The annual cost of water is estimated at \$3,000.

FUEL

The cost of fuel for steam requirements is estimated at \$12,000 annually.

Consideration should be given to the use of suitable local fuel in determining the design of the boiler to be purchased.

TRUCK

A five-ton truck will be required for delivery purposes. The cost of the truck is estimated at \$4,000.

The cost of the truck driver is shown on page five. The cost of fuel, oil, maintenance and repair parts is shown under supplies on page seven.

* * * * *

DEPRECIATION

<u>Item</u>	<u>Estimated Cost</u>	<u>Years Life</u>	<u>Estimated Per Year</u>	<u>Actual Per Year</u>
Building	\$ 72,000	20	\$ 3,600	_____
Production tools and equipment	760,926	10	76,092	_____
Other tools and equipment	3,700	10	370	_____
Furniture and fixtures	700	10	70	_____
Truck	4,000	4	1,000	_____
Total			\$ 81,132	_____

MANUFACTURING OVERHEAD

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Depreciation	\$ 81,132	_____
Indirect labor	53,200	_____
Power	15,000	_____
Water	3,000	_____
Fuel	12,000	_____
Supplies	4,600	_____
Total	\$ 168,932	_____

MANUFACTURING COST

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Direct materials	\$ 287,000	_____
Direct labor	90,000	_____
Manufacturing overhead	168,923	_____
Total	\$ 545,932	_____

FIXED ASSETS

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Land	\$ 2,000	_____
Building	72,000	_____
Production tools and equipment	760,926	_____
Other tools and equipment	3,700	_____
Furniture and fixtures	700	_____
Truck	<u>4,000</u>	_____
Total	\$ 843,326	_____

WORKING CAPITAL

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Direct materials - 30 days	\$ 23,000	_____
Direct labor - 30 days	6,600	_____
Manufacturing overhead - 30 days	14,000	_____
Reserve for sales collections - 30 days	<u>92,700</u>	_____
Total	\$ 136,300	_____

CAPITAL REQUIREMENTS

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Fixed assets	\$ 843,326	_____
Working capital	<u>136,300</u>	_____
Total	\$ 979,626	_____

SALES REVENUE

The current price of number one wallboard is \$50 per 1,000 square feet.

Defective or number two wallboard is sold at \$38 per 1,000 square feet.

The annual sales revenue is estimated as follows:

<u>Grade</u>	<u>Square Feet</u>	<u>Price Per 1,000 Square Feet</u>	<u>Estimated Annual Sales</u>	<u>Actual Sales</u>
No. 1	20,000,000	\$ 50.00	\$ 1,000,000	_____
No. 2	3,000,000	37.50	<u>112,500</u>	_____
Total Sales Revenue			\$ 1,112,500	_____

RECAPITULATION OF COSTS, SALES AND PROFITS

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Direct materials	\$ 287,000	_____
Direct labor	90,000	_____
Manufacturing overhead	<u>168,932</u>	_____
Total Manufacturing Costs	\$ 545,932	_____
Interest on loans	\$ 49,000	_____
Insurance	4,000	_____
Legal	2,400	_____
Auditing	3,600	_____
Unforseen expense	<u>40,568</u>	_____
Total Administrative Costs	\$ 99,568	_____
Sales commissions, travel, freight out, bad debts, discounts and allowances	140,000	_____
Profit before taxes	<u>327,000</u>	_____
Total Annual Gross Sales	\$ 1,112,500	_____

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

<u>Account Number</u>	<u>Monthly Expense</u>	<u>Monthly Budget</u>	<u>Annual Budget</u>	<u>Actual</u>
10 Administrative	\$ _____	\$ 4,916	\$ 59,000	\$ _____
20 Sales	_____	11,333	140,000	_____
30 Direct Materials	_____	23,913	287,000	_____
40 Supplies	_____	383	4,600	_____
51 Power*	_____	1,250	15,000	_____
52 Water*	_____	250	3,000	_____
53 Fuel	_____	1,000	12,000	_____
60 Unforeseen Expense (Reserve Account)	_____	3,380	40,568	_____
71 Direct Labor*	_____	7,500	90,000	_____
72 Indirect Labor*	_____	4,433	53,200	_____
80 Depreciation (Reserve Account)	_____		81,132	_____

Note: Administrative includes interest on loans,
insurance, legal and auditing.

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

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

R. W. MITCHELL MANUFACTURING COMPANY

BY **SAMPLE CHECK**

VICE PRESIDENT

YOUNG & RUBICAM CO.

- 15 -

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.

SUMMARY

A small plant, built and operated according to the assumptions made in this manual would be a profitable undertaking.

There are some determinations, however, that should be made before a decision is reached to build and operate such a plant. Among the necessary determinations to be made are those with respect to the following items:

MATERIALS AND SUPPLIES

1. Are all materials and supplies available locally?
2. Is the local material market competitive?
3. Are 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.?

SUMMARY (Continued)

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?

SUMMARY (Continued)

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?

SUMMARY (Continued)

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

Textbook

Selected Process Industries

McGraw-Hill Book Company
330 West 42nd Street
New York 36, New York

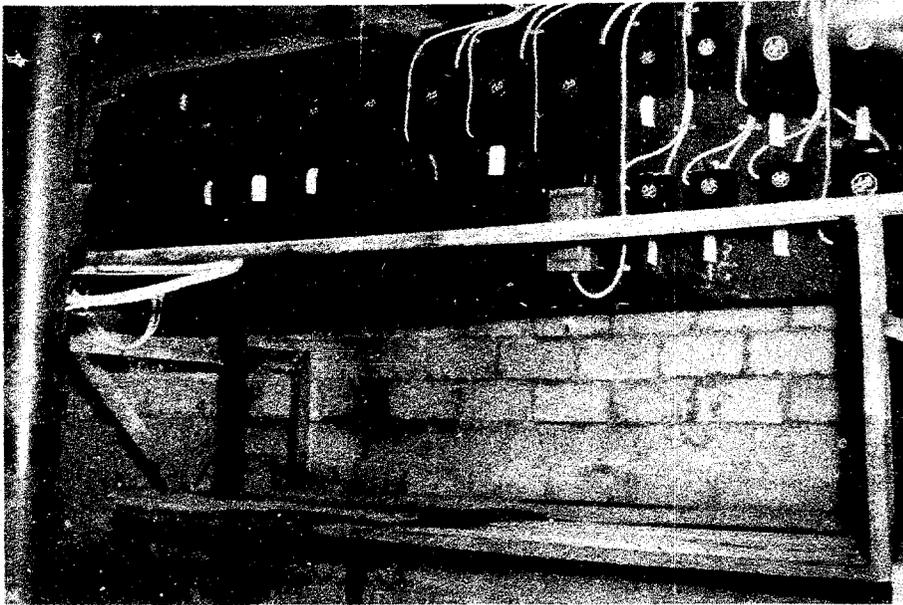
Periodicals

The Woodworker

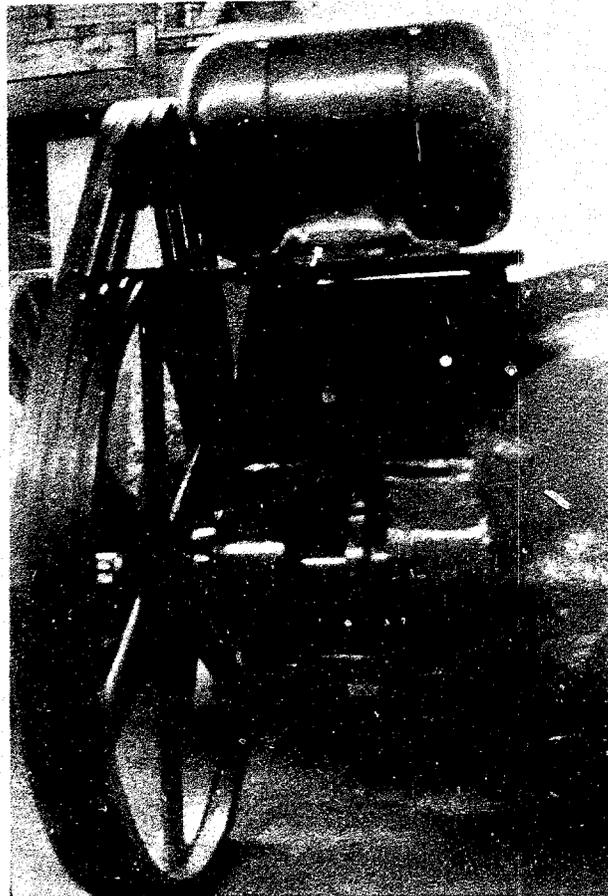
The S. H. Smith Company
2232 North Meridian Street
Indianapolis 7, Indiana

ABBREVIATIONS

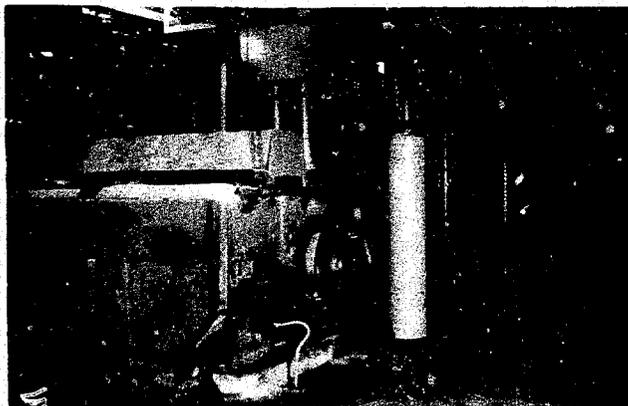
'	Foot or feet
"	Inch or inches
hp.	Horsepower
No.	Number
p.s.i.	Pounds per square inch



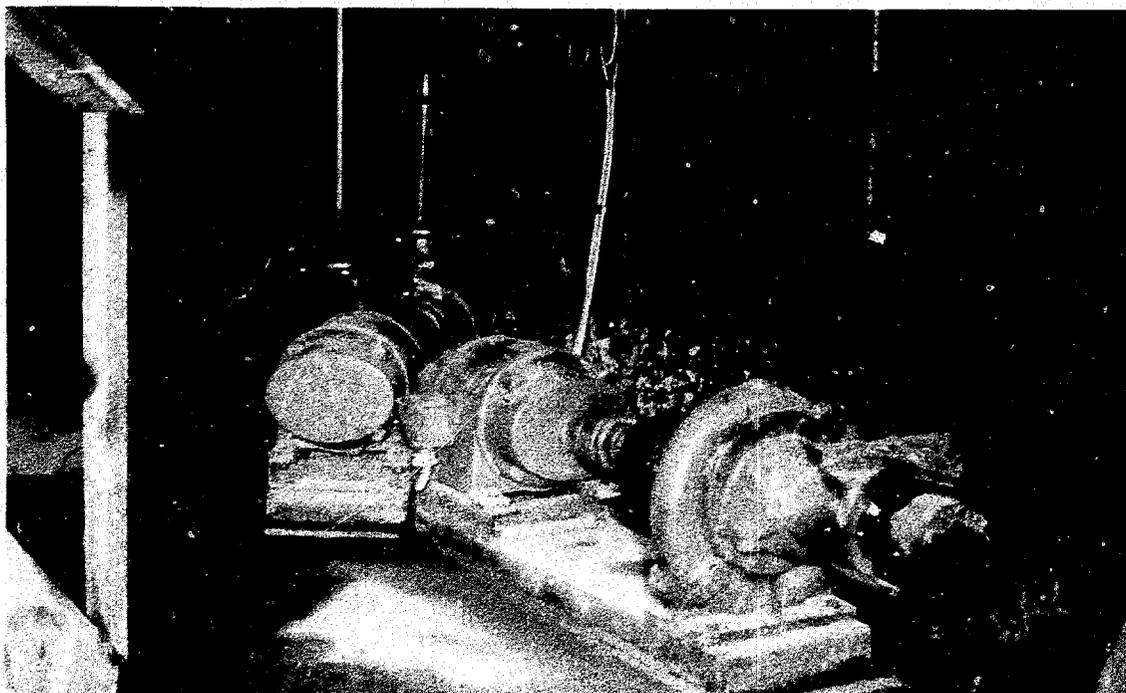
ELECTRIC STARTING PANEL



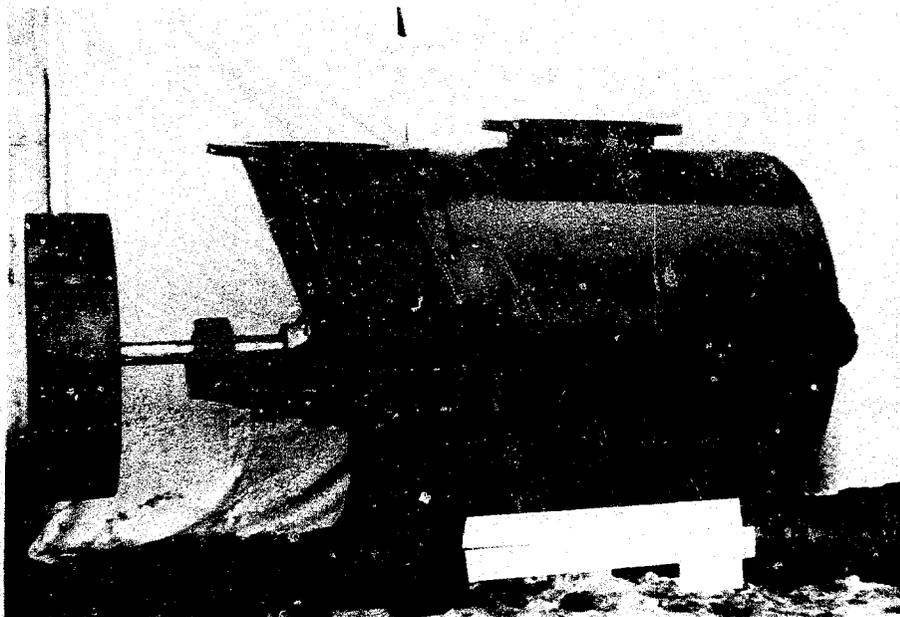
AGITATOR



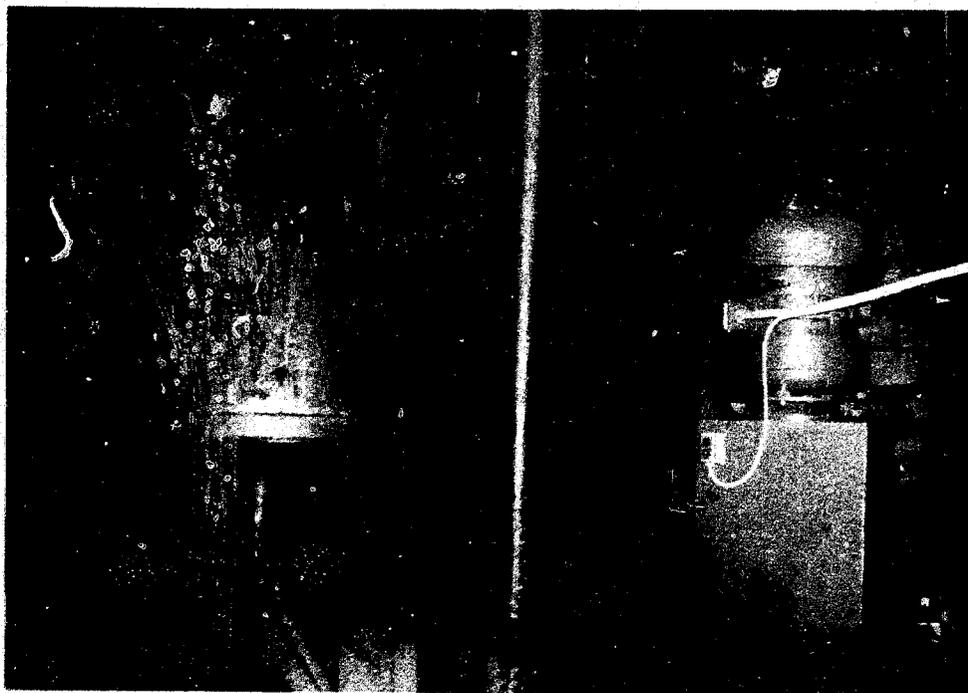
PULP WASHER AND THICKENER



STOCK PUMP

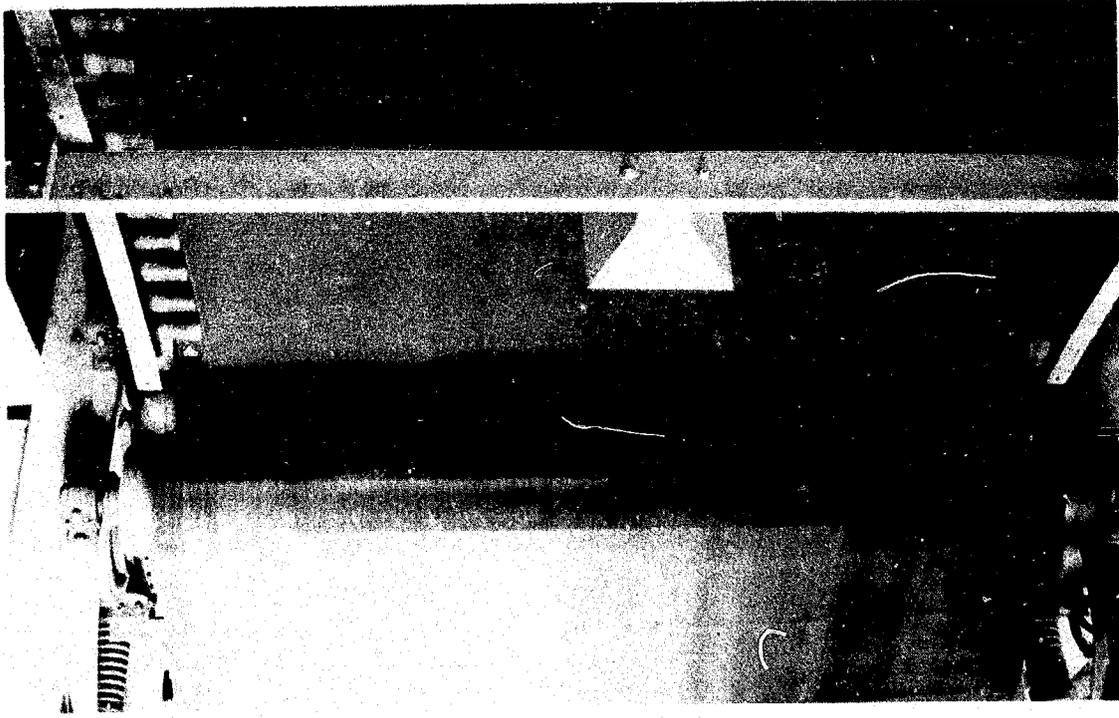


PULP SCREEN



AQUABRUSHER, PULPER AND BEATER

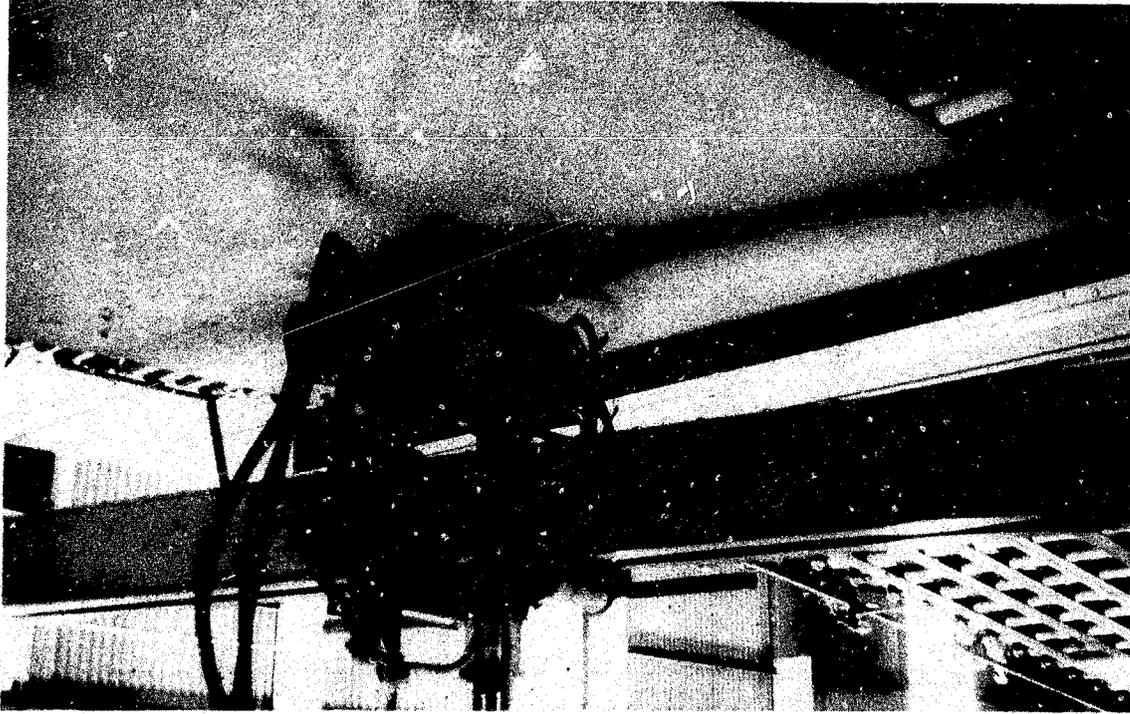
Wet Board Entering Press Section



Press Section

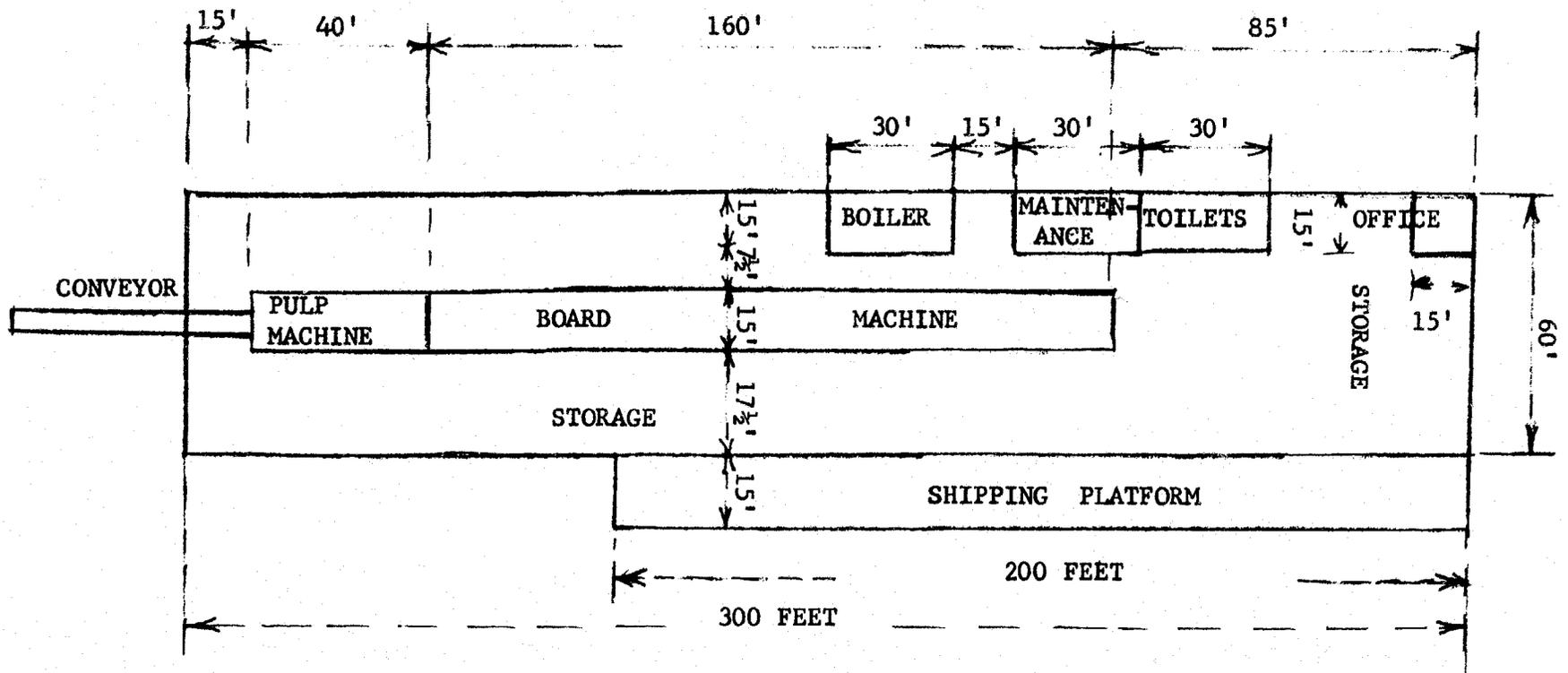


Wet-Board Cut-off Saw



PLANT LAYOUT

BAGASSE BOARD



INTERNATIONAL COOPERATION ADMINISTRATION

SERVICES OF THE INDUSTRIAL TECHNICAL COOPERATION PROGRAM

TYPE III - TECHNICAL AIDS FOR OVERSEAS

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