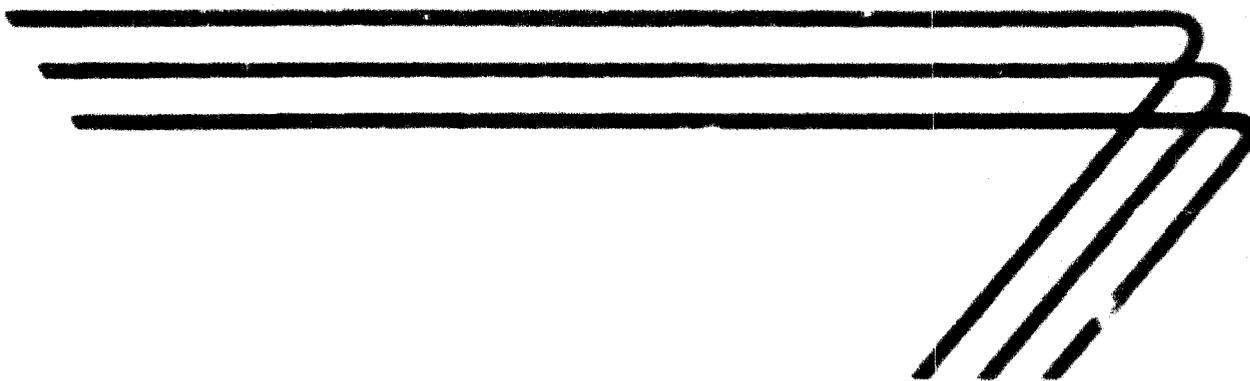


15

PLANT REQUIREMENTS FOR MANUFACTURE OF ALUMINUM KITCHENWARE



**DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
COMMUNICATIONS RESOURCES DIVISION**

Washington 25, D. C.



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 Agency for International Development, but merely a citation that is typical in its field.

This report was prepared by the George H. Andrews Engineering Associates, Inc., 411 Southern Building, Washington 5, D. C., in January 1962 for the technical aids program through the facilities of the Office of Technical Services, U. S. Department of Commerce.

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The report has been reviewed and approved by Mr. B. C. Lewis, Plant Superintendent of the Union Everedy Company, Inc., Frederick, Maryland.

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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

The purpose of this report is to present basic information for establishing a manufacturing plant in a foreign country to produce aluminum kitchenware from aluminum sheets.

There are many kitchen utensils which can be made from aluminum. These include roasting pans, cake pans, muffin pans, biscuit and cookie baking sheets, casseroles, can openers, knives, forks, spoons, molds, juice extractors. The type particularly suitable for manufacture from aluminum includes kettles, double boilers, waterless cookers, and saucepans. A saucepan has been taken as representative of this group and the estimates in this report are based on the manufacture of such a representative piece.

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 per day, five days per week, and fifty weeks per year.
7. No special provision is made for the training of new personnel. It is assumed that learners' rates are paid in such cases.

B. 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.

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

MANUFACTURING UNIT

The manufacturing unit for this product is one piece of kitchenware such as one saucepan. A pan and a cover constitute two pieces. An open pan with no cover is one piece. In computing Sales Revenue, page 13, the number of complete utensils is used instead of the number of pieces.

PRODUCTION CAPACITY

This plant is designed to produce 720,000 pieces of aluminum kitchenware per year. This production can be increased to 1,440,000 pieces per year by working two shifts per day, and to 2,160,000 pieces per year by working three shifts per day, without additional equipment.

PRODUCT SPECIFICATIONS

All information and figures contained in this report are based on the production of saucepans, double boilers, and comparable pieces made

from aluminum sheet metal. For the purpose of this report it is assumed that the saucepan manufactured in this plant is made from 18 gage aluminum sheet. Other items can be made and other thicknesses of aluminum can be used as the direct material without changes of machinery. However, suitable dies for the pieces to be made and the material to be used would be required.

MANUFACTURING OPERATIONS

Most of the operations performed in a factory for the manufacture of aluminum kitchenware are like those generally used by machinists on many other kinds of metalworking operations for the manufacture of relatively small household utensils and equipment.

The operations are described in the sequence in which they usually occur. The machines are placed so that there is flexibility of operation with the minimum of back-tracking and no confusion of traffic flow from one machine to another. Not all machines are used on the construction of every piece of work.

Receiving -- Material is received and hand-trucked to shelves, racks, or skids on the storeroom floor.

Requisitioning -- Materials are withdrawn from storage as needed and hand-trucked to the saw or shears for cutting to size.

Cutting -- The stock is cut into strips of the correct size to produce the maximum number of blanks from each strip with a minimum of waste.

Rods may be cut on the power hacksaw.

Blanking and initial forming -- The strips of aluminum sheet are fed into the blanking presses where a circular disc or blank is punched and partially formed.

The circular disc should be no larger than is required to produce a finished pan or other utensil. The excess is waste and can easily amount to a large loss of direct materials. If the disc is too small there will not be enough metal in the blank to make a perfect finished piece and the resulting loss will be not only the metal in the rejected piece but will also include labor loss as well.

Trimming and beading -- The next operation, after the initial forming, is trimming the edges to size on a trimming press. The lip of the utensil is formed as a part of this operation.

Final drawing and forming -- The final drawing and forming operations are done on a large press and in a single operation.

Particular care must be taken to make the drawing uniform to prevent bulges and wrinkles. If a bulge or wrinkle becomes apparent in the initial forming, it may be hammered or dinged out before the final drawing and forming.

Grinding, Buffing, and Polishing -- The machines used for these operations are usually lathes or similar machines that have been adapted to a utensil manufacturer's special requirements, since all three operations are applied to the inside, outside and bottom of the utensils.

Piercing -- The utensil is then pierced on the utensil pierce press, and the brackets and ferrules are pierced on the bracket pierce press.

Riveting -- The brackets are riveted to the utensils on the riveting machine.

Washing -- The entire assembly is then washed in a hooded tank or tub and delivered to inspection.

Inspecting, wrapping, and packaging -- These operations are done on a belt conveyor with tables on both sides. The utensils are inspected and placed on the conveyor. The wrappers pick up and wrap the utensils and return them to the conveyor. The packagers pick up and package the utensils in cartons containing 12 pieces and remove the package to the conveyor.

The packages are placed on skids and taken to the shipping room.

DIRECT MATERIALS

For the purpose of this report, it is assumed that the aluminum will be purchased as standard 18 gage aluminum sheets with the selection of sizes made to keep scrap to the minimum. In some locations, it may be more economical to buy circular blanks or coils. This will depend on the relative prices of sheets, coils, and circular blanks, the amount and value of the scrap and the other elements of manufacturing costs that will apply to this part of the manufacturing process, as well as the transportation cost.

The direct materials required for the manufacture of 720,000 pieces of aluminum kitchenware include the following:

<u>Item</u>	<u>Unit</u>	<u>Number of Units</u>	<u>Unit Cost</u>	<u>Annual Cost</u>	
				<u>Estimated</u>	<u>Actual</u>
Sheet aluminum and rods	lbs.	43,000	\$.40	\$189,200	_____
Handles (complete with rivets)	each	144,000	.06	8,640	_____
Wrapping material and cartons		11,200	.30	21,360	_____
TOTAL				\$219,200	_____

Although for the purpose of this report it is assumed that handles are purchased, it may be desirable to manufacture them, particularly if the design is such that a considerable part of the scrap can be used in the manufacture of handles.

SUPPLIES

<u>Item</u>	<u>Annual Cost</u>	
	<u>Estimated</u>	<u>Actual</u>
Lubricants	\$ 200	_____
Hand tools	100	_____
Cutting tools	300	_____
Maintenance material	400	_____
Spare parts	600	_____
Cleaning compound	500	_____
Sand and other grinding material	500	_____
Office supplies	200	_____
TOTAL	\$2,800	_____

DIRECT LABOR

<u>Job Classification</u>	<u>Number Needed</u>	<u>Hourly Rate</u>	<u>Annual Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Blanking press operator	1	\$2.50	\$ 5,000	_____
Trimming press operator	1	2.50	5,000	_____
Drawing press operator	1	2.50	5,000	_____
Surfacing machine operators	10	2.00	40,000	_____
Square shear operator	1	1.75	3,500	_____
Bracket and ferrule men	5	1.75	17,500	_____
Buffers and polishers	2	1.75	7,000	_____
Cleaners	2	1.50	6,000	_____
Wrappers and packers	2	1.50	6,000	_____
Truckers	2	1.50	6,000	_____
Receiving and shipping men	<u>1</u>	1.50	<u>6,000</u>	_____
TOTAL	29		\$107,000	_____

INDIRECT LABOR

<u>Job Classification</u>	<u>Number Needed</u>	<u>Hourly Rate</u>	<u>Annual Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Manager	1		\$ 9,000	_____
Supervisor	1		7,000	_____
Office help	2		6,500	_____
Maintenance man and boiler operator	<u>1</u>		<u>3,500</u>	_____
TOTAL	5		\$28,000	_____

PRODUCTION TOOLS AND EQUIPMENT

<u>Item</u>	<u>Number Needed</u>	<u>Unit Cost</u>	<u>Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Piercer backbars	1	\$1,000	\$ 1,000	_____
Power square shears	1	4,000	4,000	_____
60 ton blanking and forming press	1	7,500	7,500	_____
20 ton trimming press	1	2,500	2,500	_____
30 ton drawing and forming press	1	3,000	3,000	_____
Polishing lathes - side	3	3,500	10,500	_____
Polishing lathes - bottom	3	3,500	10,500	_____
Polishing lathes - inside	4	3,500	14,000	_____
Bracket formers	2	500	1,000	_____
Ferrule formers	3	600	1,800	_____
Pierce press (utensil)	1	900	900	_____
Pierce press (bracket)	1	900	900	_____
Riveter	1	800	800	_____
Cleaning tanks	2	500	1,000	_____
Air compressor	1	5,000	5,000	_____
Wrapping and packing conveyor	1	1,600	1,600	_____
Dies	5	2,000	10,000	_____
Punches	5	1,800	<u>9,000</u>	_____
TOTAL			\$85,000	_____

OTHER TOOLS AND EQUIPMENT

<u>Item</u>	<u>Cost</u>	
	<u>Estimated</u>	<u>Actual</u>
Hydraulic lift truck	\$1,500	_____
Skids	800	_____
Hand tools	200	_____
Inspection equipment	<u>1,800</u>	_____
TOTAL	\$4,300	_____

FURNITURE AND FIXTURES

<u>Item</u>	<u>Number Needed</u>	<u>Unit Cost</u>	<u>Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Desks and chairs	2	\$150	\$300	_____
Filing cabinets	2	\$ 50	100	_____
Typewriter	1	\$150	150	_____
Adding machine	1	\$150	<u>150</u>	_____
TOTAL			\$700	_____

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 site of about one-half acre is 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, 60 feet by 100 feet, or 6,000 square feet is required for the manufacture of aluminum kitchenware. The total cost of this building, including boiler, plumbing, and wiring, is estimated at \$24,000.

POWER

The connected load required is 50 horsepower.

Based on an 80 percent load factor, the annual cost of power is estimated at \$800.

WATER

Water is used for washing the utensils after they are polished and for heating, fire protection, and sanitary purposes.

The annual cost of water is estimated at \$100.

FUEL

Fuel is used for heating and generating steam for the cleaning tanks.

The annual fuel requirements are estimated at 8,000 gallons of bunker C oil. The annual cost of fuel is estimated at \$400.

DEPRECIATION

<u>Description</u>	<u>Estimated Cost</u>	<u>Years Life</u>	<u>Annual Cost</u>	
			<u>Estimated</u>	<u>Actual</u>
Building	\$24,000	20	\$ 1,200	_____
Production tools and equipment	85,000	10	8,500	_____
Other tools and equipment	4,300	10	430	_____
Furniture and fixtures	700	10	70	_____
TOTAL			\$10,200	_____

MANUFACTURING OVERHEAD

<u>Item</u>	<u>Annual Cost</u>	
	<u>Estimated</u>	<u>Actual</u>
Depreciation	\$10,200	_____
Indirect labor	28,000	_____
Power	800	_____
Water	100	_____
Fuel	400	_____
Supplies	2,800	_____
TOTAL	\$42,300	_____

MANUFACTURING COSTS

<u>Item</u>	<u>Annual Cost</u>	
	<u>Estimated</u>	<u>Actual</u>
Direct materials	\$219,200	_____
Direct labor	107,000	_____
Manufacturing overhead	42,300	_____
TOTAL	\$368,500	_____

FIXED ASSETS

<u>Item</u>	Cost	
	<u>Estimated</u>	<u>Actual</u>
Land	\$ 1,000	_____
Building	24,000	_____
Production tools and equipment	85,000	_____
Other tools and equipment	4,300	_____
Furniture and fixtures	<u>700</u>	_____
TOTAL	\$115,000	_____

WORKING CAPITAL

<u>Item</u>		Cost	
		<u>Estimated</u>	<u>Actual</u>
Direct materials	30 days	\$18,300	_____
Direct labor	30 days	8,900	_____
Manufacturing overhead	30 days	3,500	_____
Reserve for sales collections	30 days	<u>45,600</u>	_____
TOTAL		\$76,300	_____

CAPITAL REQUIREMENTS

<u>Item</u>	Cost	
	<u>Estimated</u>	<u>Actual</u>
Fixed assets	\$115,000	_____
Working capital	<u>76,300</u>	_____
TOTAL	\$191,500	_____

SALFS REVENUE

As previously stated, the capacity of the plant is 720,000 pieces. The complete utensils average about 2.5 pieces. For example, double boilers consist of 3 pieces, while covered pots consist of 2 pieces. Therefore, the average number of pieces per complete utensil is 2.5. On this basis, the plant produces 288,000 complete utensils.

The average f.o.b. plant price of the completed utensils is estimated at \$1.90.

On this basis, the gross annual sales would amount to \$547,200.

RECAPITULATION OF COSTS, SALES, AND PROFITS

<u>Item</u>	<u>Estimated Cost</u>	<u>Actual Cost</u>
Direct materials	\$ 219,200	_____
Direct labor	107,000	_____
Manufacturing overhead	42,300	_____
Total manufacturing cost		_____
		\$368,500
Interest on loans	5,600	_____
Insurance	600	_____
Legal	1,200	_____
Auditing	2,400	_____
Unforeseen expense	24,900	_____
Total administrative costs		_____
		34,700
Sales commissions		18,000
Travel, bad debts, discounts and allowances, freight-out		6,000
Profit before taxes		<u>120,000</u>
TOTAL ANNUAL GROSS SALES		\$547,200

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	\$ _____	\$ 50	\$ 9,500	\$ _____
20 Sales	_____	2,000	24,000	_____
30 Direct Materials	_____	18,267	219,200	_____
40 Supplies	_____	233	2,800	_____
51 Power*	_____	67	800	_____
52 Water*	_____	8	100	_____
53 Fuel	_____	33	400	_____
60 Unforeseen Expense (Reserve Account)	_____	2,075	24,900	_____
71 Direct Labor*	_____	6,917	107,000	_____
72 Indirect Labor*	_____	2,333	28,000	_____
80 Depreciation (Reserve Account)	_____	850	10,200	_____

PURCHASE REQUISITION

COMPANY NAME

DATE

10 ADMINISTRATION

40 SUPPLIES

20 SALES

50 UTILITIES

30 MATERIALS

60 UNFORSEEN EXPENSE

INDICATE BELOW THE USE OF MATERIALS

DIRECT MATERIALS

MAINTENANCE REPAIRS

MAINTENANCE MATERIALS

OPERATIVE 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.

There is a high degree of responsibility in any
industrial plant. The plant manager should
be responsible for the safety of his
employees and the public. The plant manager
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It is the duty of the plant manager to
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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 distortions?
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 PROBLEMS:

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 identified?
3. If so, in what areas and in what quantities?
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?

ALUMINUM SHEET THICKNESS TABLE

The following table shows the thicknesses of aluminum sheets from gage number 8 to 26.

The thicknesses of sheets are shown in decimals of inches.

For the purpose of this report 18 gage aluminum sheets, .0403 inches thick, are the aluminum sheets specified to be used.

<u>Gage Number</u>	<u>Thickness (inches)</u>
8	.1285
10	.1019
12	.0808
14	.0641
16	.0508
18	.0403
20	.0302
22	.0253
24	.0201
26	.0159

If heavier and more expensive aluminum kitchenware is required, a thicker gage should be used.

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A case study on the productivity and factory performance relative to aluminum ware.

Periodicals

Modern Metals. Monthly. \$8.00/year. Modern Metals Publishing Company, 435 North Michigan Avenue, Chicago 11, Illinois.

Devoted to light metals fabricators, foundries and product manufacturers using aluminum, magnesium, and titanium.

The Iron Age. Weekly. Western Hemisphere, \$25.00/year. Other, \$35.00/year. Chilton Company, Chestnut and 56th Streets, Philadelphia 39, Pennsylvania.

Devoted to metalworking, with articles on techniques of metal machining, metal products, iron, steel, and aluminum production, plant organization, machinery, marketing, and news of the industry.

Steel. Weekly. \$20.00/year. Penton Publishing Company, Penton Building, Cleveland 13, Ohio.

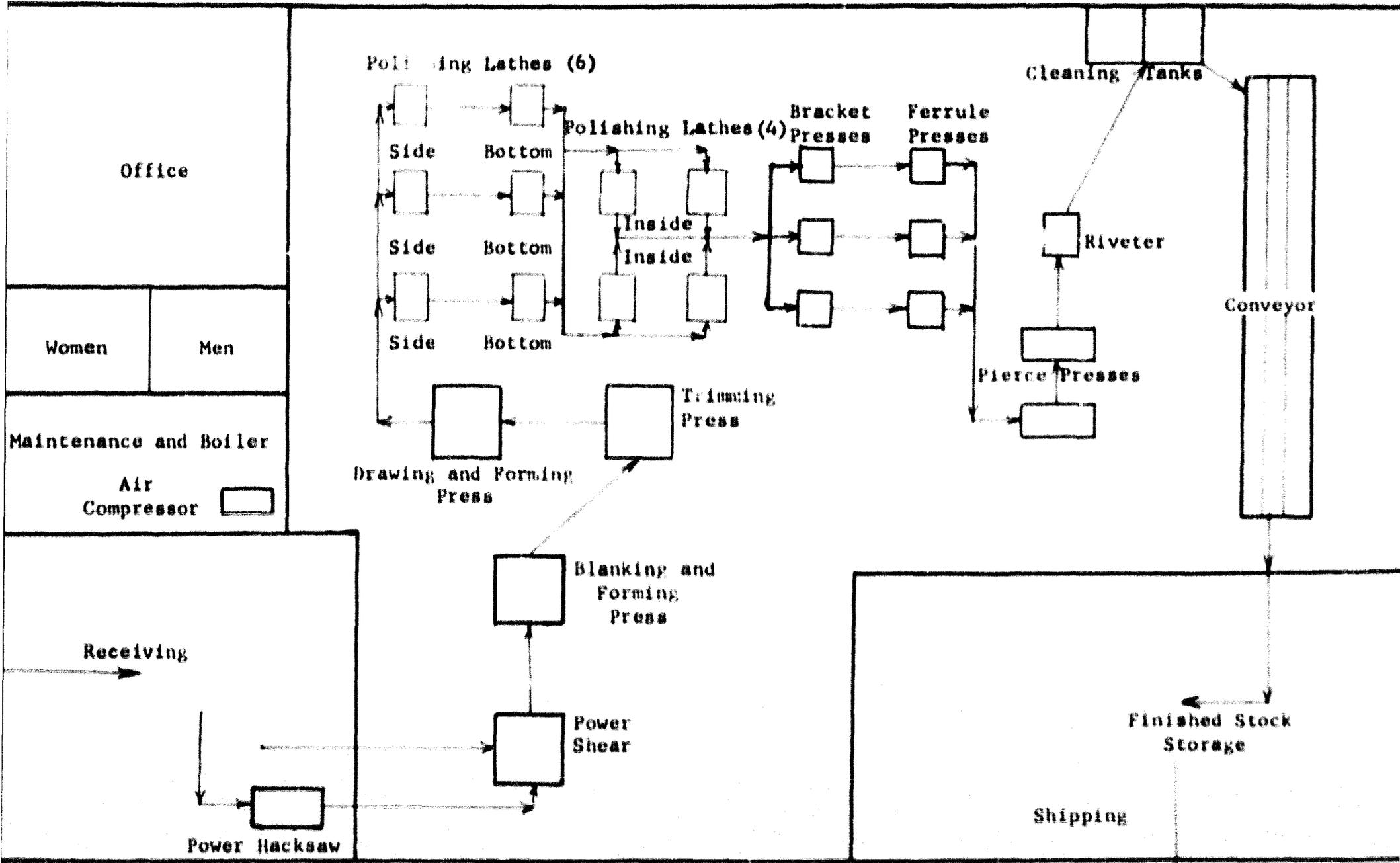
Metalworking with articles on production of steel and other metals, including aluminum, business and market situation, intended for personnel with administrative, engineering, or purchasing functions in U. S. metalworking plants, including those using aluminum.

Metal Forming and Fabricating. Monthly. Western Hemisphere, \$7.50/year. Other, \$10.00/year. Watson Publications, Incorporated, 201 North Wells Street, Chicago 6, Illinois.

Production journal, specializing in presses, forming equipment, tooling, materials, and methods of metalworking: stamping, drawing bending, extruding, rolling, slitting, shearing, forging, and welding.



PLANT LAYOUT AND WORKFLOW



100 feet