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ESTABLISHING FACTORIES FOR THE LOW-COST PRODUCTION OF GREY BOX BOARD[1/]

A Preliminary Guide

prepared by

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1/ This document has been reproduced without formal editing.

FOREWORD

This brief guide has been prepared for the use of developing countries interested in expanding their packaging material industries. The booklet may be of interest to policy and decision-making officials; it is especially designed for officers at the operational level who are responsible for defining and executing projects.

Quantitative and technical data contained herein have been synthesized from various sources and must not be relied upon as to accuracy nor used as a direct basis for commitments. Their purpose is rather to indicate parameters which need to be considered in an actual case, and approximate inter-relationships under an arbitrary set of assumptions. The paper thus represents a rough guide to prospective project developers and project managers. Access to more precise information and collaboration is discussed in Section 6.

Comments on the concept and approach of this document, as well as its content, are invited. Expressions of interest in specific topics for future publications of similar nature are also welcome. Please contact:

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1. SUMMARY

In many of the developing countries there may be a significant market for grey box board as a low-cost packaging material - either as a more economical alternative to corrugated board or as a direct import substitution. Thus, the establishment of a small Grey Board manufacturing unit may well prove to be both practically and economically feasible and of considerable benefit to the economy. The units are based on the use of low grade waste paper as the fibrous material necessary for production. Such waste is often otherwise discarded as useless by society.

In addition, the operation of the plant is labour intensive, based on the employment of workers where manual labour can substitute economically for the use of expensive machinery. This creates additional jobs in a community where unemployment is a major problem and labour is inexpensive.[1/]

It is visualized that units be established with the minimum of capital outlay, utilizing suitable imported secondhand equipment supplemented by indigenously manufactured parts of a less sophisticated nature in the countries where local engineering expertise makes this possible. The Grey Board plants are most suitable for installation in countries where ambient temperatures are prevalently high and the sheets of board may be dried naturally in the elements, obviating the necessity of installing costly artificial drying plant and thus reducing capital outlay and production costs to a minimum.

1/ The alternative technology emphasizing full mechanization is far too costly for economical use at the relatively low production volumes considered in this document (please see Section 4.1).

It is difficult to assess accurately the cost of establishing a unit, as such a calculation depends on many variables, i. e. cost and availability of suitable plant, possibility of utilizing local engineering services, etc; but a rough estimate may be put at between $ 50,000 and $ 100,000, excluding the cost of buildings and services. Due to the peculiarities of paper and board manufacture, plants in the order of five to ten tons per day vary little in capital cost between the smaller and larger units as there is little difference in the relative size of the plant required. Subject to local conditions, the potential for attractive financial returns from such a project appear very good.

2. THE PRODUCT

2.1 Description of the Basic Product

These simple Grey Board units are basically designed to produce rectangular sheets of board from low grade waste paper. The product is made in a basis weight of 250 gsm (grammes per square metre) and upwards, as required, depending on application and market demand. This quality of Grey Board is generally used in the manufacture of small boxes to contain shoes, machinery parts, soap and detergent, etc. Provided that the box is lined with a hygienic material such as waxed paper or acrylic film, it may also be used for packaging a wide variety of food products. This low-cost material may be important for packing export products as well as locally consumed articles. In many applications, the boxes are both reinforced and decorated by being covered with paper on which design and product information have been printed. Additional uses include low-cost book covers, pasteboard file folders and backing for pads of writing paper.

As an example, one ton of 400 gsm board would equal 2500 square metres, or 3333 sheets of 75 x 100 cm size, and approximately one half millimeter thick. Each sheet would yield about four shoe boxes or a ton would yield perhaps 5000 shoe boxes allowing for some wastage. If the ex-factory price of the board is $ 190 per ton, each sheet of 400 gsm would be worth about 7 US cents equivalent. Thus the material for a shoe box costs less then 4 cents.

2.2 Potential Product Diversification

Production may be diversified to serve additional markets with the same basic equipment. For example, it is also possible to produce a "solid board" up to 2000 gsm for use in the manufacture of containers similar to suitcases or boxes where considerable strength is important. Solid board is also commonly used to produce such items as back covers for radios, interior panels for automobiles, base for cloth lined boards, book covers, display and mounting boards.

Further, by the addition of a synthetic resin to the furnish and the use of selected waste paper, preferably kraft, a "leather board" may be produced. This product is of a quality quite acceptable to the footwear industry for use as inner soles and stiffening. This application is particularly attractive in a country where leather is scarce or where the cost of leather is prohibitory for its use in the manufacture of inexpensive shoes.

It may be noted that the suggested plant is likely to have excess pulping capacity. Thus the entrepreneur may wish to consider the production of diverse products such as egg trays and roofing boards, which can also be made through relatively low technology approaches, but do not require the "board machine".

This preliminary guide covers only production of the basic grey board, but necessary adaptations for diversification can be carried out with minimum difficulty. The additional products can be produced on the same equipment if capacity is available, since changeover is not complicated. It is also useful to set up a second machine as demand justifies, since this gives a certain protection against occasional breakdowns.

3. MARKETING, COMMERCIAL AND REGULATORY ASPECTS

3.1 The Market

It is imperative that a market for Grey Board already exist or be developed in the country in which a plant is established. It is also advisable that a venture of this nature have Government approval and backing, even although the plant may derive from the private sector. A market survey is of primary importance to establish demand and to determine the offtake expected. If a consumption of Grey Board already exists, supplied from foreign sources, then this task becomes infinitely easier. As a very rough guide to potential demand, it may be noted that three such plants are successfully operating in Uruguay and that Sudan has inaugurated a plant with favourable prospects. In many respects, the sales will depend on the effort devoted to identifying and promoting possible uses.

3.2 Raw Material

After establishing the market characteristics, the next step is to ascertain availability and suitability of raw material in the shape of low grade waste paper. Without a sufficiency of local raw material supply it is not practical to establish a plant and operate it economically.

The use of virgin fibres is precluded by the expense of producing suitable pulp from this source to manufacture such a low priced product as Grey Board. The exercise must include a detailed survey to establish the practicability of waste paper recovery and collection and also to determine the probable site of the proposed manufacturing unit in relation to the source of waste paper supply. It should be noted that some developing countries attain a recovery rate for waste paper as high as 50 % of total consumption and this target should be borne in mind as a guideline.

If commercial waste paper collection is not already organized, it may require considerable effort to set up the required network. The "low grade" waste required may be found by collecting old newspapers, magazines, cartons, etc. If there is a municipal trash collection, some useful material may be available by sorting either before or after collection. The waste is commonly baled and is often purchased for a given price (such as $ 30 per ton) delivered to the plant. Care must be exercised to be sure that the waste is not being "watered" (10 % moisture is a reasonable maximum) and that scrap metal is not being put in to increase the weight of bales.

3.3 Siting Factory

In fixing a site for a Grey Board factory several important considerations must be taken into account: -

(a) Adequacy of water supply
(b) Adequacy of labour
(c) Availability of waste paper supplies
(d) If possible a dust free area
(e) Supply of electrical power
(f) Distance from market for finished product
(g) Ease of disposal for factory effluent

3.4 Competition

A Grey Board unit as proposed may find it difficult to operate economically under severe competition from a large industrial unit producing a similar product. But in some countries where labour is cheap the small units do compete successfully under these conditions. Under most circumstances it would be visualized that a small Grey Board factory would be a completely new venture without any serious competition from another local source. In the case of product competition, grey board has a considerable marketing advantage compared with corrugated board since its cost is normally only 35 - 50 % as great.

3.5 Conversion of Product into Finished Packaging

In a country which already imports Grey Board for conversion into boxes and has no source of local supply, then the creation of a unit to produce the board indigenously can only meet with success. All concerned should benefit with a substantial saving in foreign exchange. In a country where complete boxes are imported then a converting factory to support a Grey Board factory is imperative to consume the product of the factory.

4. THE FACTORY

4.1 Choice of Technology

There is a range of techniques by which box board can be produced. (This is true even without considering corrugated board, with which "grey board" competes to a certain extent). In very small markets or where an entrepreneur is beginning operations with only very restricted access to capital, there is a "hand-made" approach which simply involves distributing diluted pulp on a horizontal screen and allowing the board to form as gravity extracts the excess water. This is done in a variety

of ways according to the ingenuity of the entrepreneur. But the uniformity and strength characteristics are definitely inferior when compared with more sophisticated production techniques. And it is extremely doubtful that large-dimension sheets of board (such as the common 75 x 100 cm) can be made in this way.

On the opposite end of the complexity (and cost) range is an "automatic" machine which produces board in a continuous strip. The board comes out completely dried and is cut into sheets of desired size for stacking and shipment. The mechanical properties of pulp are such that only a certain thickness can be made on a moving screen. If too much pulp is deposited, effective extraction of the water cannot take place and "crushing" occurs. The difficulty is overcome in the continuous machine by simultaneously making perhaps six thin layers and pressing them together between rollers to create the final board. All of these steps taking place at once requires very complex equipment (it is almost equivalent to six paper machines) and a set of controls like a steel rolling mill. A recent quotation for a 15 ton per day unit was about $ 750,000 for the equipment alone, F.O.B. Europe; and it is presumed that high-level maintenance capability would be essential.

The technology described in this booklet aims at the minimum plant cost and minimum technical complexity consistent with producing commercial quality board. The technique has been in use in the field for many years; it has by now become well adapted to use in a number of developing countries. The "secret" of producing uniform, high-strength board is to assemble a number of thin layers, depending on final thickness required. In the low-cost plant, this is done by winding a thin layer around a drum until the proper total thickness is reached.

(A special light signals the operators.) Then the wet board is quickly cut by hand and removed from the drum, and the winding-up begins again. Operation is continuous. With the 5 ton per day unit, around 550 sheets (400 gsm) will be produced in an hour.[1/] The suggested approach also eliminates mechanical drying as both machinery and energy requirements are very costly. The air-drying approach is very satisfactory for warm climates and moderates to low humidity. (In marginal cases, local tests will have to be made.) As an example in Uruguay, a 5 ton operation uses approximately 1800 m^2 of drying loft and allows about 24 - 72 hours for drying, depending on the season. (The calendering operation which finally flattens and smooths the boards after drying, works best if there is still about 5 - 7 % moisture present).

4.2 Process Technical Description

As already explained, the actual mechanical processes in the production line are kept to a minimum with the emphasis on the employment of manual labour whereever feasible. The largest single unit in the process consuming the greatest proportion of electrical power is the pulper which reduces the waste paper to a slush in preparation for forming a sheet of board on the single vat wet machine. The pulper operates on a batch cycle and does not run continuously as a single charge completed in about one hour slushes sufficient pulp to operate a five ton per day wet machine for four hours. No additives are required in making grey board as the waste which is used already contains sufficient to ensure acceptable properties.

No mechnical cleaning of the fibres is included in the cycle as it is proposed this operation be completed manually before the waste paper is slushed, in the pulper. However, sand tables or rifflers are included after dilution of the pulp and previous to feeding to the wet machine, as cleaning by this method is accomplished by gravity as the dilute pulp passes over the rifflers. The addition of a rotary screen is an optional extra and depends on the quality of waste paper to be used

1/ This is about the maximum rate of sheet removal for a hand operated machine. For thicker sheets, thr hourly production by weight may be somewhat greater.

and should be determined at the time of setting up the plant, but under normal circumstances this item can be excluded.

The diluted pulp as discharged from the rifflers is fed to the wet board machine where the sheet is formed on the cylinder mold, couched off and transferred by felt to the press roll to which it adheres, and then built up to the desired predetermined thickness before being cut off manually as a sheet equal in size to the width of the wet machine in the cross direction and the circumference of the press roll longitudinally. It may be noted that the water extracted during operation of the wet board machine and the press is re-cycled. No more than about 5 % of make-up water is required.

The sheets are stacked into piles, separated by felts or similar material to avoid sticking during the pressing process to remove surplus water, pressed in the hydraulic press and then hung singly in an open air dryer loft until dry.

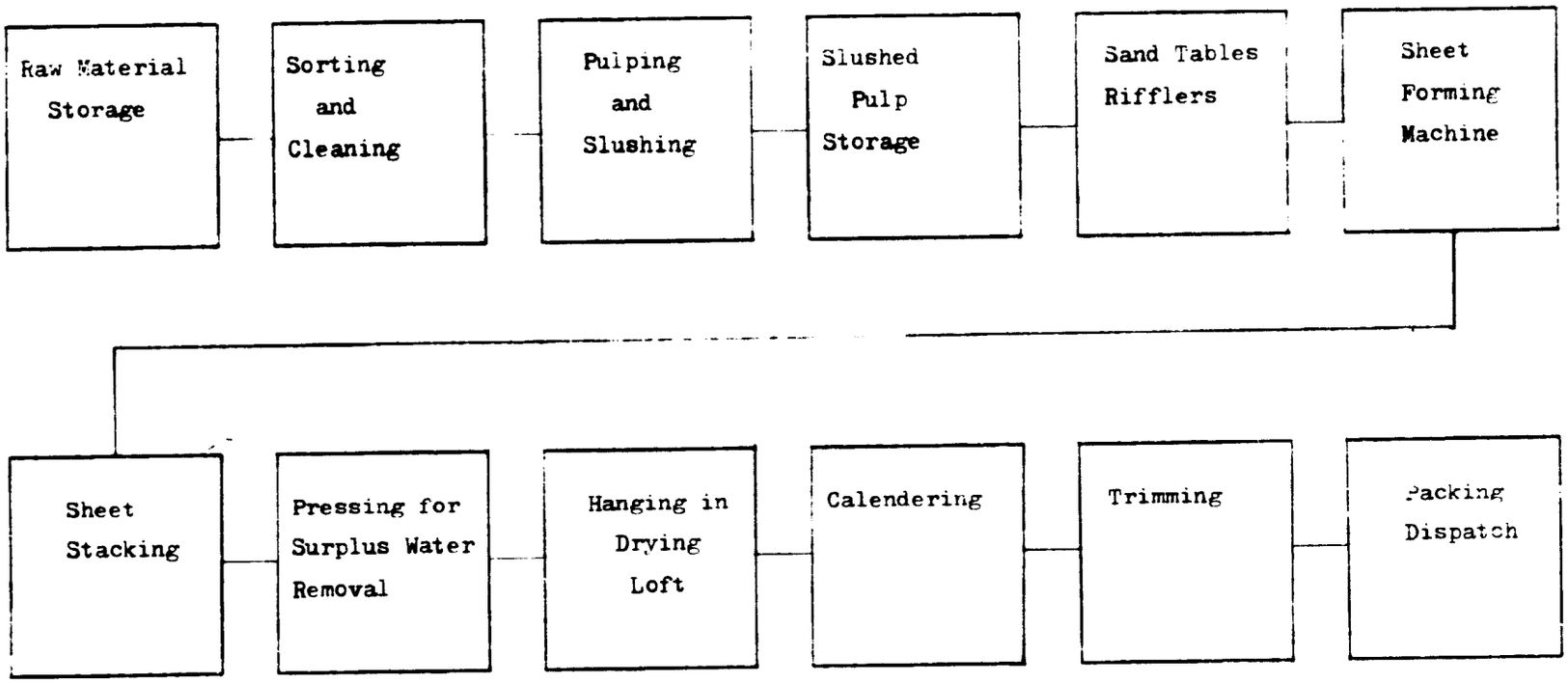
After drying, sheets are passed through a two-roll calender to iron out any distortions caused during the drying process and to increase the density. They are then passed through a trimmer to be trimmed and cut to the final desired dimensions, followed by packing and despatch.

Exhibit 1 illustrates a typical plant flow diagram for a five/ten tons per day Grey Board factory based on a labour intensified operation with the minimum of mechanisation.

EXHIBIT 1

Raw Material and Production Flow Diagram

5/10 Ton Per Day Grey Board Plant



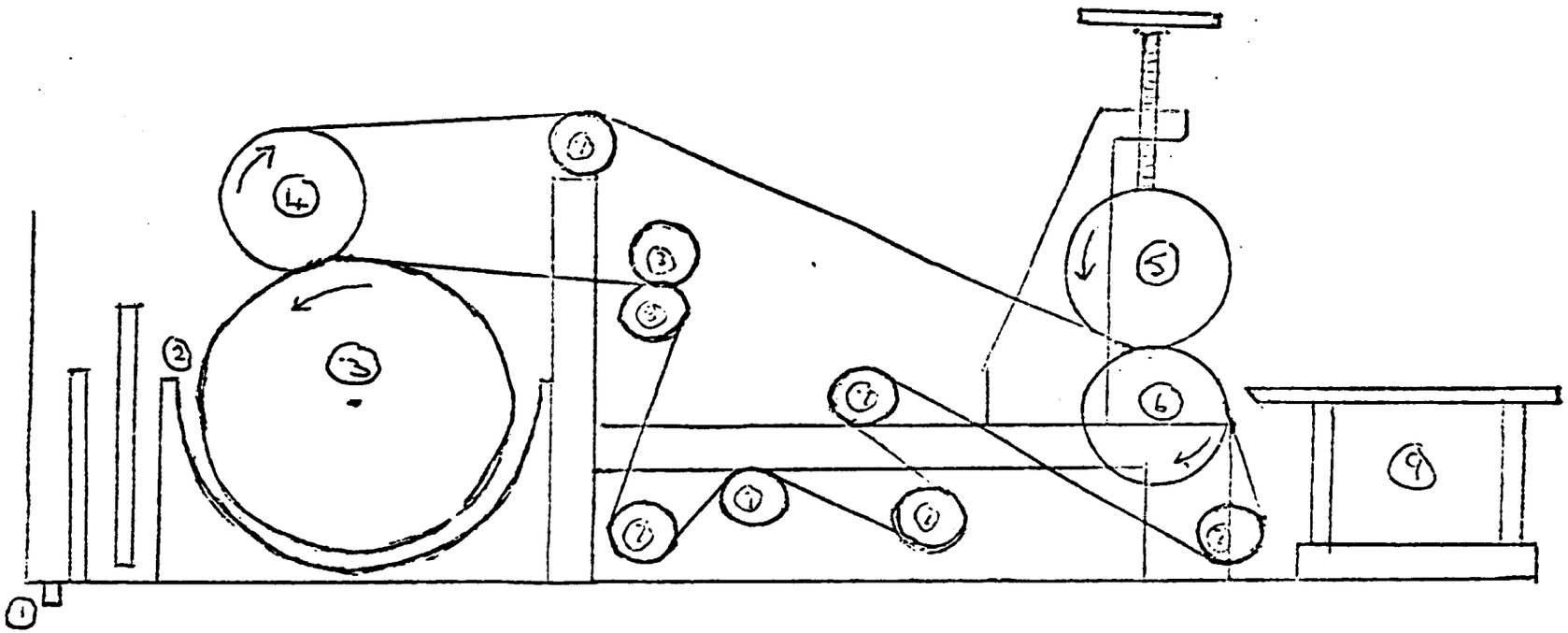
4.3 Wet Board Machine

The "wet machine" section of the Grey Board plant is probably the most important individual section of the mechanical requirements as on its satisfactory operation depends the quality of the board produced. A small machine of 100 cms in width is suitable for a five ton per day plant whilst a machine of 150 cms width is suitable for a ten ton per day plant. The machine operates on a variable speed control depending on basis weight and the density of the board required.

Exhibit 2 illustrates a typical simple wet board machine layout. The stock is fed in at point (1), passes to vat (2) where a sheet is formed on cylinder mold (3). At point (4) the sheet is couched from the cylinder mold on to an endless felt which conveys it to the top press roll (5) and to which it adheres. The sheet then builds up on the top press roll until the desired caliper is reached when it is cut and removed by hand as a sheet equal in length to the circumference of the press roll. At the time of the original design of the unit, a suitable sheet length must be determined to suit local market requirements, and the circumference of the top press roll chosen accordingly. The size of the sheet required will also determine the dimension of the hydraulic press to be used to remove surplus water before drying. It must always be borne in mind when installing a wet board machine for manual sheet discharge that the dimensions of the sheets must be kept within reasonable limits enabling operators to handle them without damage. The maximum acceptable size for sheets produced under these conditions is 100 cms x 75 cms and it is inadvisable to go beyond this limit. In the case of a ten ton per day unit where a wider machine is necessary to obtain that production level, the sheet would be split in the centre as it builds up on the press roll giving two sheets of 75 cms width on a 150 cms width machine. Should the other dimension required be 100 cms in length then the press roll circumference must be adjusted to suit.

EXHIBIT 2

Wet Board Machine Layout



1.Stock inlet. 2. Vat. 3.Cylinder Mold. 4.Couch roll. 5.Top press roll.
6.Bottom couch roll. 7.Felt carrying rolls. 8.Squeeze rolls. 9. Sheet table

4.4 Mechanical Plant

The following table itemises the plant necessary as a minimum requirement to set up a Grey Board factory utilising manual labour in preference to mechanical means where practicable:

EXHIBIT 3 Basic Plant Requirements

(1) Pulper - Capacity 10 tons per day complete with (25 HP) drive motor and discharge pump
(2) Wet Board Machine - width either 100 cms or 150 cms depending on production required, with variable speed drive
(3) Two-roll calender
(4) Trimmer
(5) Electrical motors as required
(6) Hydraulic Press complete
(7) Piping, drive shafts, small pumps, etc.
(8) Trolleys and pallets for sheet conveyance and stacking
(9) Hanging racks for sheets in open air drying lofts
(10) Necessary felts and wires for wet board machine
(11) Buildings, concrete tanks and chests, electric wiring, drying loft etc.

It is expected that of the above items 1, 2, 3, 4, 6 and 10 would be imported but with the exception of item 10 all can be secondhand equipment. In the case of item no. 2, provided that sufficient engineering expertise be available locally only the cylinder mold and the top and bottom press rolls need be imported as the remaining items required for the wet machine, i. e. frames, vat felt rolls and all other small parts may be manufactured locally. Items 4, 8, 9 may also be prepared locally whilst item 11 will be 100 % indigenous.

It is important to note that inclusion of a mechanical drying process would probably double the equipment investment. The dryer and boiler are complex and costly; needless to say, the cost of energy would also drive up the operating cost significantly.

4.5 Electricals

Item no. 5 covering the electrical drives has alternative options. Each section of plant may be driven by its own individual motor, or, with the exception of the pulper, a line shaft drive may be incorporated with one main drive motor. The second alternative would limit the number of motors in the plant to two and under this system the gross electrical energy requirements would amount to approximately 80 HP. Under this scheme, electrical maintenance would be reduced to a minimum. The syste of a single line shaft has one serious disadvantage however. At the time when the plant is not running at full output and perhaps only one section of the equipment operating, the line shaft must run to drive that single section. This uses more electrical power than would be necessary if an individual small motor was engaged to drive that section.

4.6 Labour

The operation and running of a simple Grey Board plant does not require high-level expertise. Operators can be trained fairly quickly in the semi-skilled and unskilled techniques. One senior supervisor is essential to control the overall operation at all times whether the plant be run on a batch or 24 hour per day continous basis, to control and make decisions on plant operation and production.

The number of unskilled and semi-skilled labour employed will depend on the rate of production. Obviously a plant producing ten tons per day will require more labour to handle the product than a plant of five tons per day capacity, simply by virtue of the physical effort involved in handling the greater tonnage of sheets produced, both in the manufacturing and the finishing stages.

Exhibit 4 illustrates a typical breakdown of the labour requirements sectionwise for both five and ten ton per day plants. The numbers indicated are those required at any time the plant is in full production, irrespective

of whether running on a batch system or a continous basis. For ease of operation and the maximum utility of the manpower employed, certain stages in the production line have been married up in order that workers may be diverted in each of the sections where their services are most required at any time. Exhibit 4 indicates a convenient grouping of the production stages for this purpose.

4.7 Quality Control

Quality control is limited in the product of Grey Board to caliper, basis weight of the board, and strength properties. Strength depends primarily on the quality of waste paper consumed, but to some degree on the satisfactory operation of the wet board machine. With such a simple plant the necessity for sophisticated quality control tests is obviated and little or no advantage can be obtained by conducting them, as long as the three properties caliper, basis weight and strength are kept within the desired limits.

5. FINANCIAL ANALYSIS

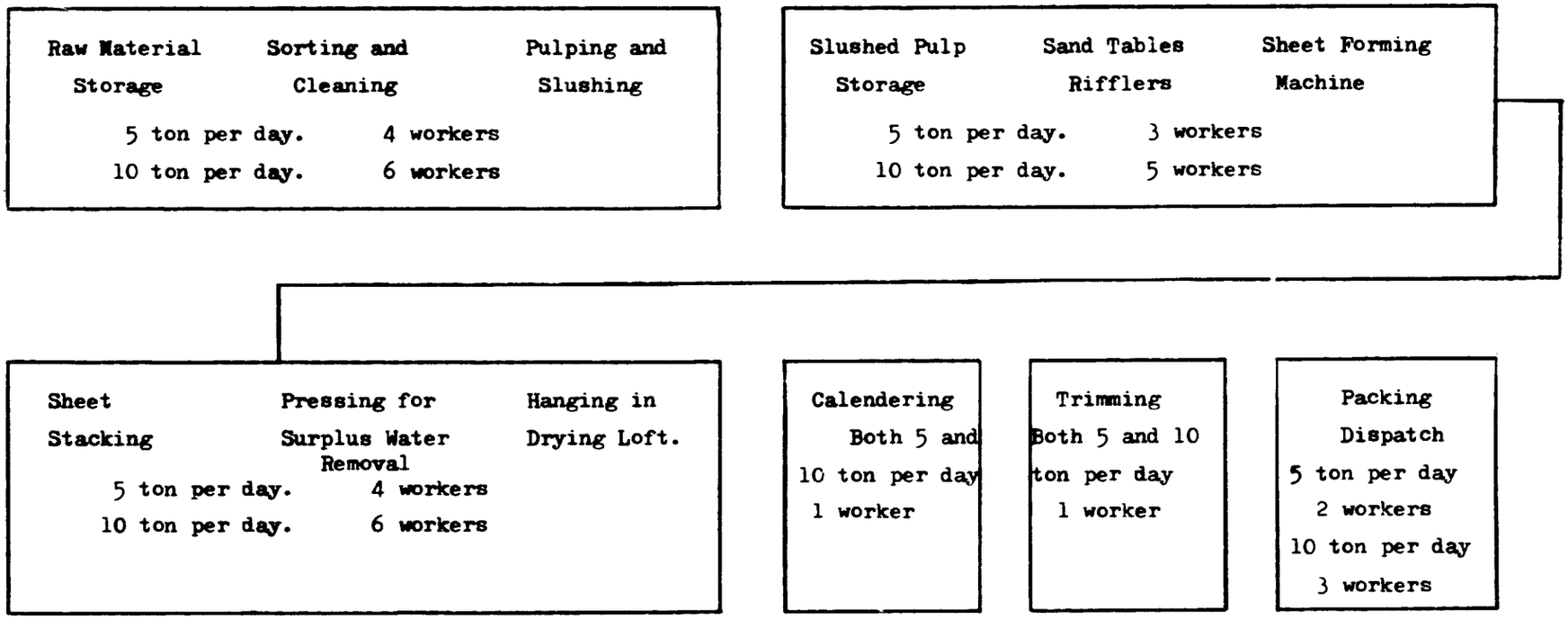
To project an accurate financial analysis is difficult because economical operation of any Grey Board plant depends on the conditions existing in the particular country in which it is installed, and these vary considerably from country to country. Only after a detailed feasibility study has been conducted can the economical viability of a plant be determined, depending on raw materials, labour, power cost, etc.

To give some preliminary indication of the viability of a Grey Board plant in a developing country, we have relied on general observations in various countries, on comparatively detailed analysis of a representative

EXHIBIT 4

Labour Requirements

5 and 10 tons per day plants



Totals: 5 tons - 15 workers
10 tons - 22 workers

case (a plant which is presently operating) and on inquiries regarding availability and cost of suitable used equipment.[1/]

The results have been summarized in Exhibit 5. The table presents pro-forma estimates of investment, operating results and profit ratios for units rated at 5 and 10 tons daily output. Both of these unit sizes - under the arbitrary assumptions adopted - appear to offer very attractive profits when operated at capacity. Projections for the smaller unit operated at a reduced output of 2 tons per day indicate that the break-even point is only about 40 % of capacity.

It must be emphasized that these favourable projections do not mean that detailed analysis of a particular project opportunity would yield similar results. Of course, much depends on being able to set up the plant along the lines of the low-cost approach described. Yet it may be observed that plant depreciation expense is very low in proportion to sales turnover. Thus the project could presumably support a somewhat greater equipment investment without difficulty, if sales are adequate to support operation at a high level of capacity utilization.

1/ The suitability of used equipment is frequently a controversial subject. In this case, because of its relative simplicity and low operating speeds, the financial gains appear to far outweigh any technical risks involved.

EXHIBIT 5 Illustrative Projection of Financial Operating Results
($x1000)

	10 tons/day[1]	5 tons/day	5 ton plant operating at 2 tons/day
Sales (at $ 190/ton)	566	283	113
Costs:			
Raw material[2]	120	60	24
Labour and supervision	105	70	35
Depreciation	20	15	15
Power	70	35	17
Other overheads, administration and sales expenses	45	30	15
	360	210	106
Gross Profit before interest and income tax	206	73	7
Allowance for interest and income tax[3]	70	28	7
Net Profit	136	45	0
Investment:			
Machinery[4]	100	75	75
Land and building	60	50	50
Working capital	60	30	15
Total	220	155	140
Net profit as % of sales	24	16	-
as % of investment	62	29	-

1/ Output rating based on 24-hour operation

2/ Assumes cost of $ 30/ton and yield of 75 %

3/ Assumes 10 % interest on one-half of the investment and 30% income tax

4/ Assumes mid-point of likely range (uncertainty is at least plus-minus 25 %)

(3) If both (1) and (2) satisfactory, examination of possible Government approval and support.

(4) Based on market survey and tonnage of waste paper available prepare details for technical design work to be completed.

(5) In light of the basic technical design, conduct survey for suitable second hand equipment for incorporation in the final design.

(6) Examine possibility of indigenously manufactured parts for project.

(7) Draw up programme and flow diagram for implementation of the project.

Subject to financial and scheduling arrangements, technical co-operation service in connexion with development and implementation of a specific project is available through local representatives or directly from the Factory Establishment and Management Section of UNIDO.

6. FOLLOW-UP ACTION

It is recommended that the following steps be taken if the establishment of a Grey Board plant is contemplated, assuming finance is potentially available.

(1) A market survey be conducted to determine possible demand for Grey Board as well as a realistic sales prices.

(2) If (1) shows promise then a survey to examine availability and cost of waste paper supply, including a collection network if necessary.

7. BIBLIOGRAPHY AND ADDITIONAL INFORMATION SOURCES

(a) On the subject of boxboard and related products

- Modern Pulp and Paper Making, third edition by John B. Calkin, Chapter 2, Page 16

- Pulp and Paper Manufacture by McGraw Hill, Volume 2, Page 35, Volume 3, Page 563

- Pulp and Paper by Casey, Volume 2, Chapter XXI, Page 1246

(b) Other UNIDO publications providing similar scope and intended for potential sponsors of industrial projects (selected)

- Establishment of Factories in Developing Countries for the Re-refining of Automotive Lubricating Oil, UNIDO/IOD.111

- Guidelines for the Production and Marketing of Acrylic Sheet in Developing Countries, United Nations Sales No. E.71.II.B.21

- Technical and Economic Aspects of the Oil Palm Fruit Processing Industry, United Nations Sales No. E.74.II.B.10

- A Fertilizer Bulk Blending and Bagging Plant, United Nations Sales no. E.76.II.B.2

- Establishment of Factories in Developing Countries for the Production of Electrical Distribution Transformers, UNIDO/IOD.139

- Guidelines for the Establishment and Operation of Vegetable Oil Factories, United Nations Sales No. E.77.II.B.1

- Manufacturing Guide, Lime Industry, UNIDO/ISID/ING.3

- Manufacturing Guide, Furfural, UNID/ISID/ING.1

(c) Selected UNIDO publications providing specialized functional guidance for establishing new factories

- Contract Planning and Organization, United Nations Sales no. E.74.II.B.4
- Guidelines for the Acquisition of Foreign Technology in Developing Countries, (with special reference to technology licence agreements), United Nations Sales no. E.73.II.B.1
- National Approaches to the Acquisition of Technology, UNIDO/DTT.2
- The Case for National Industrial Consultancy Services, UNIDO/IOD.125
- Manual for the Preparation of Industrial Feasibility Studies, UNIDO/ICIS.33
- Closing the Factory Establishment Gap, UNIDO/IOD.105, 10 August 1977

(d) Industry associations

- Fibre Board and Packing Case Association, 14, Chantry House, Eccleston St., London S.W.1, UK
- Paper Machinery Makers Association, Africa House, Kingsway, London, UK
- Technical Section of British Paper and Board Makers Association, Plough Place, Fetter Lane, London E.C. 4, UK
- Ecole Français de Papeterie, 44 Avenue Felix Viallet, Grenoble, France

(e) New equipment suppliers

- Black Clawson, West Gate Works, East Dock Road, Newport, Monmouthshire, UK
- Escher Wyss, 798 Ravensburg Wuatt, Postfach 105, FRG
- Rice Barton, 65 Taintra Street, Worcester, Mass., USA
- Watford Engineering, Lower High Street, Watford, Herts, UK
- Bertram Sciennes, St. Katherines Works, Edinburgh, Scotland
- Tagenberg Werke AG, Himmelgeisterstr. 107, D-4 Düsseldorf, FRG
- Carl Kraft und Söhne, 516 During-RHLD, FRG

(f) Suppliers of seoondhand paper and board manufacturing equipment

- Xavier Magdelaine, 1, Rue Saint Antoine, 75004 Paris, France
- P. Piette, Lannerstrasse 25 b, A-1190 Vienna, Austria
- Dr. Ing. Julius Hermann, Kaiser Sigmundstr. 48, 6 Frankfurt/Main, FRG
- Kurt Tramer, 5420 Launstein, Sebastianusstrasse 32, FRG
- Arrow Projects Ltd., Greaves Place, London S.W. 17, UK

(g) Directories

For oomplete list of manufacturers of all types of paper and board machinery manufactures refer to:

- World Paper Makers and Merchants Directory of all Nations. Published by: Admark Directories Ltd., Mercury House, Waterloo Road, London S. W. 1, UK
- Phillips Paper Trade Directory, Published by: Ben Brothers Ltd., 25 New Street Square, London, E.C. 4, UK

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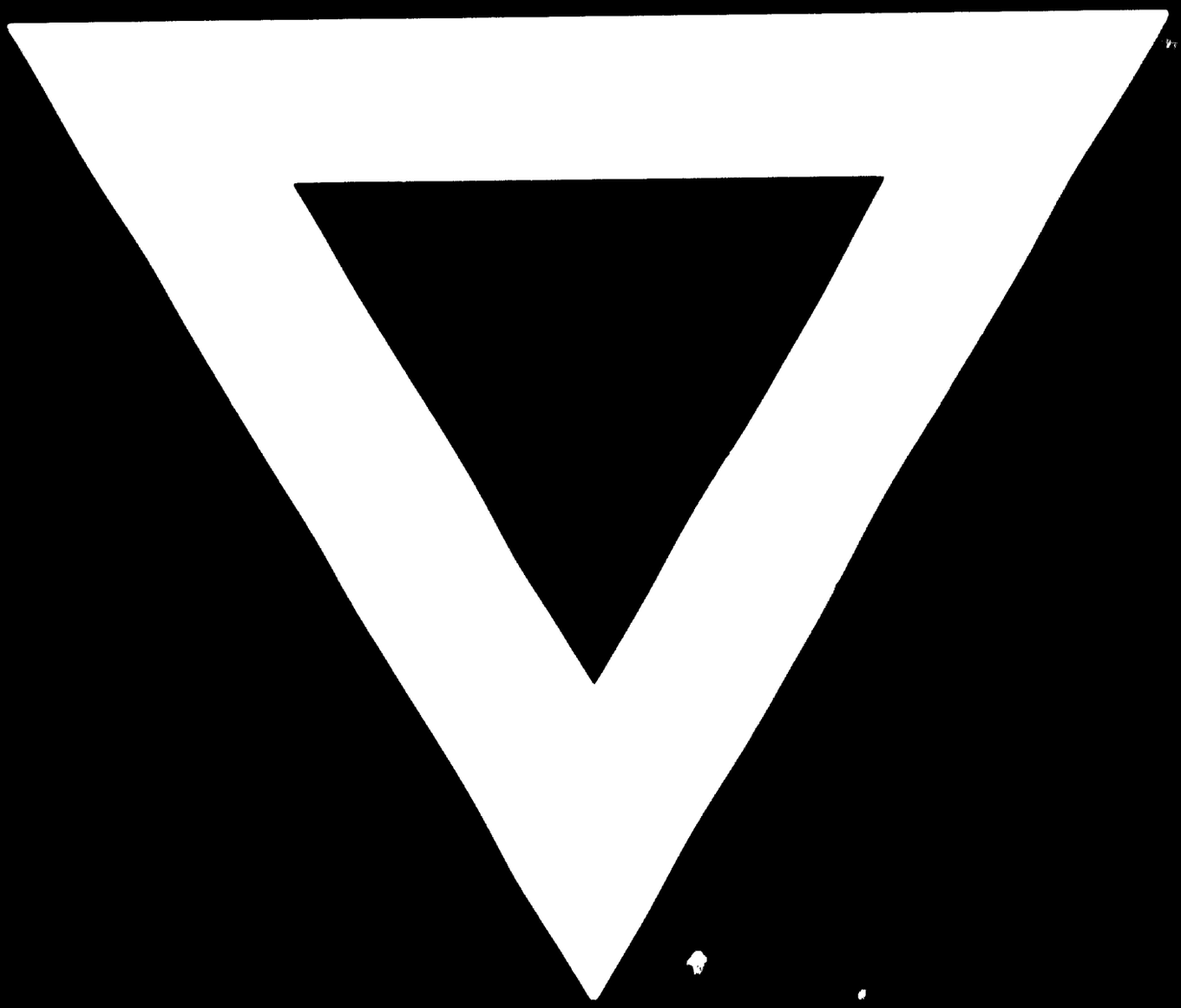

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