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SURVEY OF THE INDONESIAN TEXTILE INDUSTRY

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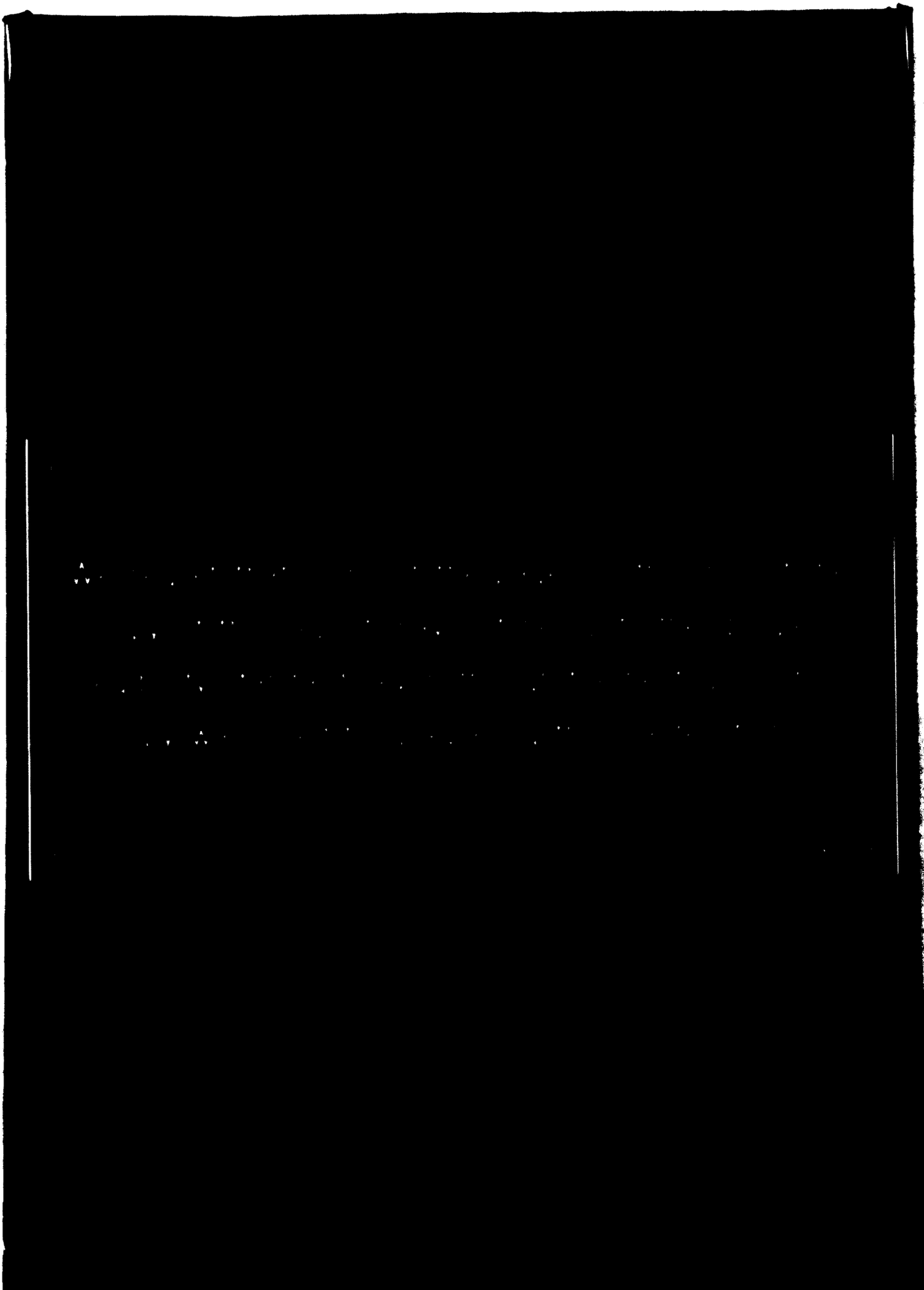

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1.0.0.0 INTRODUCTION

The objective of this assignment was to evaluate the textile industry of Indonesia and to formulate specific recommendations relative to its long term development.

In carrying out this assignment, Werner selected from its international organization a team of experts in technical, marketing and economic disciplines with experience in this type of assignment. While in Indonesia these experts worked closely with Government and Industry leaders and visited over ninety textile mills whose combined capacities, by sector, are as follows:

- Cotton and synthetic spinning 85%
- Cotton and synthetic weaving 42%
- Dyeing and finishing 80%
- Printing 50%
- Knitting 39%

This report presents a comprehensive analysis of the Indonesian textile industry, by sector, both from the manufacturing and marketing viewpoint

along with market forecasts through 1980. Included in the Conclusions and Recommendations section (section two) is a comprehensive long-range growth plan for the Indonesian textile industry, by sector, along with our recommendations of the policies and programs necessary in order to implement it. This plan is designed to combat imports, increase employment and place the industry in a competitive position such that it could compete favorably in world markets within the next decade.

Following the Conclusions and Recommendations, section three is devoted to an in-depth analysis of the present manufacturing facilities and techniques while section four provides a detailed analysis of market conditions along with long-range forecasts of major market segments. Both sections contain specific recommendations and program outlines for the future development of the Indonesian textile industry.

The official exchange rate used in this report is 378 Rp per $1.00 U.S.

2.0.0.0 CONCLUSIONS AND RECOMMENDATIONS

2.1.0.0 MARKETING

2.1.1.0 Highlights

Raw Material

Current & future requirements of staple fiber for the Indonesian textile industry are shown below:

FORECAST OF STAPLE FIBER REQUIREMENTS

YEAR	COTTON		MAN-MADE	TOTAL
	MM LBS.	000 NET BALES	MM LBS.	MM LBS.
1970	100	208	-	100
1971	104	217	5.0	109
1972	112	233	7.0	119
1973	124	258	9.0	133
1974	136	283	13.0	149
1975	155	323	16.0	171
1976	176	367	25.0	201
1977	200	417	35.0	235
1978	230	479	45.0	275
1979	266	554	57.0	323
1980	308	642	68.0	376

Yarn

The current and forecast yarn requirements for Indonesia are as follows:

Millions of Pounds*

Year	Locally Produced	Imported	Total
1970	90	98	188
1971	99	103	202
1972	112	104	216
1973	129	106	235
1974	147	107	254
1975	169	103	272
1976	197	101	298
1977	230	94	324
1978	267	85	352
1979	312	73	385
1980	361	54	415

*includes total continuous filament requirement

Fabric

Current and future requirements of textile fabrics in Indonesia are shown on the following page:

FORECAST OF FABRIC DEMAND BY YEAR
(Millions of Pounds)

	LOW(1)			HIGH(2)		
	DOMESTIC	IMPORTS	TOTAL	DOMESTIC	IMPORTS	TOTAL
1971	181	188	369	186	187	373
1972	193	185	378	204	182	386
1973	205	182	387	223	176	399
1974	218	179	397	244	169	413
1975	232	175	407	265	162	427
19761	250	167	417	292	150	442
1977	269	158	427	320	137	457
1978	289	149	438	350	123	473
1979	314	135	449	386	103	489
1980	340	120	460	415	80	495

(1) Assumes demand will grow at same rate as population.

(2) Assumes increasing effect of affluence (disposable income) by 1% per year through 1980.

Finished Goods

Current and future requirements of finished fabrics in Indonesia are as follows.

FINISHED FABRIC DEMAND ESTIMATES FOR 1980
(Millions of Pounds)

			PRINTED	DYED	BLEACHED	GREIGE
Cambric:	1970	63	45	12	6	--
	1980	76	56	20	--	--
Shirting:	1970	47	19	8	--	20
	1980	62	20	18	--	24
Sarong:	1970	27	10	13	--	4
	1980	24	9	11	--	4
Heavy:	1970	33	--	9	--	24
	1980	48	--	15	--	33
Home:	1970	14	3	11	--	--
	1980	29	8	21	--	--
Specialty:	1970	57	14	43	--	--
	1980	91	26	65	--	--
Rope:	1970	3				3
	1980	4				4
Bags:	1971	41				41
	1980	48				48
Hand:	1970	25	5	7	--	13
	1980	24	5	7	--	12
Knitted:	1970	50	8	10	29	3
	1980	71	11	15	45	--
Total:	1970	360	104	113	35	108
	1980	477	135	172	45	125

2.1.2.0 Recommendations

Fiber

1. Reduce dependence on long-term credit arrangement under PL 480 by freeing foreign exchange for purchases on world market.

2. Examine possibilities of U.S.A. Commodity Credit Corporation export credit sales program.

3. Encourage installation of domestic polyester staple facility.

4. The Government of Indonesia should strongly support and encourage future studies which investigate the economic feasibility of growing cotton locally.

Yarn

1. Improve quality of domestic yarn to eliminate need for imports.

2. Emphasis should be on blended yarns as indicated by new investment program proposed to meet growing market demand.

3. Encourage installation of domestic synthetic filament facility if it is an economic unit.

Fabric

1. Improve quality of domestic fabrics to compete with imports.

   Broaden range of fabrics produced to displace imports.

2. Increase production of synthetic fabrics to meet growing demand.

3. Encourage local production of selected items of apparel to capitalize on labor intensiveness of operation and to help stabilize the fabric market.

Tariffs

The long term goal of tariff policy should be to adopt tariff rates which will equate the prices of imported and domestically produced goods in the marketplace. This will have two important functions:

- To maintain the competitive incentive in the domestic industry.
- At the same time it will not allow lower cost competition.

This policy applied today would result in generally increased prices since the cost base for domestically produced goods is such that the price of imports would have to be raised substantially to bring about a price equalization.

In the current situation, however, any fiscal policy which would raise the price of either imported or of domestically produced textiles would bring about an inevitable, totally undesirable and virtually uncontrollable surge in illegal and unrecorded imports.

Short term tariff policy should therefore have the objective of reducing the incentive to smuggle goods, while at the same time maintaining a level of protection for the domestic textile industry which will allow it to compete with more efficient external producers and have a margin of profitability conducive to the modernization of existing equipment and an increase in total productive capacity. It is very important that only a minimum of protection be provided in order to force modernization and expansion. Domestic producers should be made aware that the level of tariff will be continually decreasing and that in a short time unless they have become efficient and

productive they will not be competitive either with imports or other domestic producers.

Distribution

It is difficult to see how this situation can be improved. The power is in the hands of the capitalist class of merchants and wholesalers, basically Chinese, who effectively control the movement of goods. A policy of encouraging the development of larger retail units and national distribution where economically feasible by the fabric producers through selected wholesalers operating on a regional rather than on a purely local basis, would seem to have the best chance of cutting costs and inefficiency but this will have to be accompanied by an attempt to reduce the high percentage of smuggled goods currently on the market.

2.2.0.0 MANUFACTURING

2.2.1.0 Conclusions

Spinning - Cotton and Synthetic System

In general, the spinning equipment is much newer and in much better condition than the weaving equipment. In most plants the equipment in each department was of the same manufacturer and model. Some plants, however, have machines of many different manufacturers and models, thus resulting in a great deal of confusion.

The average production for cotton count 25.88/1 is 12.2 grams per spindle hour in Indonesia compared to 17.8 grams per spindle hour for modern equipment or 68% of theoretical capacity.

The reasons for this low production are:

1. Low spindle speed
2. Obsolete processing equipment prior to spinning
3. Not utilizing design capacity of equipment
4. Poor maintenance
5. Excessive ends down

Weaving - Cotton and Synthetic

To appraise the weaving sector, over 10,000 looms were observed. Of these, only 70% were operating. The remaining 30% were not operating due to:

a) Lack of working capital

b) Lack of electricity

c) Obsolescence

The comparison of weaving production is difficult to make because the many factors affecting it are not comparable from mill to mill. Differences in fabric construction and their distribution may vary in each mill. For this reason a comparison is made according to the thousands yards of weft inserted per loom hour.

	Thousand Yds/Loom Hr.
Shuttleless Loom	48.0
Modern Converted Loom	17.6
Looms Running in Indonesia	9.8

These figures indicate that the weaving sector of the Indonesian textile industry is presently operating at approximately 56% of theoretical capacity.

Knitting

Theoretical knitting production is extremely difficult to calculate due to the fact that knitting machines are highly versatile and capable of running a wide variety of yarns and fabrics. Our best estimate of theoretical knitting production indicates that at the present time the Indonesian knitting industry is operating at approximately 56% of capacity.

The knitting equipment is of good quality and is well-suited for the types of fabrics produced. Based on our survey, we estimate that of the 3392 industrial knitting machines in Indonesia, the following units are mechanically or economically obsolete:

CATEGORY	NUMBER MACHINES IN PLACE	NUMBER OBSOLETE	PERCENT OBSOLETE
Circular 40 rpm & over	242	42	17.3
Circular less than 40 rpm	2770	770	27.8
Half hose	274	74	27.0
Netting (warp)	56	6	10.7
Flat	40	-	-
Tricot (warp)	10	-	-
	3392	892	26.2

The knitted fabrics produced are of good quality and, in the greige, are capable of competing with similar fabrics knitted in other parts of the world. It must be pointed out, however, that the dyeing and finishing of knitted fabrics is below competitive standards thus appreciably lowering the overall quality of Indonesian knits. In addition, the fact that the knitting industry is operating far below economical production levels has the effect of increasing unit costs thus making these fabrics even less competitive in world markets.

Bleaching, Dyeing, Printing and Finishing

To appraise the existing machinery and equipment of the dyeing, printing and finishing industry, a detailed sur ey of twenty-seven mills was conducted with an annual production of 214,000,000 linear yards bleached and dyed and 100,800,000 linear yards printed. This represents 80% of the installed capacity for dyeing and 50% for weaving.

The quality of the dyed and printed fabric in Indonesia is below the standards expected in the United States and Europe. The poor quality of the fabric in many cases is the result of spinning faults and weaving

faults. Some spinning faults (neps, thin places, thick places, uneven yarn, etc.) and weaving faults (thick places, thin places, missed picks, etc.) are magnified when the fabric is dyed and/or printed.

Labor

Indonesia, as is true in many developing countries, has a very high unemployment rate. Although the labor force is greater than the available number of jobs, serious problems still face the textile industry from a labor point of view. There is a lack of highly skilled and experienced labor in the following general categories:

Management personnel

Supervisory personnel

Machine fixers

Training personnel

Another key factor in the labor force, particularly from the machine operator level down to the simpler tasks involved in textile manufacturing is the lack of adequate training. Before adequate training is obtained for the labor force the reorientation of the thinking of top management is required. Formal-

ized training programs should be established that not only train the worker in the necessary steps for performing his assigned task, but also training the worker so that he will be motivated to accomplish that task. Too often management tends to blame its labor problems on the Indonesians as being slow learners. This type of thinking on the part of some management must change as it is not sound.

When visiting the textile manufacturing plants in Indonesia, the predominant problems observed were:

a. Lack of labor training
b. Very poor labor utilization
c. Productive equipment in poor mechanical condition
d. Obsolete production equipment
e. Non-utilization of equipment because of lack of power, capital and/or sales

2.2.2.0 Recommendations

While the textile industry of Indonesia is faced with many problems the three key problems are: poor utilization of capacity, poor utilization of labor and poor quality of the goods produced. The major thrust of our recommendations is toward the solution of these problems.

Our recommendations are as follows:

Cotton and Synthetic Spinning

1. Modernize and replace obsolete equipment at a lower capital expenditure than the cost to build new facilities. This would result in increased production, improved yarn quality and reduced cost per pound. The order of priorities are:
   a. Drawing
   b. Pickers (including opening equipment)
   c. Winding (primarily install and use slub catcher)
   d. Spinning
   e. Roving
   f. Carding (as fillet clothing on cylinder, doffer and flats wear out, replace with metallic cloth)

This will create excessive carding capacity of approximately 175 cards. These excessive units could be used for expansion or transferred to new mill at a value of $462,000.

2. The large capital investment required for a spinning mill makes it necessary to achieve maximum production to reduce the fixed cost per pound. It is recommended that the spinning mills operate 24 hours per day, 7 days per week. Some of the mills are already operating under this schedule.

3. Yarn Package - Better quality cones that will not crush during storage or shipment should be used. Also yarn should be shipped in cases rather than as loose cones. The above recommendation will reduce the amount of yarn damage prior to arrival at the weaving mill and knitting mill. Also the yarn would not have to be rewound before processing by the weaver or knitter, which increases their cost.

4. Quality Control - A strict quality control system should be implemented in each spinning mill.

Cotton and Synthetic Weaving

The cotton and synthetic weaving sector of the Indonesian textile industry is made up of many small

units and a small number of large units. For this industry to achieve the optimum level of performance from the existing equipment in place, the following recommendations are made.

1. Modernize equipment that is in poor mechanical condition. This can be done at a lower capital expenditure than the cost of building new facilities. This would result in increased production, improved quality, and reduced manufacturing cost per yard. The order of priority is:
   a. Slashing - A major contributing factor to low weaving efficiency other than yarn quality is mproper slashing.
   b. Warping
   c. Weaving (looms)
   d. Quilling

2. Increased Operating Hours - The weaving sector should increase the number of hours each loom is operated per year as the spinning sector has done. The looms observed averaged operating less than 5,000 hours per year. It is recommended that the weaving mills increase the number of operating hours to at least 7,000 hours per year.

Some plants are located in residential areas and are restricted by law with respect to the hours they can operate. Availability of electricity will also restrict some mills' operating hours.

3. Consolidation - Many of the small weavers cannot afford some of the equipment necessary to improve weaving efficiency, improve quality and reduce cost. A good example of this is inadequate slashing equipment. Consideration and encouragement should be given to the smaller weavers to consolidate. Then they could afford the expensive slashing equipment producing warps for all the plants in the company.

   Several other advantages would result from this. They are:

   a. More purchasing power.
   b. Larger sales distribution.
   c. Improved loom efficiency.
   d. Improved fabric quality.
   e. Lower manufacturing cost per pound.

4. Quality Control - A strict quality control system should be implemented in all plants.

Knitting

1. Modernize and upgrade the circular knitting equipment with particular emphasis on the medium size and smaller mills.

2. Provide additional training for both supervisory and production employees.

3. Increased operating hours - the knitting industry is presently operating far below its capacity. Operating hours should be increased to a three shift operation, 6000 hours of operation per year.

4. Quality control - A strict quality control system should be implemented in all plants.

Bleaching, Dyeing, Printing and Finishing

1. Modernize equipment at a lower capital expenditure than the cost to build a new facility.

2. Quality control - Set up a quality control system to measure the following:
   a. light fastness
   b. wash fastness
   c. crocking

d. bleeding

e. shrinking

f. print registration

g. print balance

There should be standard tests to improve quality, maintain consistent quality, improve customer acceptance and confidence.

Industry Recommendations

1. Sources of Machinery: The machinery and equipment is purchased from the United Kingdom, Europe, The People's Republic of China, Japan, India and the United States. If all machinery and equipment was produced by a few countries and suppliers, then supply houses could be set up, relieving each plant from carrying excessive supplies and reducing lead time on supply orders. It appears management approves equipment and machinery by purchase price with little or no consideration given to productivity, quality, life of equipment and availability of operating supplies.

2. Machinery Incentives: Factories should receive an incentive to replace worn out, obsolete equipment with modern equipment. This could be in the form of not imposing duty on the equipment imported. The equipment that is removed should be destroyed and not sold to another factory. The Government should not allow obsolete, worn out equipment to be imported to start new factories or to increase the size of present factories. If labor intensive equipment is allowed, it should be able to produce a quality product.

3. Quality Standards: A permanent non-profit Quality Control organization should be established that would have the responsibility of establishing all testing procedures and quality standards related to the textile industry. This organization would aid industry and Government agencies as well as protect the consumer. These standards would be established to satisfy consumer needs yet still be attainable by the local textile industry. From this, a price/quality ratio for textile goods could be established.

This organization would be set up by the government or independent agency working with the Customs Department, Standards Department, and textile plants. The standards should cover:

A. Sales Yarn:
   1. Yarn count variation
   2. Fiber content
   3. Break factor
   4. If dyed:
      a) shade variation
      b) wash fastness
      c) light fastness
      d) crocking
      e) bleeding

B. Woven Fabrics:
   1. Ends per inch
   2. Picks per inch
   3. Weight per square yard
   4. Break strength
   5. Weaving quality
   6. Width variation

C. Knitted Fabrics:
   1. Courses per inch

2. Wales per inch
3. Weight per square yard
4. Break strength
5. Knitting difficulties
6. Weight variation

D. Dyed and Printed Fabrics:

1. Shade variation
2. Wash fastness
3. Light fastness
4. Crocking
5. Bleeding
6. Break strength
7. Print registration
8. Shrinkage

For such an agency to function properly would require the full support of the Government both in the form of legislation and financial support.

Under this program the Government should, using normal sampling techniques, test all products which receive import proptection. If products do not meet the established standard, disciplinary action such as the following should be imposed:

1. Fines
2. Reduction of selling price
3. Removal of import protection

Indonesia is anxious to promote a campaign to purchase locally produced textiles. While this is a good approach, as long as the quality standards in textile fabrics remain inferior, the local consumer will have little confidence in the product. By establishing quality standards, confidence will be restored in locally produced products.

4. Labor Law Revision - As an inducement to foreign investment consideration should be given to the revision of Laws No. 9 and 11 concerning notice periods and separations. As these laws now stand they act as a deterrent to foreign investment and should therefore be made more lenient.

5. Labor Cost Control - Labor cost control's function is to insure the actual labor performance is kept in line with established standards and is a natural evolution resulting from introducing measured work assignments.

Several requirements are necessary for establishing effective labor cost controls. These requirements have to be known for each production machine, each job classification and each type of product. These requirements are:

a. Standard work assignments
b. Standard machine production
c. Product
d. Actual machine production
e. Actual employee hours used
f. Actual hours operated

Based on standard work assignments and expected production, standard labor costs per unit of production can be developed. The actual cost should be compared with the standard costs and the variances analyzed on a weekly, bi-monthly or monthly basis.

6. Waste Control - Since raw material constitutes the main item of cost in most, if not all textile products, the exercise of good control over waste can considerably influence the profitability of any textile operation. The establishment of an

effective waste control program requires establishing standard waste by process and product and a program for disposition of the waste produced.

In conducting a waste control program, the actual waste produced is weighed and recorded then disposed of in a predetermined manner. At regular intervals, the actual waste produced is compared to standard. If the actual waste produced exceeds standard tolerance an investigation is launched to determine and correct the cause.

It is essential in any textile operation to control not only the waste which is unrecoverable and, therefore sold, but also the waste which is being returned to previous processes to be reworked. Very often little attention is given to controlling the amount of reworkable waste produced. An excessive quantity of waste being reprocessed is detrimental to the processing performance of the product and eventually to the quality of the finished product.

Textile Institute and Training

Textile Institute

The Indonesian textile industry is fortunate to have the Textile Institute, located in Bandung, which provides students with degrees in Textile Technology which are available to industry. While the Institute provides an invaluable service to the textile industry there are four major areas in which it should broaden its scope. These areas are:

1. Management Development

   The Institute should implement special programs to improve the skills of Indonesians in the techniques of mill management. These programs should be conducted at the Institute as well as in regional areas where transportation is a problem. These programs should include:

   a. Seminar
   b. Special area discussion courses
   c. Demonstration of modern equipment using modern techniques
   d. Special refresher courses

2. Instructor and Operator Training

The Institute should design courses where instructors are trained in the proper techniques and movements to perform a given task with maximum results and minimum efforts. Once the instructors are trained then the training of operators could be accomplished by:

a. Large Plants

Assist the large plants in establishing their own training program for operator and technicians.

b. Small Plants

Have adequate facilities at the Textile Institute for training operators and technicians when the plants cannot afford a full time training program.

c. Rural Cottage Industry

Hold seminars in the rural area for plants that cannot afford sending their employees to the Institute.

This type of training program in textile companies of both developed and developing countries have invariably resulted in:

(1) Shorter learning time

(2) Increased manpower productivity

(3) Reduced labor turnover

(4) Increased quality

(5) Reduced waste

(6) Reduced absenteeism

3. Consulting Service

To provide additional support to the Indonesian textile industry the experts teaching at the Institute should be made available to the industry when it has specific problems. It is also recommended that when the experts go to the mills to assist in solving specific problems, they are allowed to take some advanced students with them. This would give the students first hand knowledge in problem solving.

4. Supervisor Training

The Textile Institute should grant undergraduate degrees in the following areas of textile technology:

a. Spinning

b. Weaving

c. Dyeing, finishing and printing

d. Knitting

e. Mill management

f. Yarn texturizing (option course)

g. Textile design

h. Physical testing (option course)

i. Color fastness and testing (option course)

Preventative Maintenance

The object of a preventative maintenance program is to insure that all equipment is properly maintained. Each machine is cleaned, lubricated, inspected, adjusted and worn parts replaced on predetermined frequencies. These frequencies are determined according to the type of equipment, its age and condition and the number of hours it operates.

Such periodic maintenance minimizes down-time for mechanical failure and extends the useful life of the machine. Also, product quality is improved by proper equipment maintenance.

Maintenance of equipment in Indonesia is generally poor, with the exception of several spinning mills. The installation of preventative maintenance programs would go a long way toward alleviating this situation.

Another feature of preventative maintenance programs is that employees can be trained to perform limited specialized functions making it much easier to train people who have had no previous experience in textiles.

Many machines were observed running with mechanical failures and in many cases if a machine had a breakdown on the night shift it was not repaired and returned to production until the day shift. Preventative maintenance programs are designed to eliminate this.

Where skilled labor is not readily available and the potential work force is non-industry oriented, it is necessary to minimize job skills as much as possible to get maximum utilization from the available skilled labor. Preventative maintenance programs are one of the most effective vehicles with which to achieve the degree of specialization required to minimize job skills. An example of this is that an employee could be trained to plumb spindles on a spinning frame. How to plumb a spindle is all he is required to know. It is not necessary to know anything else about the frame such as how to level the

rail or change cots as his only job is to plumb spindles. Technicians, supervisors or highly skilled personnel would be used only to follow up and spot check to see that the spindle plumber was performing his job properly.

Supplies

The inventory of supplies and repair parts is inadequate. This is obvious when one observes the number of machines not operating because of lack of repair parts. The main reasons are:

1. Some machinery manufacturers are no longer in business, therefore, alternative sources for supplies have to be located .

2. Some countries that supplied machines to Indonesia will not furnish supply parts due to political difficulties between the countries. Alternative sources must be found through a country that is friendly to both Governments. By placing the order with the friendly country, they in turn place the order to the country of machine origin. Then the supplies are shipped in reverse order resulting in a long lead time.

3. The machine's country of origin is located such a long distance from Indonesia that long lead times are required.

4. Custom difficulties when an order is not properly filled. Some plants complained that vital supply parts were at the docks and customs would not release them because of error in paper work and/or improper shipments.

5. Mill management not placing orders on time. This is created through either not having a maximum, minimum reorder control procedure, lack of interest or lack of capital.

It is recommended that steps be taken by the Indonesian Government to start standardizing equipment. By doing this central supply houses could be set up in Indonesia relieving the mill from carrying excessive supplies.

2.3.0.0 Proposed Growth Plan

It is our opinion that the Indonesian textile industry should have as its goals first to gain control of the domestic market and, second, in the longer range, to participate in world markets. In setting these goals it must be realized that the first must necessarily precede the second. If the Indonesian textile industry is unable to compete favorably in the somewhat protected home markets, it is even less able to compete in the more highly competitive world markets where price, quality and delivery are the key purchasing criteria.

There is no doubt that Indonesia has the same basic ingredients for the development of its textile industry as possessed by the major Asian textile-producing countries such as Japan, Korea and Taiwan. It has a healthy investment climate in terms of stability of government, realistic economic and investment policies, attractive land for plant sites and a large labor force. This abundant labor supply, while unskilled, is capable of being trained. It has low wage rates and a training center which provides a nucleus of key technical personnel on which to build. It has substantial investment

capital available through a combination of foreign and domestic sources. Last, but certainly not least, Indonesia has a growing demand for textile products fueled by its large, growing population and its ever-increasing affluence.

For these reasons we have developed a growth plan for the Indonesian textile industry which is both realistic and attainable. This plan was developed on the underlying premise that the only effective way to combat the import problem is for the domestic industry to be able to compete favorably with imports in terms of price, quality and delivery. The plan has therefore been developed to serve a threefold purpose:

1. To combat imports, both legal and illegal, by making the industry more competitive.

2. To bring the various industry sectors into a reasonable supply/demand balance.

3. To provide the textile industry with an increasing share of domestic markets through 1980.

In establishing these objectives we have attempted to be realistic. We fully realize that, in today's market, no country can reasonably expect to supply its entire textile requirement in every market. There will always be some imports. The key to success is in minimizing them. After extensive market analysis, we have developed a plan which will accomplish this. This plan has as its long-term goal the local production of 80% of domestic textile requirements (consumption) by 1980.

The growth plan consists essentially of two phases, modernization and expansion. The modernization phase consists of upgrading present equipment to efficient operating levels in order to improve quality or increase production, or both. The expansion phase is necessary both to bring the industry to a reasonable "mill" (supply/demand) balance and to capture a greater share of the domestic market. While both the modernization and expansion phases can be accomplished simultaneously, then ultimate success is largely dependent upon the adequate training of supervisory and production personnel. (The training programs and facilities

required are discussed in detail in Section 3.0.0.0 and are summarized under the Training heading of this section.)

The term "modernization" is somewhat misleading since we have used it to cover a wide range of machinery and corrective actions. For example, the modernization of spinning equipment would encompass the use of change-over kits to replace worn out drafting equipment, whereas the modernization of looms would consist of the installation (or re-installation) of stop motions or other automatic devices.

Since the modernization program covers the entire primary textile industry, it is necessary to establish priorities as to the order in which the program should be implemented. We have thus established these priorities beginning with the area which is the most critical - that is, the spinning sector. These are as follows:

1. Spinning sector
    1) Drawing
    2) Pickers and opening line

3) Winding

4) Spinning

5) Roving

6) Carding

2. Weaving sector

1) Slashing

2) Warping

3) Weaving

4) Quilling

3. Dyeing and finishing sector

(No order of priority)

4. Printing sector

(No order of priority)

5. Knitting sector

(No order of priority)

The above priorities indicate that the most critical area is the spinning sector and, within the spinning sector, drawing. The dyeing, finishing and printing sectors, along with knitting require general upgrading and we have therefore not established individual sub-priorities within these groups.

2.3.1.0 Basis for Plan

One of the hazards in building a growth plan of this nature is in attempting to accomplish too much in a too-short time period. In designing our recommended growth plan for the Indonesian textile industry as shown in Exhibits 2-1 through 2-9 we have made every effort to avoid this. We feel that this plan is both challenging and realistically attainable. It provides for "manageable" growth in terms of technical skills, personnel and capital requirements.

It should be noted that the plan covers a ten-year period beginning with the base year 1971. While the plan is directly related to our market forecasts and long-range goal of producing locally 80% of total domestic textile consumption, we feel that there are a number of ways in which it can be implemented. To emphasize this point and to allow for the flexibility required, we have simply numbered the years one through ten rather than list specific years. As indicated in the exhibits Year #1 corresponds to 1971.

Modernization

The modernization costs shown in the plan are estimates based on our survey and our long experience in textiles. As previously indicated, some of the modernization, such as in drawing and dyeing and finishing, is necessary in order to upgrade quality and does not increase production capacity. Other modernization such as weaving and spinning increases both quality and capacity. The modernization costs which are required are as follows:

Sector	Estimated Cost (Millions $)
Spinning	$10.4
Weaving	6.8
Knitting:	
Underwear	0.3
Half hose	--
Outerwear	--
Hand and Others	--
Dyeing and Finishing	3.8
Printing	0.1
Total	$21.4

Expansion

Our market analysis indicates that, by far, the predominant fabrics which will be required in Indonesia through 1980 will require yarns of the 20's and 30's cotton count range. In order to determine the expansion capital required to produce these fabrics we "designed" economic-sized plants to produce an average yarn and fabric construction based on the weighted average of an explosion of our individual fabric forecasts. The plants were therefore "designed" (with ± 10% yarn count flexibility) to produce the following:

Spinning - 26/1's cotton count

Weaving - 26/1's warp and weft

60 X 60 ends and picks per inch

The dyeing, printing and finishing requirements were based on individual fabric forecasts and economic plant sizes. Since knitting machines can be added either individually or in groups, we simply added machines as necessary with an allowance made for both the machine price and the floor space required.

The typical plants which were utilized to calculate the expansion phase are as follows:

Spinning:	
No. of spindles	30,000
Cost per plant	$6,800,000
Capacity (MM Lbs.)	8,100,000
Employees:	
Supervisory	30
Production	600
Weaving:	
No. of looms	400
Cost per plant	$2,500,000
Capacity (MM Lbs.)	3,700,000
Employees:	
Supervisory	20
Production	400
Printing:	
Cost per plant	$1,200,000
Capacity (MM Lbs.)	2,250,000
Employees:	
Supervisory	9
Production	60

Dyeing and Finishing:

Cost per plant	$5,000,000
Capacity (MM Lbs.)	7,500,000
Employees:	
Supervisory	30
Production	200

It should be noted that the above plants have been calculated on the basis of a three-shift, five or six days per week operation except spinning which is based on 4 shifts, 68 hours per week.

In addition, the machinery utilized in our calculations is not the most automated, capital intensive machinery available. Instead we have based our calculations on machinery which offers the economical combination of high production at a lower capital investment and greater labor utilization.

2.3.2.0 Highlights of the Plan

As stated above, the plan uses 1971 as its base year (Year #1). Since the field work for this study was accomplished in mid-1971, we have had to estimate the additional production capacity which came "on stream" during that year. In addition,

because of the fact that this report is being submitted in early 1972, we have not allowed for the implementation of our recommendations before that time (Year #2).

Based on the above, this plan is predicated on the fact that in Year #2 (1972) the modernization program must be accomplished and additional training facilities must be provided through the Textile Institute. With these factors accomplished, the industry is in a position to expand rapidly during Years #3 through #7. The growth in capacity will continue, but at a lesser rate, during Years #8, 9 and 10 as the overall production goal is realized. Upon completion of this ten-year growth plan, the industry must continue to grow in order to maintain its share of domestic markets and to begin an export program to world markets.

The highlights of the growth plan, by sector, are as follows:

Spinning (Exhibit 2- 1)

In Year #1 (1971) the total spun yarn consumed in Indonesia amounted to 326.0 million pounds. At

Exhibit 2-1

SPINNING SECTOR - INDONESIA

RECOMMENDED GROWTH PLAN*

	Year Number									
	1	2	3	4	5	6	7	8	9	10
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Market Requirements (MM Lbs.)										
Total Yarn Requirement	326.0	336.0	346.0	358.0	369.0	380.0	393.0	405.0	419.0	435.0
Total Consumption Goal (80%)	260.8	268.8	276.8	286.4	295.2	304.0	314.4	324.0	334.4	341.0
Production at Capacity	141.2	172.4	196.7	221.0	245.3	269.6	293.9	310.1	326.3	342.5
Capacity (MM Lbs.)										
Beginning of Time Period	125.0	141.2	172.4	196.7	221.0	245.3	269.6	293.9	310.1	326.3
Addition Through Modernization	-	15.0	-	-	-	-	-	-	-	-
Addition Through Expansion	16.2	16.2	24.3	24.3	24.3	24.3	24.3	16.2	16.2	16.2
Total Capacity - Year End	141.2	172.4	196.7	221.0	245.3	269.6	293.9	310.1	326.3	342.5
Investment (MM $)										
No. of Additional Plants	2	2	3	3	3	3	3	2	2	2
Cost/Plant (MM $)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
M-Additional Spindles	60	60	90	90	90	90	90	60	60	60
Cumulative	60	120	210	300	390	480	570	630	690	750
Modernization Cost	-	10.4	-	-	-	-	-	-	-	-
Expansion Cost	13.6	13.6	20.4	20.4	20.4	20.4	20.4	13.6	13.6	13.6
Total Investment/Year	13.6	24.0	20.4	20.4	20.4	20.4	20.4	13.6	13.6	13.6
Cumulative Investment	13.6	37.6	58.0	78.4	98.8	119.2	139.6	153.2	166.8	180.4
Employment (Additional)										
Supervisory	60	60	90	90	90	90	90	60	60	60
Production	1200	1200	1800	1800	1800	1800	1800	1200	1200	1200
Total	1260	1260	1890	1890	1890	1890	1890	1260	1260	1260
Cumulative	1260	2520	4410	6300	8190	10080	11970	13230	14490	15750

*Objective: To produce 80% of domestic requirements by 1980 excluding filament.

this time the capacity of the spinning sector was 141.2 million pounds. In order to meet the production goal of 80% of domestic consumption by Year #10 (1980), an additional 199.3 million pounds of capacity must be added.

To achieve this additional volume over the ten-year period requires the addition of twenty-five spinning mills (30,000 spindles each) or two to three additional mills per year. The total cost of these mills, including modernization of existing mills, will be approximately $180.4 million or an average of $18 million per year.

The twenty-five mills which will be built during the ten-year period will increase the total employment of the spinning sector by over fifteen thousand people as follows:

Supervisory	750
Production	15,000
Total	15,750

This large increase in personnel re-emphasizes the critical nature of the training requirement. We

feel that if our training recommendations are followed closely the trained personnel necessary to achieve the expansion phase will be readily available.

Weaving (Exhibit 2-2)

In year #1 (1971) there were approximately 274 million pounds of woven fabrics consumed in Indonesia, not including hand woven fabrics. Had the weaving sector operated at capacity during that year, it could have produced approximately 149.4 million pounds or 54.4% of the total domestic requirement. In order for the weaving sector to be able to produce 80% of the total domestic requirement by 1980 an additional 133.8 million pounds of capacity must be installed.

In terms of equipment, 14,000 additional looms (35 plants) must be installed to achieve this increased capacity. The total investment required to accomplish this expansion is $94.3 million including the $6.8 million required for modernization of present equipment.

Exhibit 2-2

WEAVING SECTOR - INDONESIA

RECOMMENDED GROWTH PLAN*

	Year Number									
	1	2	3	4	5	6	7	8	9	10
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Market Requirements (MM Lbs.)										
Total Fabric Requirement	274.0	283.0	289.0	299.0	309.0	318.0	327.0	337.0	348.0	354.0
Total Consumption Goal (80%)	219.2	226.4	231.2	239.2	247.2	254.4	261.6	269.6	278.4	283.2
Production at Capacity	149.4	170.6	181.7	196.5	215.0	233.5	252.0	266.8	277.9	285.3
Capacity (MM Lbs.)										
Beginning of Time Period	142.0	149.4	170.6	181.7	196.5	215.0	233.5	252.0	266.8	277.9
Addition Through Modernization	-	13.8	-	-	-	-	-	-	-	-
Addition Through Expansion	7.4	7.4	11.1	14.8	18.5	18.5	18.5	14.8	11.1	7.4
Total Capacity - Year End	149.4	170.6	181.7	196.5	215.0	233.5	252.0	266.8	277.9	285.3
Investment (MM $)										
No. of Additional Plants	2	2	3	4	5	5	5	4	3	2
Cost/Plant (MM $)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Additional Looms	800	800	1200	1600	2000	2000	2000	1600	1200	800
Cumulative	800	1600	2800	4400	6400	8400	10400	12000	13200	14000
Modernization Cost	-	6.8	-	-	-	-	-	-	-	-
Expansion Cost	5.0	5.0	7.5	10.0	12.5	12.5	12.5	10.0	7.5	5.0
Total Investment/Year	5.0	11.8	7.5	10.0	12.5	12.5	12.5	10.0	7.5	5.0
Cumulative Investment	5.0	16.8	24.3	34.3	46.8	59.3	71.8	81.8	89.3	94.3
Employment (Additional)										
Supervisory	40	40	60	80	100	100	100	80	60	40
Production	800	800	1200	1600	2000	2000	2000	1600	1200	800
Total	840	840	1260	1680	2100	2100	2100	1680	1260	840
Cumulative	840	1680	2940	4620	6720	8820	10920	12600	13860	14700

*Objective: To product 80% of domestic requirements by 1980 excluding filament.

Additional looms (35 plants) must be installed to achieve this increased capacity. The total investment required to accomplish this expansion is $94.3 million including the $6.8 million required for modernization of present equipment.

The additional employment which would result from this expansion is as follows:

Supervisory	700
Production	14,000
Total	14,700

As stated above, these figures do not include the hand or cottage industry. We feel that while the cottage industry will continue to exist for many years to come, the higher quality levels and economies of scale which will result from the modernization and expansion of the weaving mills will have a long-term detrimental affect on the home industry.

Knitting: Underwear (Exhibit 2-3)

The total consumption of knitted underwear amounted to 30.6 million pounds in 1971 and is expected to

Exhibit 2-3

KNITTING: UNDERWEAR

RECOMMENDED GROWTH PLAN*

	Year Number									
	1	2	3	4	5	6	7	8	9	10
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Market Requirements (M Lbs.)										
Total Fabric Requirement	30,671	31,837	33,047	34,302	35,606	36,959	38,363	39,821	41,335	43,000
Total Consumption Goal (80%)	24,536.8	25,469.6	26,437.6	27,441.6	28,484.8	29,567.2	30,690.4	31,856.8	33,068.0	34,400.0
Production at Capacity	38,400.0	38,400.0	38,400.0	38,400.0	38,400.0	38,400.0	38,400.0	38,400.0	38,400.0	38,400.0
Capacity (MM Lbs.)										
Beginning of Time Period	38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400
Addition Through Modernization	-	-	-	-	-	-	-	-	-	-
Addition Through Expansion	-	-	-	-	-	-	-	-	-	-
Total Capacity - Year End	38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400
Investment (M $)										
Cost/Machine ($)	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000
Modernization Cost (m)	-	275	-	-	-	-	-	-	-	-
Expansion Cost	-	-	-	-	-	-	-	-	-	-
Total Investment/Year	-	275	-	-	-	-	-	-	-	-
Cumulative Investment	-	275	275	275	275	275	275	275	275	275
Employment (Additional)										
Supervisory	-	-	-	-	-	-	-	-	-	-
Production	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-
Cumulative										

* Objective: To produce 80% of domestic requirements by 1980

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increase to 43.0 million pounds by 1980. If the domestic industry produces 80% of this requirement by 1980, the production level will be 34.4 million pounds. While this segment of the industry is presently operating well below its capacity, it has a capacity level of 38.4 million pounds which is sufficient to meet requirements through 1980.

While there is no requirement for expansion capital through 1980, existing machinery should be updated. We estimate that this modernization could be accomplished at a cost of approximately $275,000.

Knitting: Half Hose (Exhibit 2- 4)

At the present time (Year #2) the half hose sector of the knitting industry has enough capacity to supply 80% of total domestic consumption of this market through Year #5. During the Years #6 through #10 an additional 46 machines must be installed to manufacture the 200,000 pounds necessary to maintain the 80% share of the domestic market. These machines can be installed for a total capital investment of $230,000, including floor space.

Exhibit 2-4

KNITTING: HALF HOSE

RECOMMENDED GROWTH PLAN*

	Year Number									
	1	2	3	4	5	6	7	8	9	10
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Market Requirements (M Lbs.)										
Total Fabric Requirement	644	668	694	720	747	776	805	836	868	900
Total Consumption Goal (80%)	515.2	534.4	555.2	576.0	597.6	620.8	644.0	668.8	694.4	720.0
Production at Capacity	600.0	600.0	600.0	600.0	600.0	621.0	645.5	670.0	694.5	721.0
Capacity (M Lbs.)										
Beginning of Time Period	600.0	600.0	600.0	600.0	600.0	600.0	621.0	645.5	670.0	694.5
Addition Through Modernization	-	-	-	-	-	-	-	-	-	-
Addition Through Expansion	-	-	-	-	-	21.0	24.5	24.5	24.5	66.5
Total Capacity - Year End	600.0	600.0	600.0	600.0	600.0	621.0	645.5	670.0	694.5	761.0
Investment ($)										
No. of Additional Machines	-	-	-	-	-	6	7	7	7	19
Cost/Machine	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
Modernization Cost	-	-	-	-	-	-	-	-	-	-
Expansion Cost (m)	-	-	-	-	-	30	35	35	35	95
Total Investment/Year	-	-	-	-	-	30	35	35	35	95
Cumulative Investment	-	-	-	-	-	30	65	100	135	230
Employment (Additional)										
Knitting (Skilled)	-	-	-	-	-	4	5	5	6	14
Knitting (Unskilled)	-	-	-	-	-	1	1	1	1	1
Fixers, Mechanics, Supervisors:										
- Knitting	-	-	-	-	-	1	1	1	2	2
- Fabricating	-	-	-	-	-	-	-	-	-	-
Total						6	7	7	9	17
Cumulative	-	-	-	-	-	6	13	20	29	46

*Objective: To produce 80% of domestic requirements by 1980

The additional employment necessary to support this expanded capacity is as follows:

Production (skilled)	34
Production (unskilled)	5
Fixers, mechanics and supervisors	7
Total	46

In the half hose "industry" the machinery in place is good and requires no modernization.

Knitting: Outerwear (Exhibit 2-5)

In 1971 (Year #1) the total consumption of knitted outerwear fabrics amounted to 14.7 million pounds as opposed to an estimated production capacity of only 2.7 million pounds. The knitted outerwear "industry" thus had a capacity to supply only 18.3% of total demand. By 1980 the total domestic consumption of these fabrics will be approximately 20.6 million pounds.

To reach the 80% production goal by 1980, an additional 14 million pounds of capacity must be installed during the ten-year period. Based on a

Exhibit 2-5

KNITTING: OUTERWEAR*

RECOMMENDED GROWTH PLAN**

	Year Number 1	2	3	4	5	6	7	8	9	10
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Market Requirements (M Lbs.)										
Total Fabric Requirement	14,664.5	15,222.4	15,800.4	16,401.3	17,024.2	17,671.1	18,343.1	19,040.0	19,762.9	20,644.9
Total Consumption Goal (80%)	11,731.6	12,177.9	12,640.3	13,121.0	13,619.4	14,136.9	14,674.5	15,232.0	15,810.3	16,515.9
Production at Capacity	2,747.0	3,489.0	4,602.0	6,086.0	7,941.0	10,167.0	12,393.0	13,877.0	15,361.0	16,518.0
Capacity (MM Lbs.)										
Beginning of Time Period	2,450	2,747	3,489	4,602	6,086	7,941	10,167	12,393	13,877	15,361
Addition Through Modernization	-	-	-	-	-	-	-	-	-	-
Addition Through Expansion	297	742	1,113	1,484	1,855	2,226	2,226	1,484	1,484	1,157
Total Capacity - Year End	2,747	3,489	4,602	6,086	7,941	10,167	12,393	13,877	15,361	16,518
Investment (M $)										
Modernization Cost	-	-	-	-	-	-	-	-	-	-
Expansion Cost	200	500	750	1,000	1,250	1,500	1,500	1,000	1,000	780
Total Investment/Year	200	500	750	1,000	1,250	1,500	1,500	1,000	1,000	780
Cumulative Investment	200	700	1,450	2,450	3,700	5,200	6,700	7,700	8,700	9,480
Employment (Additional)										
Knitting (Skilled)	9	24	35	47	59	71	71	47	47	35
Knitting (Unskilled)	3	6	10	13	16	19	19	13	13	9
Fixers, Mechanics, Supervisors (Knitting)	2	7	10	12	15	18	18	12	12	10
Total	14	37	55	72	90	108	108	72	72	54
Cumulative	14	51	106	178	268	376	484	556	628	682

*Not including hand knitting
**Objective: To produce 80% of domestic requirements by 1980

weighted average machine price, including cost of floor space we estimate that this additional capacity would require an investment of $9.5 million or approximately $1.0 million per year. (It should be noted that a weighted average price was used due to the wide range of machines which produce outerwear. These include single jersey, tricot, Raschel, flat, interlock and sweater strips.)

The additional employment required to support this expansion is as follows:

Production (skilled)	445
Production (unskilled)	121
Fixers, mechanics and supervisors	116
Total	682

Knitting: Hand and Others (Exhibit 2-6)

This sector of the knitting industry will increase from 4.8 million pounds of production (and consumption) in 1971 to 6.4 million pounds in 1980. The capacity in hand and "other" knitting must therefore be increased by 1.6 million pounds by 1980. To do this would require the addition of 1,067

Exhibit 2-6

KNITTING: HAND & OTHER

RECOMMENDED GROWTH PLAN

	Year Number									
	1	2	3	4	5	6	7	8	9	10
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Domestic Consumption (MM Lbs.)	4.8	5.0	5.2	5.4	5.5	5.7	5.8	6.0	6.2	6.4
Domestic Production (MM Lbs.)	4.8	5.0	5.2	5.4	5.5	5.7	5.8	6.0	6.2	6.4
Additional Machines - No.	-	133	133	134	67	134	67	133	133	133
Cost/Machine ($)	750	750	750	750	750	750	750	750	750	750
Additional Investment/Year (M$)		99.8	99.8	100.5	50.3	100.5	50.2	99.8	99.7	99.7
Cumulative Investment (M$)	-	99.8	199.6	300.1	350.4	450.9	501.1	600.9	700.6	800.3
Additional Employees/Year	-	479	479	482	241	482	241	479	479	479
Cumulative Employees	-	479	958	1440	1681	2163	2404	2883	3362	3841

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new machines at a total investment of approximately $800,000 over the ten-year period. The total additional labor required would be 3,841 employees.

Printing (Exhibit 2-7)

Our forecasts indicate that the printing capacity in place in 1971 is sufficient for the need throughout the first nine years of the forecast period. In Year #10 one additional printing facility will be required at a total cost of $1,200,000. This plant would employ 69 people of which 9 would be supervisors and 60 production personnel.

In addition to the two new plants which came "on stream" during 1971, a certain amount of upgrading is required. We estimate that this modernization could be accomplished for an expenditure of approximately $100,000.

Dyeing and Finishing (Exhibit 2-8)

In 1971 the dyeing and finishing capacity of 96.5 million pounds was only slightly below the overall industry requirement of 100.0 million pounds. Our

Exhibit 2-7

PRINTING

RECOMMENDED GROWTH PLAN*

	Year Number									
	1	2	3	4	5	6	7	8	9	10
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Market Requirements (MM Lbs.)										
Total Consumption Goal (80%)	62.2	69.2	73.1	78.3	84.8	91.5	98.0	103.3	107.3	110.1
Production at Capacity	108.50	108.50	108.50	108.50	108.50	108.50	108.50	108.50	108.50	110.75
Capacity (MM Lbs.)										
Beginning of Time Period	104.00	108.50	108.50	108.50	108.50	108.50	108.50	108.50	108.50	108.50
Addition Through Modernization	-	-	-	-	-	-	-	-	-	-
Addition Through Expansion	4.50	-	-	-	-	-	-	-	-	2.25
Total Capacity - Year End	108.50	108.50	108.50	108.50	108.50	108.50	108.50	108.50	108.50	110.75
Investment (MM $)										
No. of Additional Plants	2	-	-	-	-	-	-	-	-	1
Cost/Plant (MM $)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Modernization Cost	-	0.1	-	-	-	-	-	-	-	-
Expansion Cost	2.4	-	-	-	-	-	-	-	-	1.2
Total Investment/Year	2.4	0.1	-	-	-	-	-	-	-	1.2
Cumulative Investment	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.7
Employment (Additional)										
Supervisory	18	-	-	-	-	-	-	-	-	9
Production	120	-	-	-	-	-	-	-	-	60
Total	138	-	-	-	-	-	-	-	-	69
Cumulative	138	138	138	138	138	138	138	138	138	207

*Objective: To produce 80% of domestic requirements by 1980

Exhibit 2-8

DYEING AND FINISHING

RECOMMENDED GROWTH PLAN*

	Year Number									
	1	2	3	4	5	6	7	8	9	10
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Market Requirements (MM Lbs.)										
Total Consumption Goal (80%)	100.0	111.2	117.5	125.9	136.3	147.0	157.5	166.0	172.5	176.9
Production at Capacity	96.5	111.5	119.0	126.5	134.0	149.0	156.5	164.0	171.5	179.0
Capacity (MM Lbs.)										
Beginning of Time Period	89.0	96.5	111.5	119.0	126.5	134.0	149.0	156.5	164.0	171.5
Addition Through Modernization	-	-	-	-	-	-	-	-	-	-
Addition Thrcugh Expansion	7.5	15.0	7.5	7.5	7.5	15.0	7.5	7.5	7.5	7.5
Total Capacity - Year End	96.5	111.5	119.0	126.5	134.0	149.0	156.5	164.0	171.5	179.0
Investment (MM $)										
No. of Additional Plants	1	2	1	1	1	2	1	1	1	1
Cost/Plant (MM $)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Modernization Cost	-	3.8	-	-	-	-	-	-	-	-
Expansion Cost	5.0	10.0	5.0	5.0	5.0	10.0	5.0	5.0	5.0	5.0
Total Investment/Year	5.0	13.8	5.0	5.0	5.0	10.0	5.0	5.0	5.0	5.0
Cumulative Investment	5.0	18.8	23.8	28.8	33.8	43.8	48.8	53.8	58.8	63.8
Employment (Additional)										
Supervisory	30	60	30	30	30	60	30	30	30	30
Production	200	400	200	200	200	400	200	200	200	200
Total	230	460	230	230	230	460	230	230	230	230
Cumulative	230	690	920	1150	1380	1840	2070	2300	2530	2760

*Objective: To produce 80% of domestic requirements by 1980

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forecasts indicate that by 1980 the capacity required will be approximately 177 million pounds or an increase in capacity of approximately 80 million pounds over the ten-year period.

Using the economic-sized plants discussed above, we estimate that a total of twelve additional plants will be required to furnish the additional capacity required. (The twelve plants includes one plant which was completed during 1971.) The total investment required for these plants is approximately $63.8 million, including $3.8 million for modernizing present equipment.

The additional employment required to staff this expansion is as follows:

Supervisory	360
Production	2,400
Total	2,760

2.3.2.1 Summary of Growth Plan

Exhibit 2- 9 shows the production (at capacity) required by sector in order to meet the goal of

Exhibit 2-9

PRODUCTION SUMMARY* (MM LBS.)

RECOMMENDED GROWTH PLAN**

	Year Number									
	1	2	3	4	5	6	7	8	9	10
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Spinning	141.2	172.4	196.7	221.0	245.3	269.6	293.9	313.1	326.3	342.5
Weaving	149.4	170.6	181.7	196.5	215.0	233.5	252.0	266.8	277.9	295.3
Knitting										
Underwear	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4
Half Hose	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8
Outerwear	2.7	3.5	4.6	6.1	7.9	10.2	12.4	13.9	15.4	16.5
Hand & Others	4.8	5.0	5.2	5.4	5.5	5.7	5.8	6.0	6.2	6.4
Total	46.5	47.5	48.8	50.5	52.4	54.9	57.2	59.0	60.7	62.1
Total Weaving & Knitting	195.9	218.1	230.5	247.0	267.4	288.4	309.2	325.8	338.6	347.4
Printed Fabrics	62.2	69.2	73.1	78.3	84.8	91.5	98.0	103.3	107.3	110.1
Bleached, Dyed & Finished	100.0	111.2	117.5	125.9	136.3	147.0	157.5	166.0	172.5	176.9

* Production at capacity level
**Objective: To produce 80% of domestic requirements by 1980

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locally producing 80% of total domestic textile consumption by 1980. A summary of the investment required to achieve this goal and its effect on employment by sector is shown below.

GROWTH PLAN SUMMARY
(Cumulative 1971-1980)

	MM $	ADDITIONAL EMPLOYEES
Spinning	180.4	15,750
Weaving	94.3	14,700
Knitting		
Underwear	0.3	--
Half Hose	0.2	46
Outerwear	9.5	682
Hand and Others	0.8	3,841
Total Knitting	10.8	4,569
Printing	3.7	207
Dyeing & Finishing	63.8	2,760
Total	$353.0	37,986

In addition to the above expenditure for expansion and modernization there are several other costs to be considered:

- Electric Power - As pointed out in the report, the electric power supply in Indonesia is somewhat limited. For the textile industry to be able to modernize and expand it is essential that a good electric power supply be available. We therefore feel that any expansion will require additional power generation equipment. As a rough figure, we estimate that the power generation equipment to supply the expanded textile industry through 1980 would require an investment of approximately $21.9 million.

- Roads - As the industry expands more and better highways and roadways must be provided. It is our estimate that by 1980 the expenditure for roads and highways could well exceed $50 million.

- Textile Institute - Without trained personnel the goals of the textile industry will never be realized. There is an immediate need for

training programs and facilities. We estimate that the Textile Institute could be geared to accommodate this training requirement for a cost of approximately $850,000. This would include both both the upgrading of present facilities and the construction of classroom, dormitory and manufacturing facilities for new and expanded programs.

2.3.3.0 Implementation of the Plan

If this plan is to be successfully implemented, a strong program of incentives and enforcements must be developed and implemented by the Government of Indonesia. Such a program should be directed toward the solution of the following:

1. Lack of incentive to invest
2. Lack of investment capital for:
   a. Modernization
   b. Expansion
   c. Working capital
3. Lack of technical knowledge and trained personnel.

To overcome these problems, policies must be formulated to encompass the points discussed below:

Lack of incentive to invest - The Indonesian textile industry of today with its low productivity, large, inadequately trained labor force and limited borrowing power has little interest in or hope of modernization and/or expansion. If the growth plan outlined above is to be realized, policies must be implemented which would:

a) Provide factories with incentives to purchase new equipment for expansion and to replace worn out, obsolete equipment. These incentives could be in the form of:

   1. Accelerated write-offs (depreciation)
   2. Exemptions from duties on equipment imported.
   3. Low cost loans with realistic repayment terms (see below).
   4. Technical assistance either from the Government or the Textile Institute in machinery selection, installation and modernization. In the replacement of

equipment, the equipment that is removed should be destroyed and not sold to another factory. The Government should not allow obsolete, worn out equipment to be imported to start new factories or to increase the size of present factories. If labor intensive equipment is allowed, it should be able to produce a quality product.

5. Investment tax credits

b) Force expansion and modernization through tariff control. In the short term, while the modernization and initial expansion programs begin, tariffs should be maintained at or near present levels in order to protect the "infant" industry. By 1975 action should be taken to reduce tariff protection on at least an annual basis such that by 1980 the textile industry will have only minimal tariff protection. This long term tariff reduction will act both to combat illegal imports and to create competition. To insure that this program is effective - that is, that it forces modernization and expansion by removal of market protection - it is imperative

that it be given wide publicity long before it is put into effect. In addition, once the initial target date is reached there should be no deviation from the program which was publicized to the industry.

The theory behind this recommendation is that as the Indonesian textile industry converts to a three-shift operation, modernizes and expands with a trained labor force, unit costs will be substantially lower, thus enabling the industry to compete with imports in terms of price, quality and delivery. On this basis by 1980 Indonesia should be able to compete in the world textile market.

It should be realized, however, that as a result of this program a large number of marginal firms which do not elect to upgrade and expand to at least economic-sized units, will be forced out of business as competition increases. Conversely, the larger, better managed firms which comply with this program will become much larger and stronger and more competitive.

Lack of investment capital - The Indonesian textile industry has been plagued by the inability to secure sufficient short term and long term investment capital. In the short term, if the industry is to convert to and maintain a three shift operation, a low cost line of credit must be made available for the financing of working capital - primarily raw materials and finished goods inventories. In the longer term, low cost investment capital must be made available for the purpose of financing modernization and expansion programs.

Lack of technical knowledge and trained personnel - Indonesia like most developing countries, suffers from a shortage of highly trained technical personnel - primarily textile and industrial engineers. While the Textile Institute has made a major contribution in providing qualified technical personnel, the forecast demand for these skilled people will far exceed the supply. In addition, there will be a critical need for trained first and second line supervisors and key operatives.

The modernization and expansion program cannot be successful without a large number of trained

personnel. It is therefore essential that funds be made available and a program instituted to upgrade and expand the Textile Institute in Bandung.

While such a program would be costly in its initial stages - as previously mentioned, $850,000 not including additional faculty salaries - it would offer two major long-term benefits. First, it would provide the means for training the large number of people required to support the modernization and expansion program and, secondly, the consulting service provided by the faculty would make available to companies of all sizes assistance in planning, management, manufacturing, marketing, organizations and administrative controls.

The consulting service would be geared to the needs of management and the everyday realities of running a business profitably. Clients would include both government and privately owned companies. Assignments would be accepted only after preliminary discussion with potential clients, mutual definition

of the problem and approach, results expected, and agreement upon conditions under which each project is to be conducted. Assignments would range from individual short-term studies to complete project planning and implementation, and continuous retainer agreements.

Each faculty member engaged in this service would be a specialist in one or more management disciplines. Each would have a successful record in the textile industry along with special training in human relations and in communication skills.

Fees would depend on the scope of the assignment and the consulting time required to execute the assignment. Total fees would, of course, be agreed upon in advance.

Such a consulting service should not be designed to offer prepackaged, "off the shelf", programs for the solution of a company's problems. Instead, the service must offer a methodological approach which clearly recognizes that each company's problems are unique and must be solved within that company's frame of reference and, frequently, through the application of several disciplines.

Since the upgrading and expansion of the Textile Institute is an immediate need, the initial funding will have to be provided by the Government of Indonesia along with assistance which we feel would be forthcoming from UNIDO. While the budget of the Institute will have to be subsidized during the early years, the goals should be established that the Institute will be self-sufficient within the first five years of the expanded program. We feel that this would be possible as a result of the funds generated from increased enrollment (tuition), consulting fees and applied research. (The Institute should not attempt to conduct basic research.)

The establishment of this program will be both costly and time consuming. To insure that it is implemented as quickly as possible we feel that the Government of Indonesia should seek maximum assistance from outside organizations such as UNIDO which specialize in these types of activities.

2.3.3.1 Additional Considerations

In addition to the above problems and recommendations, there are several considerations which must be made relative to industry structure, location of new plants and foreign vs. domestic investment. Each will be discussed in turn.

Industry Structure - The effect which the implementation of our recommended growth plan will have on the textile industry is more one of evolution than of revolution. While ideally the spinning, weaving and dyeing and finishing sectors should be composed of a number of large, integrated mills, this is not a viable alternative, in the short-run for the Indonesian textile industry. Even if the owners and managers were willing to consolidate (which they are not) into larger units, much of the machinery which is in place today would not be worth moving.

In the longer run as the mills expand, modernize and new mills are built, there will be a natural

tendency toward at least partial vertical integration. As the industry becomes more competitive many of the smaller, marginal mills will be forced out of business.

As the industry matures, the Government should give consideration to further increasing competition by divesting itself of the ownership of its spinning mills. These, of course, would be sold to the larger Indonesian owned companies.

The hand sector will eventually go the same way as the marginal mills, decreasing in importance as the industry matures. The need for it will be considerably less as the industry becomes more competitive and many of the people from this sector are absorbed into the labor force of the expanded industry.

Location of new plants - It would be ideal if the textile industry could be distributed in direct relation to the population dispersion. This is not a practical solution however when one considers the additional transportation and distribution

facilities, power generating plants and inventories which such a configuration would require.

We feel that, to the extent possible, the present Indonesian textile industry should be "divided" into regions - such as the Bandung - Djakarta region - and new plants located such that a reasonable "mill balance" is achieved and maintained within each region. In this way, each region could become reasonably self-sufficient thus minimizing the additional investment requirement stated above.

Foreign vs. Domestic Investment

The additional investment required in order to accomplish the goals of the growth plan outlined above is approximately $353 million during the ten year period 1971-1980. Included in this investment is the modernization and expansion program as well as the approximate cost of the new mills which came "on stream" during 1971. It does not include expenditures for electric power plants, roads and the Textile Institute.

At the beginning of 1971 the total investment in the Indonesian textile industry amounted to approximately $665 million. As of December 1970, the approved investment amounted to $101.8 million of which approximately $80 million (79%) is foreign.

Our experience indicates that the primary reason for seeking foreign investment should be the managerial and technical skills which will be brought in as a result of the investment and that a reasonable balance of foreign/domestic investment is approximately 30% foreign and 70% domestic. Based on this factor the investment breakdown for the Indonesian textile industry in 1970 would be as follows:

	Millions of Dollars	Percent
Domestic Investment	$465	70
Foreign Investment	200	30
Total Industry	$665	100%

Of the $200 million foreign investment shown above, $80 million had already been approved at the beginning of Year #1 (1971). This means that an

additional $120 million of foreign investment could be approved during the ten year period 1971-1980. This $120 million is equivalent to seven or eight medium-sized vertically integrated plants (spinning, weaving, dyeing and finishing).

We recommend that the approvals for this additional investment be made on a highly selective basis in order to insure that each plant approved makes a positive and significant contribution to Indonesia's long term textile goal. Since sophisticated managerial and technical skills are urgently needed during the initial expansion phase, it is recommended that the major portion of these approvals be granted before 1975 (Year #5).

Government vs. Private Investment

As discussed above, the future of the Indonesian textile industry is dependent upon its ability to attract investment, both domestic and foreign. To be attractive as an investment opportunity the industry must be highly competitive and offer attractive long-term financial returns.

Extreme care must therefore be exercised by the Government in determining its future investment policy. At the present time, the Government-owned spinning sector supplies "raw materials" to the weaving, knitting and dyeing and finishing sectors. By confining its area of activity to the initial sector and not competing in consumer markets, the Government has minimized the adverse effects of Government ownership or competition.

It is our opinion that if the Government-owned mills were to be vertically integrated, competition would be substantially reduced and the industry would be much less attractive as an investment opportunity for both foreign and domestic investors since private investors are historically reluctant to compete with any Government. Future Government investment should be directed toward the reduction of yarn imports by the expansion of the capacity of the spinning sector.

3.0.0.0 INDONESIAN TEXTILE INDUSTRY

3.1.0.0 Indonesian Textile Industry - Technical Survey

To appraise the Indonesian textile industry from a technical and production aspect, 81 primary textile mills were visited with 42,000 employees. In order to obtain a proper evaluation of the textile industry it was necessary to divide the industry into four main sectors. They are:

1. Cotton and synthetic spinning
2. Cotton and synthetic weaving
3. Knitting
4. Bleaching, dyeing, printing and finishing

Some of the mills visited were fully integrated representing all four sectors, while the majority of the mills represented only one sector.

This section evaluates the present Indonesian textile industry with plans to rehabilitate and develop a viable textile industry.

3.2.0.0 COTTON AND OR SYNTHETIC SPINNING

3.2.1.0 Machinery Appraisal

3.2.1.1 General Comments

To appraise the existing machinery and equipment of the cotton and/or synthetic spinning industry, a detailed survey of fourteen mills was conducted. This represents over 85% of the total installed capacity within Indonesia.

Our findings and analysis were based on the following considerations:

a. The general condition of all equipment surveyed.
b. Their production.
c. Their efficiency.
d. The quality of the product produced
e. Their flexibility
f. Their suitability

The appraisal of the cotton and/or synthetic spinning machinery and equipment is shown in Exhibit 3-1 where a percentage of machinery and equipment surveyed is listed as:

a. modern

b. should be modernized

c. obsolete

Layout and Building

The majority of the plants use a straight line or U shaped layout for flow of materials, either of which is good. Five of the plants had a very poor building design resulting in poor utilization of floor space and inadequate machinery layout. This is the result of converting an existing building into a cotton and/or synthetic spinning mill. Two of these mills will be moving into a new building, in the near future, that is designed for spinning yarns and is completely air conditioned.

Material Handling

The material handling for large heavy items such as bales of fiber was adequate in most plants. The material handling for cones of yarn was inadequate. This can be attributed to the way yarn is shipped to the weaving and knitting plants and will be covered in part 3.2.1.8.

Maintenance

The availability of spare parts is a serious problem in some plants. Several faults appear to contribute to this problem. They are:

a. Some plants have obsolete equipment and no spare parts are available.

b. Inadequate Capital - Some plants do not have enough capital to keep an adequate supply of spare parts on hand.

c. Sources of machinery - Some equipment is purchased from countries that now have a poor relationship with Indonesia. The result, either spare parts are difficult to obtain or they are not available from that country. This forces Indonesia to purchase spare parts through a neutral country thus making deliveries slow.

d. Management - It appears some managers do not emphasize maintenance as they should. Some plants that have the same type equipment experience no difficulty in obtaining spare parts while their sister plant has equipment not operating for lack of spare parts. Since there is no lack of capital and the equipment is not obsolete, management is at fault due to lack of proper planning.

e. Customs - Some plants complained about the length of time to get in-coming shipments through customs. Some of this is created by invoices not properly marked. This will be covered in detail under recommendations.

Improper maintenance may result in additional short term profits but this will be offset over the long term when the machinery will either have to be rebuilt or replaced.

Planning

There is little or no long term planning on which yarn counts to produce. The plants change from one yarn count to another depending on what is selling at a given time resulting in reduced efficiency, production, and erratic raw cotton inventory. This will be covered in detail under recommendations.

Sources of Machinery

The spinning machinery is purchased from the United Kingdom, Europe, The People's Republic of China, Japan, and the United States. If all machinery and equipment was produced by a few countries and suppliers, then supply houses could be set up in Indonesia relieving

each plant from carrying excessive supplies and reducing supply order lead time.

3.2.1.2 Opening and Picking Appraisal

In general, the opening and picking equipment needs improvement. Only 50% of the equipment is modern, 28% should be modernized and 22% is obsolete and should be replaced. (see Exhibit 3-1)

Number, Condition and Suitability

There were 50 pickers observed ranging from over 35 years old to less than 2 years old. Only 25 of the pickers are capable of producing a good consistent lap if adjusted properly. Fourteen of the pickers should be modernized and 11 pickers should be replaced.

To process synthetic fibers in the 25 modern pickers would only require bypassing some of the cleaning operation, changing the beater lays and reducing the blows per inch.

Method of Operation

Roving was observed being fed into the stack calendar rolls to keep the lap from splitting at the cards.

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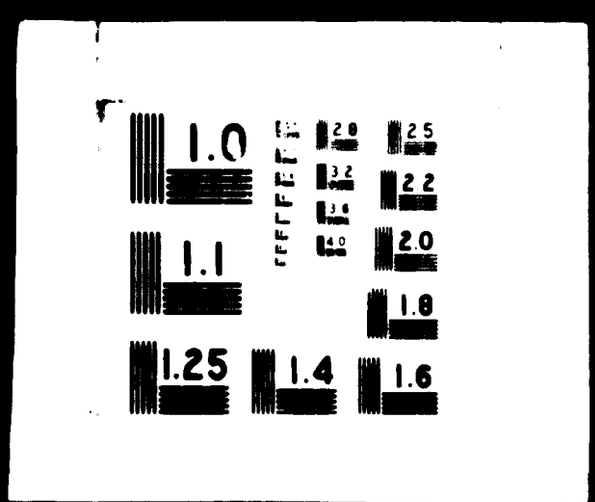


This will keep the lap from splitting but it damages the card clothing as well as increases the nep count. If sufficient pressure is obtained in the lap sheet as it passes through the stack calender rolls, then natural cohesion of the fibers reach the degree of interlocking that will eliminate any tendency of the fibers on the surface to cling to the adjacent layer.

The mills are trying to obtain sufficient blending of the raw stock either through:

a. Sufficient number of bales of raw stock fed into the blending line when there are enough blenders available.
b. Blending the raw stock by hand prior to feeding into the opening line (limited number of blenders).
c. Operating two picking processes.

3.2.1.3 Carding

Appraisal

In general the carding equipment is in much better mechanical condition than the opening and picking equipment. Seventy two (72) per cent of the cards are considered modern although some of them are

equipped with flexible wire clothing and small delivery cans should be modernized to metallic card clothing. The flexible wire clothing creates excessive neps, lower production per card hour, reduced efficiency created by stripping and frequent grinding and inferior quality when compared to metallic wire clothing. The remaining 2 per cent of the cards are obsolete and should be replaced. (see Exhibit 3-1)

Number, Condition and Suitability

There were 1329 cards observed ranging from over 35 years old to less than 2 years old. Of this 954 cards are capable of producing a good card sliver provided the lap is of good quality. These cards are suited to process cotton and short staple synthetic fibers.

Although the 351 cards that have flexible wire clothing will not produce as good a card sliver as the above mentioned they will produce an acceptable sliver. They are more expensive to maintain and operate. For this reason they are classified as should be modernized. It is suggested that as the flexible card clothing needs replacing do so with metallic card clothing (cylinder, doffer, and flats).

Method of Operation

There is excessive carding capacity with the present yarn counts produced. The majority of the mills reduces the card production per hour to improve quality, which is proper.

3.2.1.4 Combing

There are only three plants that have any combing capacity. Of these, only one plant is running its combing. The combers appear to be in good mechanical condition.

3.2.1.5 Drawing

Appraisal

In general, one of the major causes of low quality yarn within Indonesia is the drawing equipment. Eighty (80%) percent of the drawing deliveries are considered obsolete. They are considered obsolete for any one of the following reasons:

a. Poor drafting systems not capable of controlling the fibers.

b. Some equipment only feeds six ends. The minimum number fed should be eight ends.

c. Lack of stop motions.

Twenty (20%) percent of the drawing deliveries are considered modern.

Number, Condition and Suitability

There were 1,245 drawing deliveries observed ranging from over 25 years old to less than 2 years old. Of this, 252 deliveries are considered modern, in good mechanical condition, and capable of producing a good cotton and/or short staple synthetic fiber drawing sliver. The remaining deliveries could be replaced with very little capital expenditure (Exhibit 3-2) As a rule of thumb, the 993 deliveries could be replaced by 250 new high speed deliveries.

Method of Operation

One plant that had obsolete drawing (six ends fed along with poor drafting) was trying to minimise the problems created by utilizing three processes at

drawing. This helped improve their yarn but not to the degree the manager wanted. Six ends does not give enough doublings when only two processes drawing is used. The plants with modern drawing were operating with 8 ends fed and the drafting system was in good condition. They were buffing the synthetic drafting rolls (top) on a set schedule.

3.2.1.6 Roving

Appraisal

In general, the roving equipment needs to be improved, only 34% of the spindles are modern. Thirty seven (37) per cent should be modernized, in almost all cases the drafting system is not capable of controlling the fibers processed. The remaining 29% are obsolete.

Number, Condition and Suitability

There were 17,746 roving spindles observed ranging from over 30 years old to less than 2 years old. Of this 6,004 spindles are modern in good mechanical condition capable of producing a good roving. There are 6,576 roving spindles that should be modernized. The cost of modernizing a spindle is approximately one third

to one half the cost of a new spindle (see Exhibit 3-2 The remaining 5,166 spindles are obsolete and should be replaced. As a rule of thumb the 5,166 spindles could be replaced by 2,600 new spindles. (See Exhibit 3-2 for cost).

Method of Operation

The roving frames are not fully utilized due to the yarn counts being produced. In cases where mills have excess roving capacity, it would be proper to stop some of the frames all the time, running only the number required on all three shifts. This would eliminate storing the stock prior to spinning.

Some plants are using two processes of roving trying to improve their finished product. This procedure should continue until the equipment prior to roving is improved, eliminating the necessity of running two process roving.

The mills are doing a good job of obtaining maximum stock on the roving packages. This reduces waste at spinning as well as improving roving efficiency and production.

3.2.1.7 Spinning

Appraisal

In appraising the spinning equipment 62 per cent was determined modern. These frames have very good drafting systems, are in good mechanical condition, and capable of producing a quality yarn. Twenty eight (28) per cent of the spindles should be modernized and 10% should be replaced.

Number, Condition and Suitability

There were 398,832 spinning spindles observed ranging from over 30 years old to less than 2 years old. Of this 247,396 spinning spindles are considered modern, in good mechanical condition and capable of producing a quality yarn. These spindles are capable of processing cotton fiber, short staple synthetic fibers or blends thereon. There are 111,700 spinning spindles that should be modernized. They can be modernized at approximately 40 per cent of new spindle cost (see Exhibit 3 - 2). The remaining 39,736 spindles are obsolete and should be replaced. (See Exhibit 3-1)

Minor problems were observed such as:

a. Spindles not plumbed

b. Worn travelers

c. Worn aprons

d. Worn and cracked cots

Some of the above problems were created by lack of spare parts according to management. These problems create excessive ends down, loss of production and increased waste.

Method of Operation

As indicated earlier, too many of the plants are constantly changing yarn counts creating imbalances in equipment. This could be stabilized if a good yarn count forecast was produced.

The majority of the plants do not have adequate testing facilities to determine the optimum TM and break draft required to produce a strong, quality yarn. In the writers opinion, the excessive ends down are caused by several conditions. They are:

a. Obsolete equipment and equipment that needs to be modernized prior to spinning (see Exhibit 3-1)

b. Worn travelers, aprons and cots.

c. Air conditioning not adequate to hold constant temperature and humidity.

3.2.1.8 Winding

Appraisal

The winding equipment in Indonesia appears to be used only for taking the yarn off of a spinning bobbin and transferring to a larger package. Winding is the last process to remove defects from the yarn. In almost all cases the slub catchers were either not on the winding spindle or not operating. For this reason all spindles should be modernized. (See Exhibit 3-1)

Number, Condition, Suitability and Method of Operation

There were 16,520 winding spindles observed capable of winding all yarn produced by spinning. They are in poor mechanical condition (no slub catchers). The poor winding and packaging makes it necessary to rewind all yarn at the weaving and knitting mills. This rewinding of yarn and cones would not be necessary if:

a. Slub catchers were installed and/or used.

b. Better quality paper cones used. The cones presently used have such a weak wall that they are easily crushed.

c. Yarn packed in cartons. Only one mill packed their yarn in cartons. The other mill either packaged cones of yarn in bags (yarns still damaged) or loaded them in trucks with no protection.

The rewinding done at the fabric forming mills create extra cost along with unnecessary damage to the yarn.

3.2.1.9 Twisting

There were 16,520 twisting spindles observed operating approximately 20% of the time. The twisting equipment is in good mechanical condition. Too many twisters are in place to handle the twisted yarn requirements. The reason for this appears to be the inability of the weaving mills to properly size or dress their warps. It is very expensive to produce a twisted yarn; for example 40/2 because the weaving mill cannot size the warp when 20/1 would do just as well with proper sizing.

3.2.2.0 Production

3.2.2.1 Spinning

To appraise the spinning production fourteen mills were visited. These mills have 398,832 ring spinning spindles representing over 83 per cent of the installed capacity in Indonesia. The average production for 25.88/1 (cotton count) is 12.2 grams per spindle hour in Indonesia compared to 17.8 grams per spindle hour for modern ring spinning equipment (See Exhibit 3-3)

The reasons for the low production are:

1. Low spindle speed
2. Obsolete processing equipment prior to spinning (see Exhibit 3-1)
3. Not utilizing design capacity of equipment
4. Poor maintenance
5. Excessive ends down

Last year 91,507,000 lbs. of yarn was produced on the ring spinning spindles observed. Pro-rating this to all ring spinning spindles in place 105,320,276 lbs. of yarn should have been produced in Indonesia in 1970. With modern equipment operating twenty-four hours per

day, 348 days per year, 155,530,000 lbs. of 25,88/1 cotton count could be produced.

3.2.2.2 Cost

The following cost breakdown represents over 300,000 spindles observed based on a 26/1 average yarn count.

Classification	Percent
Labor*	13
Overhead (Fixed & Variable)**	30
Raw Material***	57
Total	100%

Cost per Pound: 162 Rp.

The above cost breakdown will vary from plant to plant depending on the cost accounting procedure as well as the cost center breakdown, allocation of expenses and operating conditions.

*Labor includes all labor (direct and indirect, supervision and fringe benefits).

**Overhead includes spare parts, power, water, heat (if required), depreciation, interest, insurance and taxes.

***Raw Material includes all raw fiber required to produce yarn.

3.2.2.3 Spinning Recommendations

The task at hand for the spinning sector of the Indonesian textile industry is to achieve the optimum level of performance from equipment in place. This would be the most practical and economical route the spinning mills could undertake as evidenced by the following factors:

a. Modernize and replace obsolete equipment at a lower capital expenditure than the cost to build new facilities (See Exhibit 3-4A). This would result in increased production, improved yarn quality and reduced cost per pound. The order of priorities are:

   1. Drawing
   2. Pickers (including opening equipment)
   3. Winding (primarily install and use slub catcher)
   4. Spinning
   5. Roving
   6. Carding (as fillet clothing on cylinder, doffer and flats wear out, replace with metallic cloth)

b. The large capital investment required for a spinning mill makes it necessary to achieve maximum production to reduce the fixed cost per pound. It is recommended that the spinning mills operate 24 hours per day, 7 days per week. Some of the mills are already operating under this schedule.

c. Yarn Package - Better quality cones that will not crush during storage or shipment should be used. Also yarn should be shipped in cases rather than as loose cones. The above recommendation will reduce the amount of yarn damage prior to arrival at the weaving mill and knitting mill. Also the yarn would not have to be rewound before processing by the weaver or knitter, which increases their cost.

d. Quality Control - A strict quality control system should be implemented in each spinning mill. This is covered fully in Section 3.2.4.0.

3.2.3.0 Product Quality

3.2.3.1 Spinning

The opening, picking and carding departments are generally capable of producing an acceptable lap and card sliver. From drawing through winding the quality of the yarn deteriorates. Contributing factors are:

Department	Per Cent Should be Modernized	Per Cent Obsolete
Drawing	-	80
Roving	37	29
Spinning	28	10
Winding	100	-

Listed below are ranges for yarn break and break factors (lea test) that each plant can compare its yarn strength. These tests should be conducted under standard temperature and humidity conditions.

Yarn No.		Good	Average	Poor
12/1	Skein Strength	162	150	129
	Break Factor (lea test)	2258	2040	1748
20/1	Skein Strength	107	98	90
	Break Factor (lea test)	2232	2130	2030
30/1	Skein Strength	70	66	60
	Break Factor (lea test)	2210	2056	1800
40/1	Skein Strength	48	45	42
	Break Factor (lea test)	2200	1950	1700
40/2	Skein Strength	107	98	90
	Break Factor (lea test)	2232	2130	2030

The importance of utilizing the design capability of each machine cannot be overemphasized. Winding is a good example of this where the slub catchers are not operating. The slub catcher opening should be set to two and one half times the diameter of the yarn.

The overhauling and maintenance schedules should be followed according to machinery manufacturers' recommendations or until each mill has enough experience to modify the schedules according to mill conditions and fiber processed.

3.2.4.0 Quality Control

3.2.4.1 Spinning

All of the spinning mills do not have a modern quality control system for testing yarn quality along with furnishing the necessary data to maintain the desired level. It is recommended not only for improved quality but improved running condition and efficiency that the following test be conducted in each spinning mill.

a. Control of Weights at Each Process
    1. Picker lap
    2. Card sliver
    3. Drawing sliver
    4. Roving
    5. Spinning

b. Nep Count at Cards

c. Evenness Test at Each Process
    1. Picker lap
    2. Card sliver
    3. Drawing sliver
    4. Roving
    5. Spinning

d. Raw Cotton Test (if not furnished by sellers)

1. Grade
2. Staple length (along with percent of short fiber)
3. Micronair

e. Yarn Grading by Appearance

f. Yarn Strength (see Section 3.2.3.1)

g. Slub Catcher Settings (2 to 2½ times yarn diameter)

The system should be designed so that faulty equipment or careless workmanship is detected and steps taken to prevent more sub-standard yarn.

3.2.5.0 Ownership

The Indonesian government, either central or provincial owns 378,804 cotton or synthetic ring spinning spindles representing 13 mills. The remaining 96,976 cotton or synthetic ring spinning spindles are privately owned representing 4 mills. Several mills, both government and privately owned, are expanding their facilities or have plans to do so in the near future. This is not reflected in the above figures.

EXHIBIT 3-1

APPRAISAL OF COTTON AND SYNTHETIC SPINNING

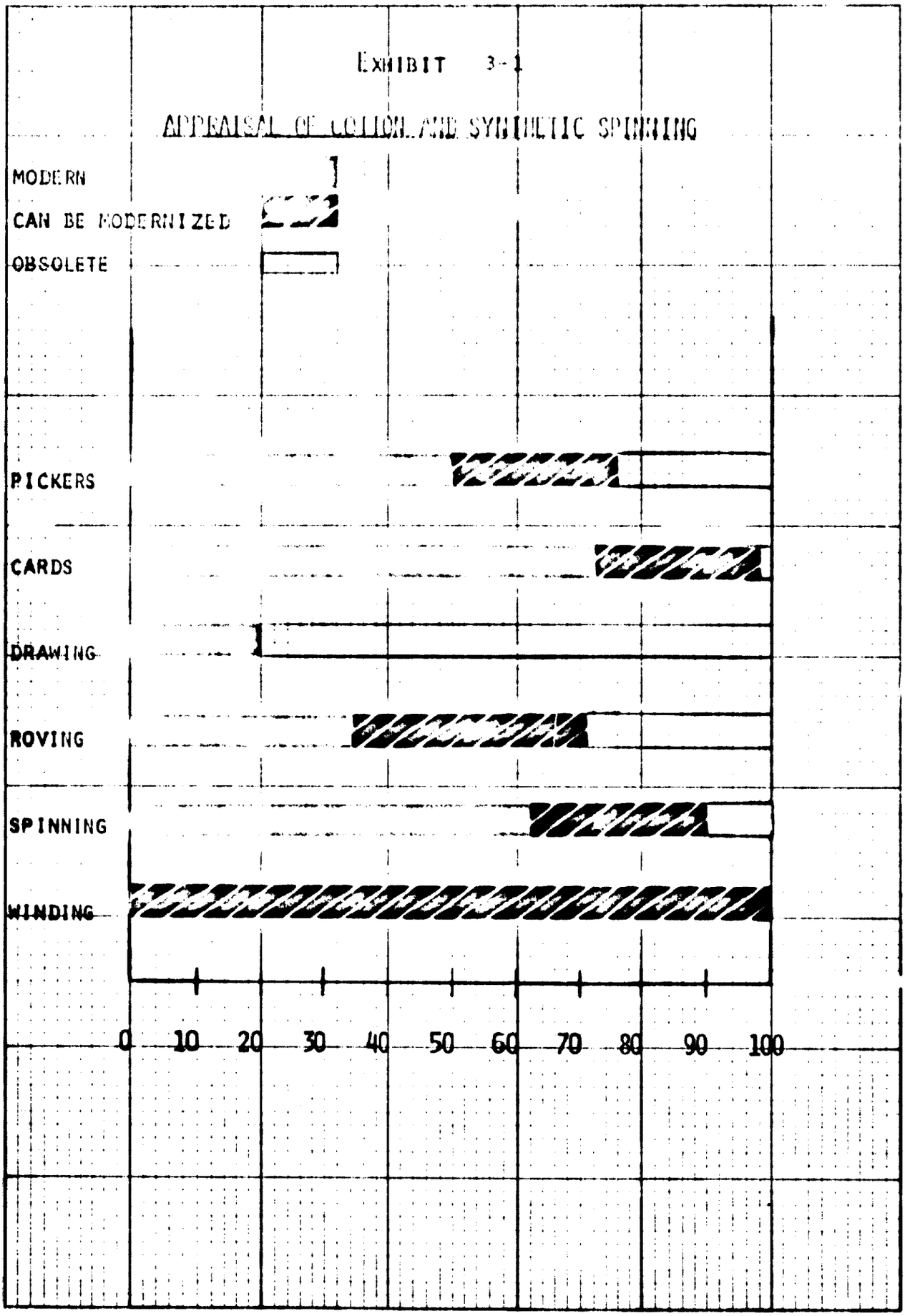


Exhibit 3-2

CAPITAL EXPENDITURE - SPINNING EQUIPMENT

Process	Suggested Price F.O.B.
Opening a cleaning line	$ 42,000
Picker	32,000
High speed card	10,000
Drawing frame per delivery	3,500
Roving frame per spindle	320
Spinning frame per spindle	52
Winder per spindle	17

Exhibit 3-3

MACHINE PRODUCTIVITY - SPINNING

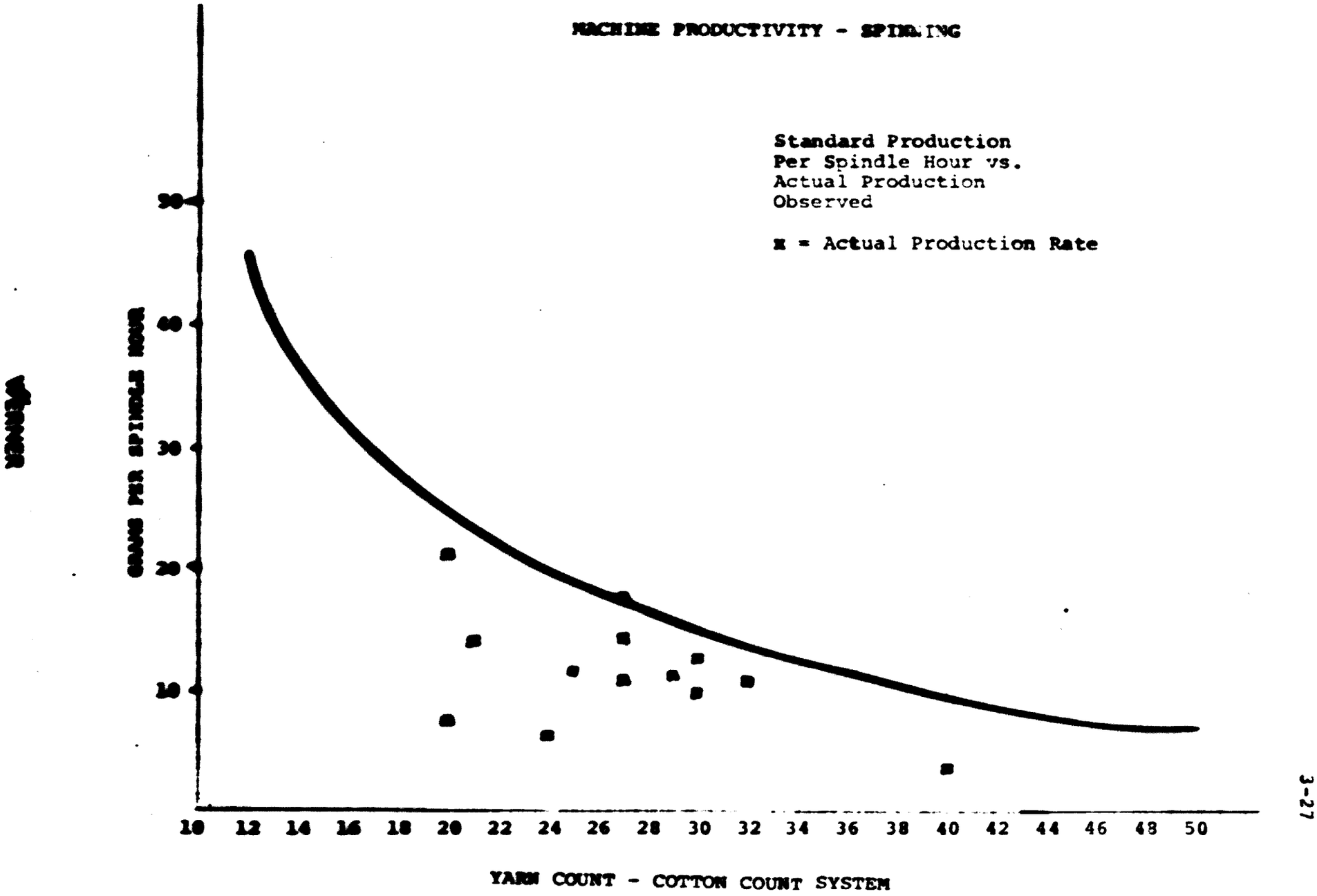


Exhibit 3-4

CARDING AND SPINNING

Machinery Cost to Replace Obsolete Equipment

Machinery Cost to Modernize Equipment That Can Be Modernized

		EQUIPMENT MODERNIZED				EQUIPMENT REPLACED				
Machine Classif.	Unit Classif.	No. That Can Be Modernized	No. in Place After Modernization	Cost To Modernize Per Unit	Total Capital Req'd To Modernize	No. of Obsolete Units	No. in Place After Replcmnt	Cost/ Unit to Replace	Total Capital Req'd to Replace Obsolete Units	Grand Total*
Picker	Machine	14	14	$50,000	$700,000	11	5	$74,000	$370,000	$1,070,000
Cards	Machine	351	351	1,500	526,500	24	12	10,000	120,000	646,500
Drawing	Deliveries	-	-	-	-	993	248	3,500	868,000	868,000
Roving	Deliveries	6,576	6,576	150	986,400	5,166	2,583	300	774,900	1,761,300
Spinning	Deliveries	111,700	111,700	25	2,792,500	39,736	27,815	52	1,446,380	4,238,880
Winding	Deliveries	16,620	16,520	10	165,200				-	165,200
TOTAL OBSERVED					$5,170,600				$3,579,280	$8,749,880
TOTAL PRO RATED TO INDUSTRY					$6,204,720				$4,295,140	10,499,860

*Investment required does not include freight and installation, also no additional building required.

3.3.0.0 COTTON AND SYNTHETIC WEAVING

3.3.1.0 Machinery Appraisal

3.3.1.1 General Comments

To appraise the existing machinery and equipment of the cotton and/or synthetic weaving industry, a detailed survey of thirty-seven mills was conducted representing 10,163 power looms producing 113,000,000 yds. per year. There are 862 mills representing 35,335 power looms according to the latest government survey. This represents all of the large weaving mills and a representative number of the small ones.

Our findings and analyses were based on the following conditions:

a. The general conditions of all equipment surveyed.
b. Their production
c. Their efficiency
d. The quality of the product produced
e. Their flexibility
f. Their suitability

The appraisal of the cotton and/or synthetic weaving machinery and equipment is shown in Exhibit 3-5 where a percentage of machinery and equipment surveyed is listed as:

a. Modern
b. Should be modernized
c. Obsolete

Layout and Building

The layout and building in the weaving mills are in poor condition compared to the spinning mills. Some of the plants have added looms resulting in several floor levels in the weave room and looms in more than one building or room. The lighting is poor in the majority of the weave rooms. This makes it difficult to see defects and it is very dangerous for the weavers. A few of the new weaving mills have a good layout of equipment and adequate lighting.

Maintenance

The maintenance of machinery is poor compared to the spinning equipment. The mills are hampered by lack of capital making it difficult to obtain adequate spare

parts. Several mills that have looms with automatic warp and weft stop motors along with automatic shuttle change or quill change devices are not using them. It is a waste of money to purchase this type loom and not utilize its design capability. Some mills have looms that are no longer produced. These mills have a very difficult time obtaining special parts. They are forced to use inferior parts with a shorter life.

In view of the age and condition of the weaving equipment and machinery (see Exhibit 3-5) it is imperative that more attention must be given to maintenance before the quality of the fabric improves.

Planning

The weaving managers complained that they could not plan for long periods of time because of lack of capital. Fabric sales reach a peak twice a year (this is covered in detail in the marketing section). They do not have the capital to produce fabrics and inventory for this peak period.

Sources of Machinery

The weaving machinery and equipment is purchased from the United Kingdom, Europe, The Peoples Republic of China, Asia and the United States. If all the machinery and equipment was purchased from a few countries, then supply houses could be set up in Indonesia relieving each plant from carrying excessive spare parts.

3.3.1.2 Quilling and Winding

Appraisal

There would be no need to have winding equipment in weaving plants, except for yarn purchased in hanks, if the spinning plants did an adequate job of winding, used better cones and packaged properly.

In general, the quilling equipment was in fair mechanical condition, well balanced with the looms.

Number, Condition and Suitability

There were 2656 quilling units observed ranging from very old to less than 2 years old. Forty-Eight (48) per cent were considered modern, Thirty (30) per cent

should be modernized and Twenty-Two (22) per cent are obsolete. It should be pointed out that some integrated plants have direct spinning. This eliminates the necessity for quilling but does not offer the opportunity to remove spinning defects at Winding.

The quilling equipment is suitable for running spun cotton and/or spun synthetic yarns. It will not run filament yarns in the present condition. Quills that are chipped, warped or bent, and cut are still being used. Management should take a close look at this, throwing away all inferior quills.

3.3.1.3 Warping

Appraisal

Some of the poor fabric quality and excessive waste can be traced directly to poor warping. Warp ends that break may not be repaired, resulting in fabric defects. Too many loom beams were observed with "ringers" - that is, too many warp ends are on the loom beam and some are not woven into fabric resulting in yarn waste. Only 16% of the warpers are considered modern, 10% should be modernized, and 74 are obsolete and should be replaced (see Exhibit 3-5).

Number, Condition and Suitability

There were 80 warpers observed ranging from over 35 years old to less than 3 years old. Only 13 of the warpers are considered modern and capable of producing a good warp beam. Eight (8) of the warpers should be modernized and 59 are considered obsolete and should be replaced. The obsolete warpers could be replaced with 30 new warpers (see Exhibit 3-6 for cost per warper).

Method of Operation

Many of the warpers do not have stop motions and therefore, when a warp end breaks it must be detected by an operator. This results in "lost" warp ends creating problems in slashing and weaving.

3.3.1.4 Slashing

Appraisal

The slashing equipment in general, lacks adequate temperature, stretch, size cooking, and moisture controls. Also, there is not squeeze roll pressure to place a proper dressing on the yarn. Experiments should be conducted with tapioca and other additives,

determining the correct size recipe to improve yarn strength and weaveability in Indonesia. Only 16% of the slashers are considered modern, 15% should be modernized and 68% is obsolete and should be replaced (see Exhibit 3-5)

Number, Condition and Suitability

There were 41 mechanical slashers observed; 5 plants sized by hand and 4 plants had no slashing. Only 7 slashers are considered modern capable of producing a good section beam. Six (6) of the slashers should be modernized and 28 are considered obsolete and should be replaced. The plants that have no slashing or size by hand use two ply yarn to get the desired warp strength. Two ply yarn is very expensive increasing fabric cost unnecessarily.

In the writer's opinion, improved slashing (both the machine and size recipe) would increase weaving production and quality. Weaving production could be increased 5 to 10 per cent with no improvements made on the looms.

Many of the weaving mills visited do not have enough looms to support a modern slasher. This will be covered in detail under recommendations and optimum weaving mill size.

Method of Operation

Management realizes the importance of proper slashing but in some cases they do not have enough capital to correct the situation. It was recommended to the weaving plants to send samples of their size recipe to a government testing facility for assistance in determining the best recipe.

Some plants that have mechanical sizing equipment will and to size loom beams for small weaving plants that do not have these facilities. This will be covered in more detail under recommendations.

3.3.1.5 Weaving

Appraisal

In general, the looms are old and in poor mechanical condition. Little maintenance has been performed over the years on a majority of the looms. Only 19% of the looms are considered modern, 10% should be modernized, and 63% is considered obsolete and should be replaced (see Exhibit 3-5).

Number, Condition and Suitability

There were 10,163 power looms observed ranging from over 35 years old to less than one year old. Only 1931 looms are considered modern, 1823 looms should be modernized and 6403 manual looms are considered obsolete.

None of the looms observed are capable of running filament yarns in their present mechanical condition. These looms are capable of producing fabrics from spun yarn only. Only a few looms are capable of producing fabric of Jacquard design.

Method of Operation

The looms observed are operating an average of 100 hours per week. The reason for the low average is some plants operate only one or two shifts per day because:

a. Lack of electricity
b. Lack of working capital
c. They are in a residential area and cannot operate during rest hours at night. Enforced by government.
d. Little or no lighting in mill.

When management was questioned about the mechanical condition of the looms, almost all replied:

a. Do not have working capital
b. Cannot purchase certain parts because loom is not made anymore.

Too many looms were observed producing inferior quality fabric. All mills said they were selling everything they produce, so little emphasis is placed on quality. Out of the 37 mills visited, the writer observed on one loom stopped because it was producing inferior quality fabric.

3.3.1.6 Inspecting

Only the large weaving mills had any formal fabric inspection. The inspection department is the point that management can monitor the quality of its production. Too many mills are not concerned about their quality. As the economy improves, the customers will demand better quality fabrics. If they cannot get them from domestic sources, then they will turn to imported goods (legal or illegal).

3.3.2.0 Weaving

3.3.2.1 Production

The comparison of weaving production is difficult to make because the many factors affecting it are not comparable from mill to mill. Differences in fabric constructionsand their distribution may vary in each mill. For this reason a comparison is made according to the thousands yards of weft inserted per loom hour.

	Thousand Yds/Loom Hr.
a. Shuttleless loom	48.0
b. Modern converted loom	17.6
c. Looms running in Indonesia	9.8

Of the 10,163 looms observed, it is estimated that only 70% are operating. The following is a breakdown of actual production and theoretical production.

Method of Operation	Annual Linear Yds.
Actual Yards(from Plants)	108,709,082
Theoretical 60 pick yards all looms observed operating present plant hours	165,000,000
Theoretical 60 pick yard all observed operating 144 hours/week 51 week/year	201,500,000

As can be seen from the preceding table, the theoretical capacity of looms observed is much more than the actual production. It is not possible under present circumstances to expect these looms to operate 144 hours per week, 51 weeks/year. These plants do not have adequate:

a. Capital
b. Electricity
c. Some looms are in such poor mechanical condition they will not operate.

3.3.2.2 Cost

The following cost breakdown represents over 60% of the looms observed converted to 60 ends and 60 picks per inch using 26/1 cotton count. Fabric weight is 3.25 linear yards per pound.

Classification	Percent
Labor*	13
Overhead (Fixed & Variable)**	27
Raw Material***	60
Total	100%

Cost per Linear Yard: 92 Rp

*Labor includes all labor (direct and indirect, supervision and fringe benefits).

**Overhead - Includes spare parts, power, water, heat (if necessary) depreciation, interest, insurance and taxes.

***Raw Material - Includes yarn and sizing material.

The above cost breakdown will vary from plant to plant depending on the cost accounting procedures as well as the cost center breakdown, allocation of expenses and operating conditions.

3.3.2.3 Weaving Recommendations

The cotton and synthetic weaving sector of the Indonesian textile industry is made up of many small units and a small number of large units. For this industry to achieve the optimum level of performance from the existing equipment in place, the following recommendations are made:

a. Modernize equipment that is in poor mechanical condition at a lower capital expenditure than the cost to build new facilities (see Exhibit 3 - 6). This would result in increased production, improved quality, and reduced manufacturing cost per yard. The order of priorities is:

   1. Slashing - A major contributing factor to low weaving efficiency other than yarn quality is improper slashing.
   2. Warping
   3. Weaving (looms)
   4. Quilling

b. Increased Operating Hours - The weaving sector should consider increasing the number of hours each loom is operated per year as the spinning sector has done. The looms observed average less than 5,000 hours of operation per year. It is recommended that the weaving mills operate 24 hours per day, 6 days per week. Some mills will not be able to operate under this schedule since they are located in residential areas and are restricted by law with respect to hours of operation. Availability of electricity will also restrict some mills' operating hours.

c. Consolidation - Many of the small weavers cannot afford some of the equipment necessary to improve weaving efficiency, improve quality and reduce cost. A good example of this is inadequate slashing equipment. Consideration and encouragement should be given to the smaller weavers to consolidate. Then they could afford the expensive slashing equipment producing warps for all the plants in the company.

Several other advantages would result from this.

They are:

1. More purchasing power.
2. Larger sales distribution.
3. Improved loom efficiency.
4. Improved fabric quality.
5. Lower manufacturing cost per pound.

d. Quality Control - A strict quality control system should be implemented. This is covered fully in Section 3.3.4.0.

3.3.3.0 Product Quality

3.3.3.1 Weaving

The quality of the woven fabric is lower than that expected by international standards. Yarn defects contributing to reduced fabric quality are discussed in Section 3.2.3.1, therefore only quality problems relating to weaving faults will be discussed in this section. Contributing factors are:

Department	Percent Should Be Modernized	Percent Obsolete
Warping	10	74
Slashing	15	68
Weaving	18	63

a. **Warping**

The warpers should be equipped with stop motion so that when the yarn breaks the machine stops automatically. This eliminates "lost" ends in the warp which are potential defects and reduced efficiency.

b. **Slashing**

To produce a properly dressed warp other than the

correct size recipe the following are required:

1. Pneumatic squeeze rolls
2. Temperature monitoring controls
3. Moisture monitoring controls
4. Stretch monitoring controls

c. Weaving

The major problems related to weaving faults are:

1. Poor weaver training
2. Poor fixer training
3. Worn shuttles
4. Worn race plates
5. Worn reeds and harnesses
6. Looms with stop motion - too many not operating
7. Lack of spare parts

Management will have to place more emphasis on consistent machine settings and fully utilizing the design capabilities of their equipment.

3.3.4.0 Quality Control

3.3.4.1 Weaving

The majority of the weaving mills have cloth inspection frames. What they lack is a system and follow-up that

identifies faulty equipment and workmanship providing management and supervision with the necessary information to prevent more sub-standard fabric. A product noted for its quality is not produced by accident. It is the result of careful planning, quality control and good management.

3.3.5.0 Ownership

A very small percentage of the weaving mills are owned by the Indonesian government. The majority of the weaving mill are owned by private entrepreneurs. These mills are usually small (less than 200 mills) and lack the capital to maintain a strong financial position.

EXHIBIT 3-4

APPRAISAL OF COTTON AND SYNTHETIC WEAVING

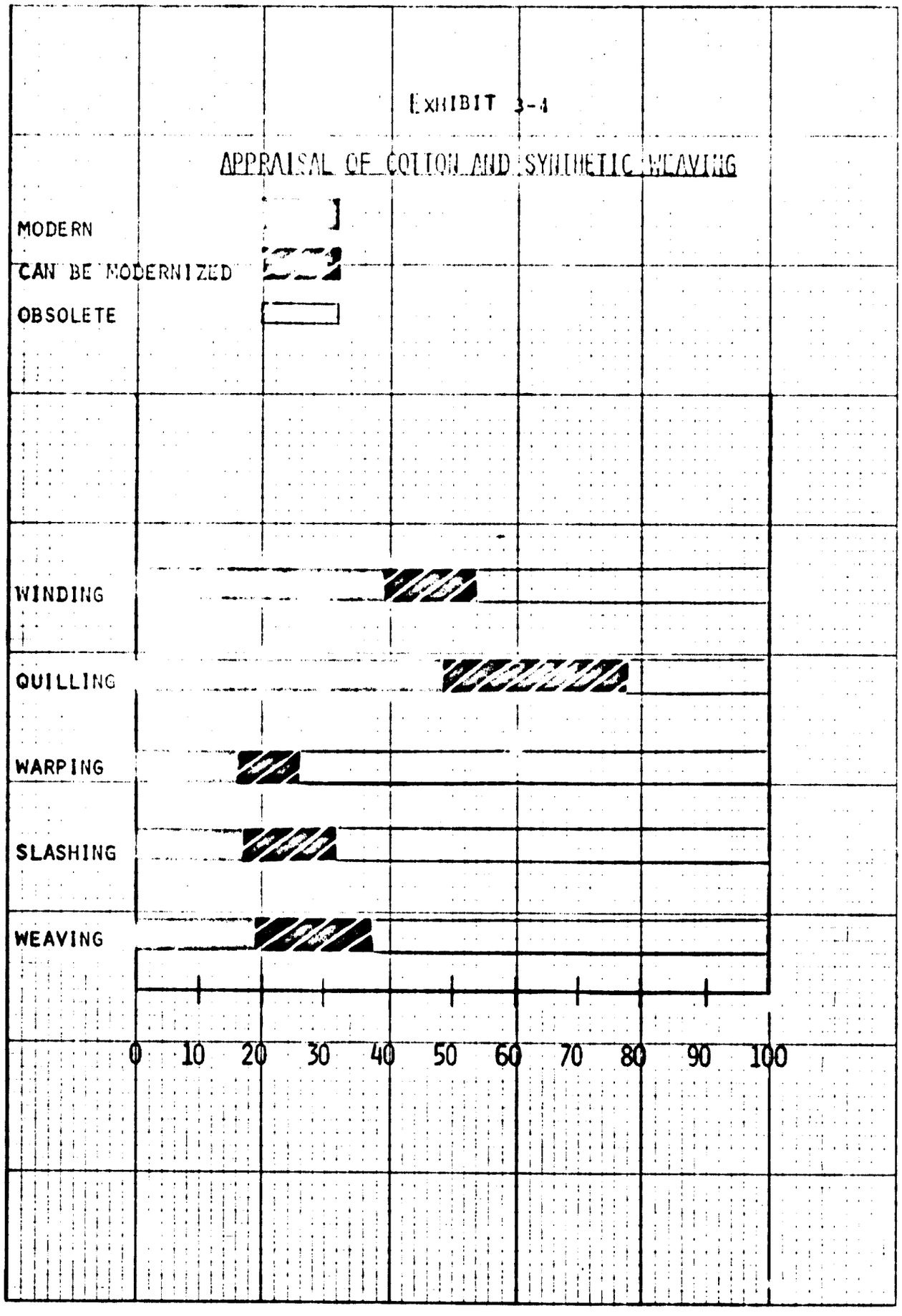


Exhibit 3-5

CAPITAL EXPENDITURE - WEAVING EQUIPMENT

Process	Suggested Price F.O.B.
Warper - Beam	$ 28,000
Slasher - 7 Can	45,000
Loom - Basic Cam	1,800
Loom - Fancy Cam	3,200

Exhibit 3-6

COTTON AND SYNTHETIC WEAVING

Machine Cost to Replace Obsolete Equipment

Machine Cost to Modernize Equipment that Can be Modernized

		EQUIPMENT MODERNIZED				EQUIPMENT REPLACED				
Machine Classif.	Unit Classif.	No. That Can Be Modernized	No. in Place After Modernization	Cost To Modernize Per Unit	Total Capital Req'd To Modernize	No. of Obsolete Units	No.in Place After Replcmnt	Cost/ Unit to Replace	Total Capital Req'd to Replace Obsolete Units	Grand Total*
Winding	Delivery	728	728	$10	$7,280	2,154	1,508	$ 20	$ 30,160	37,440
Quilling	Delivery	768	768	50	38,400	594	400	155	62,000	100,400
Warping	Machine	8	8	10,000	80,000	59	15	28,000	420,000	500,000
Slashing	Machine	6	6	25,000	150,000	28	12	45,000	540,000	690,000
Weaving		1,795	1,795	1,000	1,795,000	6,164	4,794	2,000	9,588,000	11,383,000
TOTAL OBSERVED					$2,070,680				$10,640,160	$12,710,840
TOTAL PRO RATED TO INDUSTRY					$6,833,245				$35,112,530	$41,945,715

*Investment Required does not include freight and installation, also no additional building required.

3.4.0.0 KNITTING

3.4.1.0 Machinery Appraisal

3.4.1.1 General Comments

In appraising the knitting sector of the textile industry, a detailed survey of twenty-seven mills was conducted. These mills were of the following types:

- half-hose
- single jersey
- double jersey
- flat bed
- Raschel

In addition, the dyeing, printing and finishing facilities of the vertically integrated mills were also appraised.

To insure that a representative cross-section of the knitting industry was evaluated, the mills visited covered the full geographical limits of the industry, ranging from Medan, Sumatra, to Surabaja, Java. The installed capacity of the mills visited represents approximately 40% of the total capacity of the knitting industry.

Our findings were based on an analysis taking into consideration the following:

a. The general condition of the equipment surveyed
b. Machine productivity
c. Machine efficiency
d. Quality of fabric produced
e. Machine flexibility

Our appraisal of the knitting sector is summarized in Exhibit 3-8 where the machinery surveyed is broken down percentage-wise in terms of:

a. Modern
b. Should be modernized
c. Obsolete

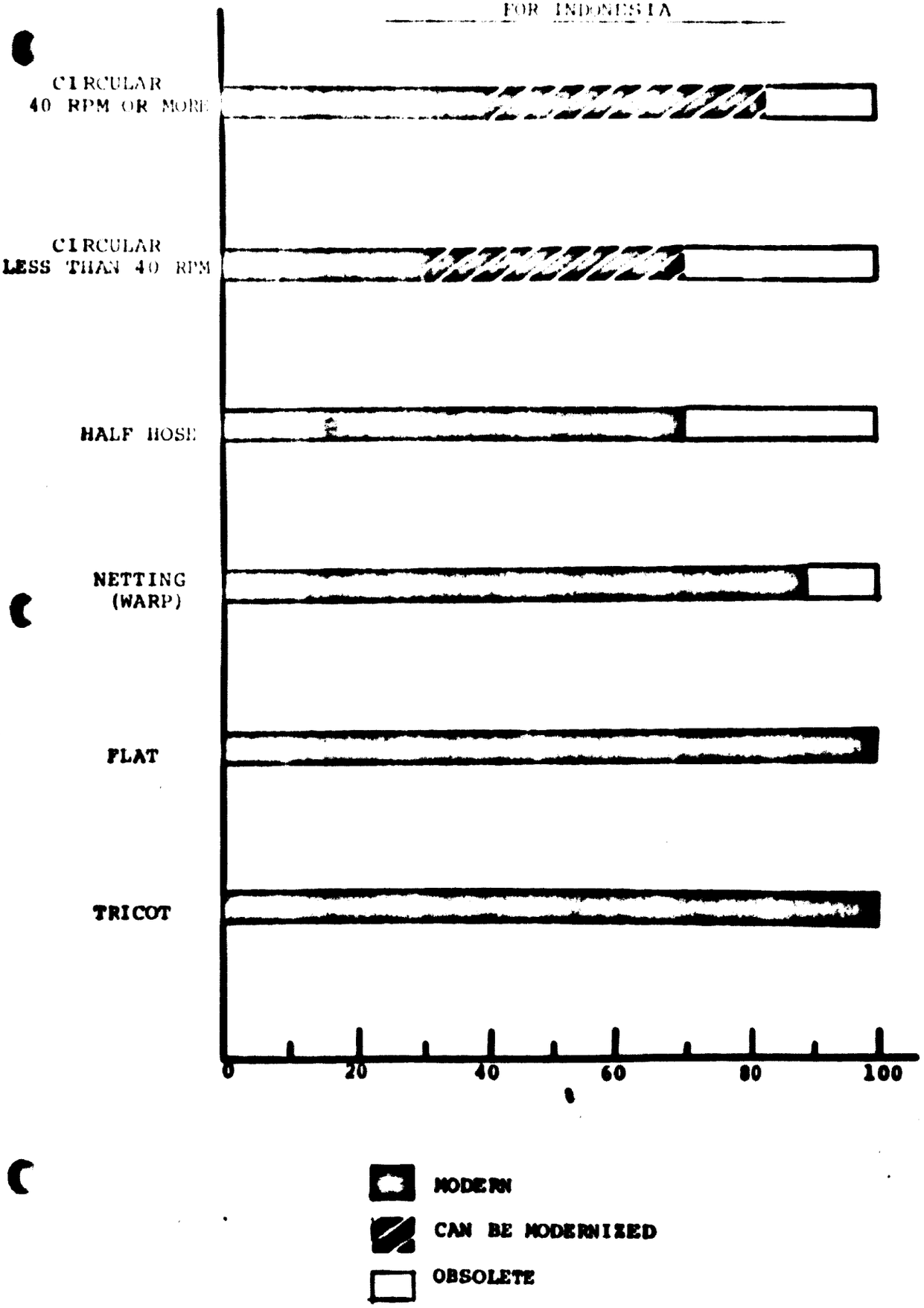
3.4.1.2 The Knitting Sector in Perspective

Of the 170 million pounds of fabrics produced by the Indonesian textile industry, the knitting sector accounts for approximately 28 million pounds or 16.5% of the total.

At the time of this survey there were 3,392 industrial knitting machines in Indonesia.

Exhibit 3- 7

APPRAISAL OF KNITTING EQUIPMENT
FOR INDONESIA



(It should be noted that this total does not include circular collar machines which are not primary knitting machines but rather are categorized as auxiliary equipment.) Of the primary machines our survey included 1,310 machines or 38.6% of the total installed capacity.

The machine types used in Indonesia's knitting industry are generally very simple and uncomplicated, and are well suited for the present fabric requirements. There are none of the more sophisticated Double Knit, Tricot, Single Jersey sinker-top, Full-Fashioned, etc. machines in place at the present time. As the industry matures, however, some of hese types of machines will surely be installed. As this occurs, the overall skill level of both labor and management will have to be increased. (See Training section in this report.)

The condition of the equipment in place is mixed. While the larger mills generally keep their knitting machinery in good repair, many of the smaller enterprises do not practice any maintenance

whatsoever, with the result of total mechanical obsolescence of their equipment. Based on our survey, we estimate that of the 3,392 industrial knitting machines in Indonesia, the following units are mechanically or economically obsolete:

CATEGORY	NO. MACHINES IN PLACE	NO. OBSOLETE	% OBSOLETE
Circular 40 RPM and over	242	42	17.3
Circular less than 40 RPM	2,770	770	27.8
Half Hose	274	74	27.0
Netting (warp)	56	6	10.7
Flat	40	--	--
Tricot (warp)	10	--	--
	3,392	892	26.2

3.4.1.3 Winding Machinery

Only a few of the spinning mills have adequate winding facilities and most of their yarns are delivered to the knitters in skeins. The winding equipment in the knitting mills is to a large degree very old-fashioned and requires two winding

operations, from large to small skein and from small skein to bottle-bobbin. In addition to the supplementary labor cost, the space requirement for this double operation is considerable and costly.

One of the major weaknesses noted in all knitting mills is the total absence of yarn lubricants (paraffin or wax). This has been pointed out and recommended in each individual mill, together with a recommendation for moisture control of the yarns. Yarns are usually too dry when delivered to the knitters and moisturizing procedures are quite simple and inexpensive, and will substantially contribute to a better overall knitting quality.

3.4.1.4 Single Jersey "Tompkins" Machinery

The bulk of the machines installed in Indonesia's knitting mills consists of the Tompkins-type circular equipment, producing men's and boys' underwear. While single jersey fabric is produced in the highly industrialised areas on the more versatile and more productive "Sinker-top"

units, we do not discount the usefulness of the Tompkins machine for Indonesia's knitting industry. The machine is much simpler, requires a minimum of maintenance, and is capable of producing quality fabrics.

3.4.1.5 Circular Single and Double Jersey 15-30" ø

The machines in place, consisting of China- and Hong Kong-made equipment, are not of the modern multi-feed design and are slow producers. They are still usable in the near future but will have to be replaced for economic reasons as the knitting industry matures. Some machines in this category, especially the plain cylinder type, which are over 60 years old, are totally obsolete and should be discarded.

3.4.1.6 Flat-Bed Knitting Machinery

Most of the flat-bed and V-bed machines in place are hand-operated and in good condition. They are used for the manufacture of trims on underwear and "T" and sportshirts, and the production of outerwear garments (sweaters and cardigans).

In high labor cost areas, outerwear garments and outerwear fabrics are produced on highly sophisticated machinery (Tricot, Raschel, Double Jersey, Sweater Strips and Full-Fashion). While some of the larger and progressive mills will install one or the other of these machine types in the near future, the present policy of producing outerwear garments on hand-operated flat-and V-bed machines should be encouraged. Although direct labor costs are somewhat higher than with fully automated equipment, total manufacturing expenditures are substantially lower, considering the extremely high investment costs of the more advanced automatic machines.

The use of hand-operated flat-and V-bed machines is practiced extensively in other low cost areas such as Hong Kong, Taiwan, South Korea and Italy with the result of not only producing sweaters, cardigans and other outerwear for their respective domestic needs, but successfully capturing large portions of foreign markets as well.

Another advantage of the hand machine knitting is the fact that the necessary training can easily be provided within the mill and in a relatively short time.

3.4.1.7 Half-Hose Machinery

Of the 27 mills visited during this survey, only 2 were engaged in the manufacture of men's and boys' half-hose, socks and anklets. One mill with nearly 100 machines is quite satisfactory with respect to quality, machine maintenance, etc. Equipment in this mill, though over 15 years old, is in good repair and successfully usable for many more years to come.

The other mill is poorly organized and the equipment, built over 50 years ago, is definitely obsolete from a strictly economical view. Working conditions in this mill are below acceptable standards. While we do not emphasize labor saving methods under prevailing conditions, it will nevertheless become impossible for enterprises this poorly equipped to compete with more modern mills.

3.4.1.8 Warp Knitting Machinery

The first modern Raschel machines are now being installed. These are lace fabric units of advanced design for the production of ladies' underwear and curtain fabrics. The machines can also be used, with slight modifications, for outerwear fabrics.

3.4.1.9 Dyeing, Bleaching and Finishing

Dyeing

There is very little dyeing performed in the knitting mills. Knitters producing outerwear use dyed yarns, processed in commercial dyehouses. In the two mills observed where piece dyeing was performed, the dyeing methods and quality were extremely poor.

Bleaching

Bleaching is a very important factor in underwear fabric processing. It is generally poor due to crude equipment, lack of proper water conditioning and inadequate use of bleaching agents. Fabrics

which are of otherwise good quality are being downgraded because of poor bleaching, thus resulting in lower selling prices and consequently lower profits. This has been pointed out at length to mill managers and must be corrected if this segment of the industry is to effectively compete in the markets for these products.

Finishing

As in bleaching, fabric finishing is an important quality factor. Open-air drying, as is performed in all mills, is not objectionable in the absence of modern finishing ranges (which are extremely expensive) although the larger mills should plan to install this equipment as a part of their long-range expansion. A substitute for a finishing range, though not achieving the same quality results, is a modern steam-fed calender, which is relatively inexpensive and easy to install.

At the present time in most mills the fabric passes through archaic calender rolls which are cold and have no other effect than rolling the fabric in

preparation for cutting. It has also been observed that sizing (starch) is used excessively, resulting in very harsh fabric.

Final pressing of finished garments could also be improved by using heavy industrial pressing irons instead of the too-light household irons. The larger mills should install Hoffman-type buck presses.

3.4.1.10 Cutting and Sewing

Cutting

Most cutting is performed by hand. Although some of the mills had electric round and straight cutting equipment, we did not see any of these in operation. There is no economic reason at this time to switch to machine cutting, as long as labor costs remain at present levels.

Cutting tables are usually adequate and very little will be gained by installing expensive special equipment, unless very high production in some selected mills requires cutting in layers of fabric instead of individual garment cutting.

Sewing

Lockstitch, chainstitch, 2-needle, covering, overlock, blindstitch and other special machines now in place are generally satisfactory throughout the industry. Most of these machines are over 10 years old but in good condition. There is no immediate need for the latest very high speed equipment.

3.4.2.0 Production

3.4.2.1 Actual Production and Capacity

In 1970 the total production of knitted fabrics amounted to 23.2 million pounds, excluding 4.8 million pounds of hand knitting. The 3,392 industrial knitting machines in place in 1970 had an estimated production capacity of 44.3 million pounds. The knitting sector therefore operated at a level approximating 52% of capacity during 1970.

The capacity figures are very conservative, taking into account all of the production reducing factors such as:

- machine age
- scarcity of skilled help
- absenteeism
- lack of machine spare parts
- inadequacy of production methods.

Most of the smaller mills operate 1 shift only while the larger mills operate from 1½ to 3 shifts. Capacity has been calculated on the basis of 6000 hours per annum.

A few of the plants visited were shut down altogether for the following reasons:

- lack of raw material
- unavailability of qualified labor
- lack of working capital
- no profitability

Lack of raw material at the time the survey was made, was due to late arrival of raw cotton under the PL 480 program. The problem was further compounded by the fact that the quality level of domestically produced yarns varies drastically from one shipment to another. Poor handling during the shipping

process is a major factor in the poor yarn quality. It is recommended that the spinning mills vertically integrate into winding and that proper packing and shipping procedures be installed.

The unavailability of qualified labor (and supervision) is the result of insufficient training facilities, both in schools and in the industry itself.

Lack of working capital is a definite problem throughout the industry and is especially felt in the smaller mills, which are often unable to obtain credits even at the highest rates.

The fact that profitabilit, in some mills is extremely low or absent altogether, is due to extremely high overhead costs. Many of the mill owners interviewed were very vague and could not (or would not) define specifically the composition of their overhead expenses.

3.4.3.0 Methods and Procedures

3.4.3.1 Factory Layout

In most cases the factory layout is adequate for the short term. In the long term, however, as demand increases, it will be very difficult to efficiently expand many plants in their present locations.

3.4.3.2 Materials Handling

The materials handling equipment for large heavy loads of fabric was inadequate. The majority of the plants used men rather than equipment to move these items. While manual movement of heavy loads is common to countries which have an abundance of labor, with consequent low wage rates, this method usually results in inefficient use of storage space and damaged goods.

3.4.3.3 Maintenance

Machinery maintenance is undoubtedly one of the most important factors affecting plant profitability and productivity. Despite this it is probably the most neglected aspect of operations in the knitting mills of Indonesia. It is neglected either because of lack

of understanding of a proper maintenance program or because of erroneous concepts concerning costs savings.

The lack of a systematized maintenance procedure adds excessive costs to the knitting process both in terms of lower machine efficiency (productivity) and lower fabric quality. Since only part of these losses (excessive costs) are directly recorded as such in the accounting records, a major portion of these costs goes virtually unnoticed by most knitters. In addition, knitters fail to use the information which they have - that is, they do not take the time to add up the costs of machine damage inflicted by improper maintenance procedures. It should also be noted that many knitters have not installed the basic accounting tools necessary to provide any of these costs.

When cloth damages occur i.e. holes, dropped stitches, ends out, etc. - needles are changed or other sources of the damage repaired. This is not enough. Each machine should have its own record of performance thus enabling the mechanic to apply

preventive maintenance procedures. These include checking all working parts, changing parts with a limited life (needles, cams, porcelain feed guides, etc.).

Many of the machines now in place have no stop motion devices. Others have such devices but are bypassed for reasons of personal convenience. It surely is false economy to save the relatively small expenditure of effective stop motion devices where they are missing now, and great negligence where they are provided and not used.

3.4.3.4 Quality Control

Quality control is one of the most important procedures in any manufacturing process. Consumer surveys of buying habits name "quality" as one of the prime motivating influences in both apparel and fabric purchases. While all of the mills which we visited attempt to detect possible defects before shipping, they inspect their goods only at the end of the manufacturing lines. A cursory examination of this type only corrects the defects

which appear in the fabric - it does not eliminate the cause of the defect. For this reason, the types of defects tend to be repetitive. The overall result is high rework costs and excessive waste.

The initial steps to the actual installation of an effective quality control program are as follows:

1. Determine precisely the existing quality levels and inspection costs.

2. Decide what is wanted in the way of quality.

3. The natural desire to bring all fabrics or garments to final inspection without rejects should be abandoned, ince it is irrational and impossible to achieve.

4. Train the examiners in a way, so they will understand fully the company's quality requirements.

5. Decide where the quality control program will start and where along the manufacturing process it will perform.

Quality control procedures must vary from mill to mill depending upon the type of end products, size of the mill, price category of the fabrics and complexity of fabric constructions. The mill owner should always have in mind that producing good quality is, in the long run, less expensive than producing inferior quality.

The recommended stations where quality control can effectively function are as follows:

- Incoming goods (Raw materials testing)
- Winding room
- Knitting room
- Cutting room
- Sewing floor
- Pressing & Finishing
- Examining
- Bagging & Boxing

This does not mean that a great number of additional personnel is required. It is part of the individual operator's and supervisor's function to signal any occuring deficiency at the earliest moment in order that proper corrective action might be taken.

The most common defects observed during the course of our survey are as follows:

Knitting defects:	Tight knitting on one feed due to abnormal tension increase.
	Repeated drop stitches due to defective needles.
	Abnormal stitch distortion due to foreign matter imbedded in needle slots.
	Repeated end-outs due to bypassing stop motions.
Sewing defects:	Improper stitch adjustments resulting in seam breakage. This is especially damaging, as the defect is usually not detected at the final inspection.
	Improper feed regulations, resulting in too long or two short stitching.

These are only a few of the deficiencies which we noted during our investigation. As an effective corrective action we recommend that the supervisors check each individual piece of machinery periodically to avoid the possibility that entire rolls of fabrics with defects are knitted, or that numerous garments are sewn before adjustments are made on the machinery.

3.4.4.0 Training

3.4.4.1 Mill Training

On-the-job training for production employees is used only in the larger mills. Fixer, mechanic and supervisory training is almost non-existent in any size knitting mill. The net result of these factors is a great scarcity of qualified employees at all levels of the knitting industry. (This point is re-emphasized by Section 3.4.4.2.)

3.4.4.2 Textile Institute

The Textile Institute in Bandung has the basic facilities for cotton spinning, weaving, knitting and textile chemistry. Although there are a number of knitting machines of various types and categories installed, none of the equipment is in good working condition. Further, there is no qualified teacher-instructor nor is there a qualified mechanic at the Institute.

If Indonesia's knitting industry is to flourish in increasingly competitive markets, it is imperative that knitting technology be taught at this institution

at all levels - from supervisory to operating personnel. While it is extremely important to train engineers and technicians, it is equally important to train managers and supervisors and key operators who will be used as instructors at the mill level.

3.4.5.0 Special Observations and Comments

3.4.5.1 Labor Utilization

As is the case in most developing countries with a large untrained labor force, the knitting industry is much too labor intensive. As the training discussed above becomes effective, job assignments can be broadened and the labor force can be reduced in the existing mills. The residual workers, who will also be trained, will be more than absorbed by the growth of the industry. The knitting industry can thus upgrade its labor force and in so doing lower its variable costs and provide trained personnel for future growth.

3.4.5.2 Electrical Power Supply

There is a shortage of electrical power in several areas, primarily around Djakarta. Only the five or six largest mills have sufficient facilities (generators) to produce electric current for their normal manufacturing requirements. Weighing the expenses of power generating equipment against production losses due to power stoppages, we feel that generators should be installed in all knitting mills.

3.4.5.3 Sales and Distribution

It is very rare that a knitter sells his goods outside of his own manufacturing area. There is little effort made to cover outlying districts, with the result that areas with no knitting facilities actually suffer from a shortage of domestically produced goods. This situation only encourages illegal imports, which are extremely high.

Illegally imported goods, especially in the textile field are a national problem. Due to its geographical configuration (3000 islands) it is impossible

to police the country with ordinary means. Undoubtedly, the best way to fight smuggling consists of producing enough goods of standard quality, providing a sound distribution setup, and pricing goods competitively.

3.4.5.4 Machine Utilization

Knitting machinery is very costly. Most mills operate in a single shift thus leaving the expensive equipment idle for two-thirds of the time. A better utilization of machinery will result in much lower unit costs by spreading the overhead (fixed) costs over a larger volume. With the present and forecast demand for knitted fabrics, most knitting mills could, with little difficulty, increase to a two or even three shift operation.

3.4.5.5 Machinery Replacement and Investment

The majority of the knitting and supporting equipment in place in Indonesian mills is old and will have to be replaced in the foreseeable future. It will become increasingly important, in view of the tight credit picture, that every investment

decision be made with extreme care. One of the reaons why machine replacement has not taken place within the last few years has been that knitting mill owners have given insufficient attention to the drastic changes that have taken place in knitting technology and requirements.

Selection of machinery is of prime importance. The natural tendency to install the most recent and most sophisticated equipment should not be followed by Indonesian mill owners. The state of the industry and general conditions in the country are different from that of highly industrialized countries, and a universal approach to machine selection cannot be applied. Final decisions as to machine selection should be based on:

- consumer needs
- availability of technical knowhow
- production capacity
- machine price

In order to provide the industry with information regarding machine types in most knitting categories,

we have included an Appendix (following Section 3.4.5.6) listing the more important machine manufacturers classified by knitting process.

3.4.5.6 Greater Product Mix Versatility

One of the major discrepancies in Indonesian knitting mills is the limited product mix. While such a procedure may well be a necessity in highly industrialized countries, using mass production methods for greatest efficiency at lowest labor expenditure, this principle does not apply to Indonesia. Here, the highest costs are for equipment, and it should therefore be utilized to its utmost capacity. Most underwear mills now working one shift for lack of additional sales, could easily change to two or three shift operations by broadening their product mix to include some outerwear such as:

- Ladies' blouses and dresses
- Ladies' sportswear
- Children's sportswear
- Playsuits
- Sleepwear

Most of these items can be produced with existing equipment (single jersey and interlock). By adding a few high production modern jacquard units, which are not too complicated, a full line of outerwear could thus be added to the present product mix. Cutting and sewing equipment would not require any modification.

Appendix A

Knitting machine manufacturers (by category)

Tricot Machines

Karl Mayer BmbH.
6053. Obertshausen (West Germany)

Liba Maschinenfabrik GmbH.
8674. Naila (West Germany)

Textile Machine Works
Division of North American Rockwell
Reading, Pa. (U.S.A.)

VEB Wirkmaschinenbau
Limbach-Oberfrohnau (East Germany)

Tsugami Manufacturing Co. Ltd.
Tokyo (Japan)

Emil Wirth, Wirkmaschinenfabrik
Hartmannsdorf b. Karl-Marxstadt (East Germany)

Single Jersey Machines

Alber & Bitzer K.G.
7477. Tailfingen (West Germany)

Camber International Ltd.
Leicester (England)

Fouquet-Werk Frauz & Planck
Rottenberg/Neckar (West Germany)

Precision Fukuhara Works Ltd.
Kobe (Japan)

Georges Lebocey & Co.
10 - Troyes (France)

Giovanni Marchisio & C.
Turin (Italy)

Mayer & Cie.
7477. Tailfingen (West Germany)

Miyake Knitting Machine Works Ltd.
Osaka (Japan)

The Singer Company - Supreme Machinery Division
Ozone Park, N.Y. 16 (U.S.A.)

G. Stibbe & Co. Ltd.
Leicester (England)

C. Terrot Soehne Maschinenfabrik
7000. Stuttgart-Cannstatt (West Germany)

Raschel Machines

Karl Mayer GmbH.
6053. Obertshausen (West Germany)

Liba Maschinenfabrik GmbH.
8674. Naila (West Germany)

Wirkmaschinenfabrik W. Barfuss GmbH.
Moenchengladbach (West Germany)

Yamamoto Machinery Works Co. Ltd.
Morita, Fukui (Japan)

Cocker Machinery & Foundry
Gastonia, N.C. (U.S.A.)

Tompkins Bros. Co. Inc.
Syracuse 4, N.Y. (U.S.A.)

VEB Strickmaschinenbau
Karl-Marxstadt (East Germany)

Scott & Williams Inc,
Laconia, N.H. (U.S.A.)

Double Jersey Machines

Alber & Bitzer K.G.
7477. Tailfingen (West Germany)

Edouard Dubied & Cie.
Neuchatel 2001. (Switzerland)

Fouquet-Werk Frauz & Planck
Rottenberg/Neckar (West Germany)

Precision Fukuhara Works Ltd.
Kobe (Japan)

Georges Lebocey & Co.
10 - Troyes (France)

Jumberca S,A,
Badalona - Barcelona (Spain)

A. Kirkland & Co. Ltd.
Leicester (England)

Giovanni Marchisio & C.
Turin (Italy)

Mayer & Cie.
7477. Tailfingen (West Germany)

Miyake Knitting Machine Works Ltd.
Osaka (Japan)

Franz Morat GmbH.
Stuttgart-Vailhingen 7000. (West Germany)

Scott & Williams Inc.
Laconia, N.H. (U.S.A.)

The Singer Company - Supreme Machinery Division
Ozone Park, N.Y. 16 (U.S.A.)

G. Stibbe & Co. Ltd.
Leicester (England)

C. Terrot & Soehne Maschinenfabrik
7000. Stuttgart-Cannstatt (West Germany)

Trabal S.A.
94. Mataro (Spain)

VEB Strickmaschinenbau
Karl-Marxstadt (East Germany)

Wildman-Jacquard Co.
Norristown, Pa. (U.S.A.)

Wildt Mellor Bromley Ltd.
Leicester (England)

Circular Sweater Strip Machines

Alber & Bitzer K. G.
7477. Tailfingen (West Germany)

Fouquet-Werk Frauz & Planck
Rottenberg/Neckar (West Germany)

Jumberca S.A.
Badalona-Barcelona (Spain)

Georges Lebocey & Co.
10 - Troyes (France)

Mayer & Cie.
7477. Tailfingen (West Germany)

The Singer Company - Supreme Machinery Division
Ozone Park 16, N.Y. (U.S.A.)

G. Stibbe & Co. Ltd.
Leicester (England)

C. Terrot & Soehne Maschinenfabrik
7000. Stuttgart-Cannstatt (West Germany)

Trabal S.A.
94. Mataro (Spain)

VEB Strickmaschinenbau
Karl Marxstadt (East Germany)

Wildman-Jacquard Co.
Norristown, Pa. (U.S.A.)

Wildt Mellor Bromley Ltd.
Leicester (England)

Full - Fashion Machines

Gebrueder Boehringer GmbH.
7320. Goeppingen (West Germany)

William Cotton Ltd.
Loughborough (England)

Fabrique Nationale d'Armes de Guerre
Knitting Machine Division
Gentbrugge (Belgium)

S.A. Monk Ltd.
Sutton in Ashfield (England)

Gebr. Scheller GmbH.
Eislingen/Fils (West Germany)

Schubert & Salzer A.G.
Ingolstadt/Donau (West Germany)

Textile Machine Works
Division of North American Rockwell
Reading, Pa. (U.S.A.)

V-Bed and Flat Knitting Machines

AB Jacquardmaskiner
Boras (Sweden)

Albo S.A.
12. Mataro (Spain)

Coppo Fabrica Italiana Macchine per Maglieria
Turin (Italy)

Edouard Dubied & Co.
Neuchatel 2001. (Switzerland)

VEB Fahrradwerk Elite-Diamant
Karl-Marxstadt W. 30. (East Germany)

Kuno Flat Knitting Machinery Co. Ltd.
Nagoya (Japan)

Mestre Mas.
Vilapiscina 33
Barcelona (Spain)

Protti-Fabrica Macchine Maglieria
Milano-Cornaredo (Italy)

Aquila Santagostino
Via Palanzone 16.
Milan (Italy)

Schaffhouse Knitting Machine Works Ltd.
Schaffhouse (Switzerland)

Singer-Alemannia Maschinenfabrik GmbH.
8581. Creussen (West Germany)

H. Stoll & Co.
Reutlingen Wttbg. (West Germany)

Takahashi Knitting Machine Co. Ltd.
Osaka (Japan)

Tricomalla
Trovador 12
Barcelona (Spain)

Universal Maschinenfabrik GmbH.
Westhausen 7081. (West Germany)

Seamless Hosiery Machines

The Bentley Engineering Co. Ltd.
Leicester (England)

Bertolini & Co.
Brescia (Italy)

Gottlieb Eppinger K.G.
7306. Denkendorf (West Germany)

Francesco Lonati
Brescia (Italy)

Maschinenfabrik Carl Merz K.G.
Hechingen (West Germany)

Moretta
Via Sieme 5.
Varese (Italy)

Nagata Seiki Co.
Tokyo (Japan)

O.M.C.
Via Agnello 18
Milan (Italy)

Samo Sangiacomo
Brescia (Italy)

Santoni & C. S.p.a.
Brescia (Italy)

Schubert & Salzer A.G.
Ingolstadt/Donau (West Germany)

Scott & Williams Inc.
Laconia, N.H. (U.S.A.)

VEB Wirkmaschinenbau
Karl Marxstadt (East Germany)

Kovo
Prague (Czechoslovakia)

Half-Hose and Sock Machines

The Bentley Engineering Co. Ltd.
Leicester (England)

Gottlieb Eppinger KG.
7306. Denkendorf (West Germany)

Fabrique Nationale d'Armes de Guerre
Knitting Machine Division
Gentbrugge (Belgium)

Irmac
Brescia (Italy)

Investa (Kovo)
Prague (Czechoslovakia)

Lawson-Hemphill Inc.
Central Falls, R.I. (U.S.A.)

Maschinenfabrik Carl Merz K.G.
Mechingen (West Germany)

Officine Moncenisio, S.p.a.
Turin (Italy)

Nagata Seiki Co. Ltd.
Tokyo (Japan)

Scott & Williams Inc.
Laconia, N.H. (U.S.A.)

Textile Machine Works
Division of North American Rockwell
Reading, Pa. (U.S.A.)

3.5.0.0 DYEING, PRINTING AND FINISHING

3.5.1.0 Machine Appraisal

3.5.1.1 General Comments

To appraise the existing machinery and equipment of the Dyeing, Printing, and Finishing industry, a detailed survey of twenty seven mills was conducted with an annual production of 214,000,000 yards.

Our findings and analysis were based on the following conditions:

a. The general condition of all equipment surveyed
b. Their production
c. Their efficiency
d. Their flexibility
e. Their suitability
f. The quality of the product produced

The appraisal of the Dyeing, Printing and Finishing machinery and equipment is shown in Exhibit 3-8 where a percentage of machinery and equipment surveyed is listed as:

a. Modern

b. Should be modernized

c. Obsolete

Layout and Buildings

The layout and buildings in the dyeing, and finishing mills ranges from poor to modern usually depending on the age of building. The older mills that have expanded did not keep a good flow of materials. This is a result of inadequate long range planning. The mechanical printing operations are newer than the majority of the Dyeing and Finishing mills. These mills have a good layout of equipment, resulting in a good flow of materials.

Maintenance

The maintenance in the small mills is usually poor. The small dyeing and finishing mills are usually part of a small weaving mill and suffer the same problems as the looms.

The large dyeing and finishing mills have done an adequate job of maintaining their machinery and equipment. Although all of these mills have weaving,

some of them either do commission work or they buy greige fabric to be processed and sold under their name. In this way the equipment is fully utilized and easier to maintain.

Planning

Long term planning in dyeing, printing and finishing, faces some of the same problems as the weaving mills. In the periods where sales volumes decline, the operation is curtailed until sales volume increases. They do not have the capital or sales planning to produce and inventory fabrics for peak sales periods.

Sources of Machinery

The dyeing, printing and finishing equipment is purchased from Europe (primary source) Japan and some from the United Kingdom. A great deal of new equipment is received from the same manufacturers in the two respective countries. This should relieve the spare parts problem to a great extent.

3.5.1.2 Dyeing

Appraisal

It is necessary to include the bleaching equipment in appraising the dyeing industry. Nine (9) of the 23 dyeing plants had equipment designed for bleaching. The remaining 14 plants were bleaching (washing) in the dye becks or jigs. See Exhibit 3-8 for a breakdown on evaluation.

Number, Condition and Suitability

There were 22 mechanical bleaching units observed ranging from domestically made to less than one year old. Any 8 of the bleaching units are considered modern, 2 should be modernized (poor maintenance) and 12 are considered obsolete. Ten (10) of the obsolete units are in one plant with only 2 running.

There were 47 becks, 132 jigs, and 5 continuous dye machines observed. Only 18 of the becks, and 56 of the jigs were considered modern. All of the continuous dye machines were considered modern. They are in excellent condition, capable of dyeing a wide range of fabrics and fibers.

Method of Operation

Because of the small size of many of the dye mills, they cannot afford the capital required for a complete range of equipment. Consequently, the dye beck and jigs may also be used to wash or bleach the fabric. This deteriorates the quality of the dyed fabric restricting the end use market.

3.5.1.3 Printing

Appraisal

The mechanical printing machinery and equipment is superior to the rest of the textile industry. The majority of the equipment is capable of printing a wide selection of fabrics and fibers with excellent results. See Exhibit 3-8 for appraisal.

Number, Condition and Suitability

There were 6 roller, 7 rotary screen and 4 automatic flat screen printing machines observed. Three of the roller, 6 of the rotary screen and 4 of the automatic flat screen machines are considered modern. All of these machines are of modern design capable of competing in both cost and quality with any country in the world.

Method of Operation

All of the mechanical printing is not running. The reasons are:

Type Plant	Reason Not Operating
Roller Printing (1 machine)	Lack of capital and raw materials.
Rotary Screen (1 machine)	No power parts for power plant held up at customs.
Rotary Screen (1 machine)	Installation not complete

Each mill will have or has its own engraving shop. The engraving shops will not utilize their full capacity of roll and screen making resulting in some increase in cost. It must be pointed out that the engraving of the rolls and screens is the heart of good printing. If a smaller number of engraving shops were set up it would reduce the number of technical experts required.

3.5.1.4 Finishing

Appraisal

The finishing equipment does not have the flexability that exists in some of the dyeing and printing mills. The majority of the finishing equipment appears to be designed for drying and does not have the ability to

heat set fabrics or apply resin finishes. In many of the spinning and weaving mills visited, there was a strong indication by management that they would be producing polyester/cotton yarns and fabrics in the near future. These fabrics will require heat setting.

This situation can be corrected by adding additional heating chambers to the present equipment. See Exhibit 3-8 for appraisal.

Number, Condition and Suitability

There were 24 stenter frames and 14 dry can ranges observed. Of this 10 stenter and 2 dry can ranges were considered modern. Six (6) of the stenter frames (add more heating chambers) and 5 of the dry can range should be modernized. The remaining equipment is obsolete and should be replaced. Serious bottlenecks could develop in many plants if fabric types and fiber content changed.

3.5.2.0 Production

3.5.2.1 Dyeing

The comparison of dyeing capacity is difficult to make since the many factors affecting it are not comparable.

For example, shade, fiber content, lot size, depth of shade, etc. all have a bearing on dye cycle time. Dyed and bleached fabrics reached 214.2 million linear yards last year in Indonesia - utilizing approximately 80% of the installed capacity observed.

3.5.2.2 Printing

To appraise the printing production in Indonesia, both mechanical and hand printing factories were visited. Production reached 100.8 million linear yards in 1970 in Indonesia utilizing approximately 50% of the installed capacity observed.

3.5.2.3 Cost

The following cost breakdown represents over 80% of the dyeing and finishing production observed. All fabrics converted to a 60 end and 60 picks per inch using 26/1 cotton count. Fabric weight is 3.25 linear yards per pound.

Classification	Per Cent
Labor*	9
Overhead (Fixed and variable)**	31
Raw Material***	60
TOTAL	100
Cost per linear yard	154 Rp.

*Labor - Includes all labor (direct and indirect, supervision and fringe benefits)

**Overhead-Includes spare parts, power, water, heat and steam, depreciation, interest, insurance, taxes, and dyes and chemicals

***Raw material-Includes greige fabric

The above cost breakdown will vary from plant to plant depending on the cost accounting procedures as well as the cost center breakdown, allocation of experience and operating condition.

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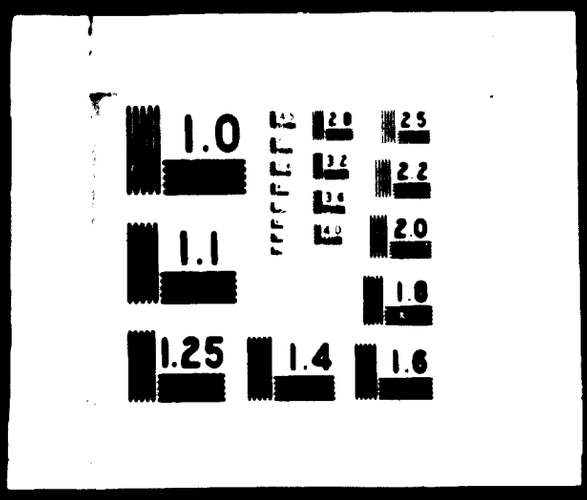


3.5.3.0 Product Quality

3.5.3.1 Dyeing Including Finishing

The quality of the dyed fabric in Indonesia is below the standards expected in the United States and Europe. The poor quality of dyed fabric in many cases is the result of spinning faults and weaving faults. Some spinning faults (neps, thin places, thick places, uneven yarn, etc.) and weaving faults (thick places, thin places, missed picks, etc.) are magnified when the fabric is dyed.

3.5.3.2 Printing Including Finishing

The quality of printed fabrics is the same as the dyed fabric with the exception of some quality imported fabrics primarily used in the bolin printing area. The spinning and weaving faults are not magnified as in the dyeing process since printing tends to hide these faults. Therefore, the visual appearance of the printed fabric is superior to piece dyed fabric.

3.5.4.0 Quality Control

3.5.4.1 Dyeing Including Finishing

None of the plants observed have a complete quality control system designed to test measure:

a. Light fastness
b. Wash fastness
c. Cracking
d. Bleeding
e. Shrinkage

These should be standard tests to improve quality, maintain consistent quality, and improve customer acceptance and confidence.

3.5.4.2 Printing Including Finishing

As in dyeing none of the plants observed have a complete quality control system designed to test measure:

a. Light fastness
b. Wash fastness
c. Cracking
d. Bleeding
e. Shrinkage

f. Print registration

g. Print balance

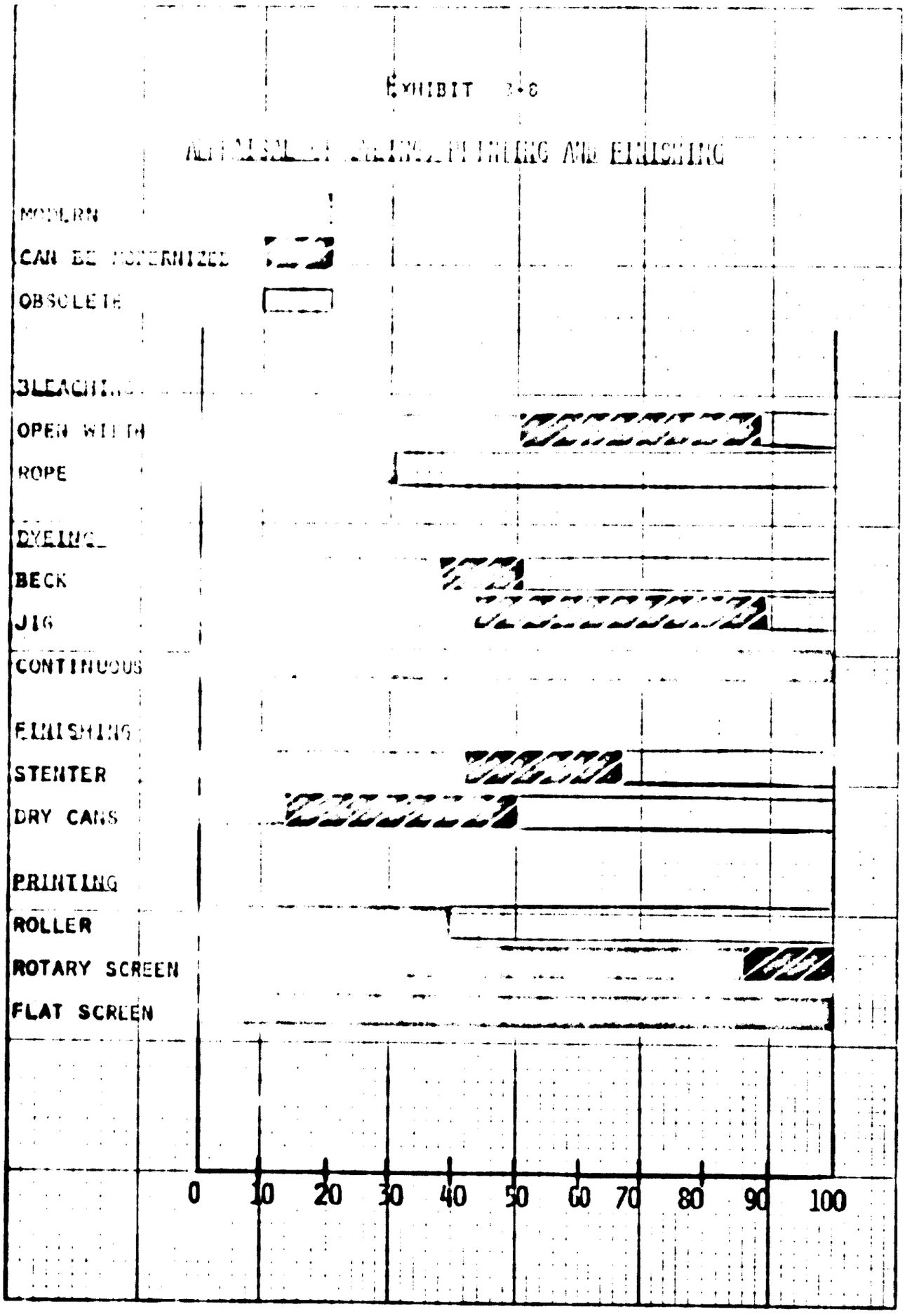
Again, as in dyeing, there should be standard tests to improve quality, maintain consistent quality, improve customer acceptance and confidence.

3.5.5.0 Ownership

The dyeing, printing and finishing mills are owned by private entrepreneurs, combination private entrepreneur and Indonesian government, or private entrepreneur and foreign investor.

EXHIBIT 3-8

ALTERNATIVE BLEACHING AND FINISHING



3.6.0.0 LABOR APPRAISAL

3.6.1.0 General Comments

Indonesia, as is true in many developing countries, has a very high unemployment rate. Probably a better term for this would be under-employment. Tremendous studies have been made to reduce the under-employment, however, the industrialization process has been unable to keep pace with the availability of people coming into the labor force.

Although the labor force is greater than the available number of jobs, serious problems still face the textile industry from a labor point of view. There is a lack of highly skilled and experienced labor in the following general categories:

- Management personnel
- Supervisory personnel
- Machine fixers
- Training personnel

The majority of the personnel in large mills holding these positions are graduates from the

textile institute in Bandung or political appointees. The small family mills employ very few graduates from the textile institute in Bandung because they cannot afford them or they are skeptical of employing them. Many of the textile graduates that the Werner team interviewed have a basic knowledge in their field. The problem is there are not enough highly trained and experienced personnel to develop these basic talents to the fullest. This situation can only be improved by the close cooperation of both the Government and the manufacturing sector. There must be a greater commitment on the part of the manufacturing sector and Government to provide the training necessary to develop personnel who can assume these responsible positions.

Another key factor in the labor force, particularly from the machine operator level down to the simpler tasks involved in textile manufacturing is the lack of adequate training. Before adequate training is obtained with the labor force, the reorientation of the thinking of top management is required. Formalized training programs should be

established that not only train the worker in the necessary steps for performing his assigned task, but also training the worker so that he will be motivated to accomplish that task. Too often management tends to blame its labor problems on the Indonesian as being slow learners. This type of thinking on the part of some management must change as it is not sound.

Changing the basic philosophy of the people can be helped by the Government in the schooling of younger people whereby they are introduced at an early age to the type of philosophy that accompanies a manufacturing economy. Each succeeding year better equipped Indonesians are available to be absorbed into the labor force.

3.6.2.0 Labor Utilization and Productivity

When visiting the textile manufacturing plants in Indonesia, the predominant problems observed were:

a. Lack of labor training
b. Very poor labor utilization
c. Production equipment in poor mechanical condition

d. Obsolete production equipment

e. Non-utilization of equipment because of lack of power, capital and/or sales

Although this sector deals with labor utilization, occasional reference is made to other faults both to explain and suggest means to improve labor utilization.

ALL DATA CONCERNING THE PRESENT LABOR FORCE WAS FURNISHED BY THE MILLS TO THE WERNER TEAM.

In Indonesia eighty-one (81) primary textile manufacturing mills were visited representing a labor force of over 42,000. These mills had 198,832 ring spinning spindles, 10,163 power looms, 1,310 knitting machines, as well as dyeing, printing and finishing equipment. This labor force is far more than necessary by any standard, especially when the quality of the finished product is considered. Admittedly a great deal of the equipment is obsolete and non-automatic but even this cannot justify such poor utilization of labor.

Labor is one of the major factors in the final cost of the finished product and each mill has to

control this labor to remain competitive. Almost all of the mills visited, especially in the weaving and finishing sectors, complained about the competition from imports both legal and illegal. Not many managers recognized the impact that poor labor utilization and productivity has on the cost of their final product. This is a twofold problem: one is the low productivity per man hour from improper training and job assignments; the other, the low productivity per man hour resulting from using obsolete and non-automatic equipment.

Exhibit 3-10 is a comparison of the actual manpower currently being used versus manpower needed in some of the mills surveyed. This possible improvement in labor is conservatively based on properly training the personnel and correctively establishing engineered job assignments. In reality, additional improvements could be realized as machine efficiencies improve increasing productivity per man hour and machine hour.

Exhibit 3-9 is designed to reflect the productivity per man hour in spinning. As can be seen from

this Exhibit, Indonesian labor productivity falls below other countries that would have to be considered developing areas. As an example: for an average count of 26/1 (cotton count) Indonesian labor is not as productive as these other developing countries. Expressed another way, spinning an average count of 26/1 (cotton count) one man working one hour would produce the following pounds of finished yarn, by area:

Exhibit 3-9

Indonesia	2.9 Lbs.
South America	10.5 Lbs.
East Africa	3.0 Lbs.
Europe	11.2 Lbs.
North America	19.7 Lbs.
Hong Kong	6.9 Lbs.

Exhibit 3-11 is designed to reflect the productivity per man hour in weaving. This Exhibit is not as specific as the comparison in spinning because of the different types of looms utilized in Indonesia. Nevertheless, it does reflect the low man hour productivity that exists.

In Indonesia the production is 13.400 yards of weft inserted per man hour. The use of non-automatic and old type looms is a major contributing factor to the low production per man hour. The majority of the

mills are assigning from 1 to 4 looms per weaver on non-automatic looms, achieving less than 70% efficiency. By providing extra shuttles one person could be responsible for replacing the empty quill in shuttles not running, assigning more looms to each weaver. This could be in the area of 8 to 10 looms also increasing efficiency up to 75% or more.

3.6.3.0 Labor Cost

Labor cost is one of the major individual factors that can influence the total cost of a product.

Labor cost is calculated by the following equation:

$$\frac{\text{Average Wage/Operator/Time Period}}{\text{Units/Operator/Time Period}} = \text{Labor Cost/Unit}$$

Units per operator per time period was discussed in section 3.6.2.0. Since this is one item directly under the manager's control, a review of its major components would be in order. The following items are the major influences on Units/Operator:

a. Operator skill
b. Operator work pace
c. Operator work assignment
d. Machine speed
e. Machine maintenance

f. Machine obsolescence

g. Layout of machines

h. Quality of raw material

i. Atmospheric condition

The average wage per hour is controlled to a lesser degree by management and is composed of the following major components:

a. Basic wage rate

b. Fringe benefits

c. Social benefits

d. Bonus

e. Incentive rate

f. Availability of labor force

In Indonesia, these components are established by a combination of location, management decision, government regulation, and labor unions. This combination greatly reduces the total influence of management on wage costs.

The basic wage ranges from 2,500 Rupiah/month up to 10,000 Rupiah/month, depending on location and job skills. Social, fringe, bonus and incentive benefits are comprised of the following items as per agreement by management, depending on job classification and location:

a. Housing allowance

b. Holiday pay

c. Laborer

d. Medical care

e. Free meal

f. Rice allowance

g. Cooking oil

h. Sugar

i. Soap

j. Uniforms

k. Transportation to and from work

l. Birth benefits

m. Death benefits

n. Incentive pay

o. Recreation activity

p. Taxes

The benefits listed above are not given by all mills. Also, accurate records are not available in some plants, therefore, it is possible that other benefits are excluded from the list. In some cases the amount of the benefit is based on the number of dependents the employee has.

In calculating fringe benefits, no increase in cost for absenteeism and labor turnover was considered. The benefits vary from 20% to 40%, depending on the mill and location. Also, some mills give a lower base wage, increasing their benefits.

Exhibit 3-12 is a comparison of Indonesian labor cost per unit produced with the textile industries of other countries. In the spinning sector, the Indonesian labor cost per pound is competitive with other countries. However, when compared with South America, the effect of low labor productivity in Indonesia becomes apparent. South America has over three times the wage rate of Indonesia, but they produce over three times as much per operator hour. In the weaving sector of the exhibit, the same situation exists. Here again the labor rates are lower than any country analyzed, but this is offset by the low production per operator hour. Exhibit 3-13 reflects obtainable goal.

The advantages in labor cost is the major advantage or asset a developing country has. Indonesia mu t capitalize on the low wage rates to compete with the world market. It is not suggested that Indonesia start trying to sell in the world market. However it is suggested that they must be able to produce textile products that are competitive in both cost and quality. Until this point is reached, world market textile products will continue to be imported. Merely imposing high tariff restrictions will not stop the imported products. This will only provide a lucrative incentive for smugglers. Because of the geographic

location and physical shape of Indonesia the only effective way to fight smuggling is from within. A strong textile industry must be built. When there is no profit in smuggled goods, the situation will cease to be a factor.

Indonesia is at a disadvantage because almost all textile machinery and supplies have to be imported. This disadvantage has to be offset by the labor cost per unit produced. This again emphasizes the importance that should be attached to increasing the output per operator hour with the Indonesian textile industry.

3.6.4.0 Training

Generally the degree of training of the Indonesian operator in the textile industry is below the standard of many other countries. In the majority of the mills visited the training of operators was informal and inadequate. The normal method appeared to be: assign a new employee to an experienced operator. These experienced operators train the new employee while performing their own duties. This is known as on-the-job training and is the least acceptable method. Because the experienced operator's abilities are not analyzed, the new operator inherits the deficiencies of the experienced operator and

develops some of his own.

The trend in the more industrialized countries during the last 10 or more years has been to develop formal and scientific schemes for hiring and training employees.

Manual dexterity tests, eye examinations and physical examinations are part of the hiring policies. The Personnel Department is responsible for employee indoctrination in company policies, practices and procedures. After this, the employee is placed under the supervision of the training director or head instructor of the program.

Training facilities are set up in a centralized location and usually include, where practicable, a small or full size sample unit of each type production equipment such as a card, draw frame, roving frame, spinning frame, winder (cone and quill) loom, inspection frame, etc. Trainees are taught under a prescribed schedule, and their progress is followed weekly until the end of the training cycle for individual assignments. This program includes everyone from sweepers to fixers. The length of training depends upon both the individual and the degree of skill required for the job.

Training programs are usually developed by training specialists who, in conjunction with the Personnel Department, review the progress of each trainee on a continuous basis. Probably the most important aspect of this type of training is the follow-up by the training department after the trainee completes the training cycle and is placed on the job for which he was trained. Without this follow-up the effectiveness of the trainee and the training program would be unknown.

This type of training program in textile companies of both developed and developing countries has invariably resulted in:

1. Shorter learning time
2. Increased manpower productivity
3. Reduced labor turnover
4. Increased quality
5. Reduced waste
6. Reduced absenteeism

In all mills no special programs for training and retraining of employees was found. Again,on-the-job training, or variations thereof, were used. The proper method is to use the training program described above.

It is recommended that the textile industry of Indonesia, in cooperation with the Ministry prepare a selection manual for hiring new personnel in the textile industry. This manual should include all the personnel testing techniques, such as:

1. Mental ability test
2. Manual ability text
3. Perception test
4. Personal qualities
5. General knowledge, etc.

An independent organization should be retained to develop the manual and train the various textile personnel managers in its use. This should be a joint venture between the Government and the textile industry as many of its features would apply to other industries.

The second recommendation is that a training program for all hourly operators be developed. This program would include assisting management in selecting candidates for training such as, supervisors and instructors. The instructors would be trained and assisted in developing a program for implementing the specific programs required. Also, assistance should be provided during the implementing of the programs by periodic reviews and evaluating the results.

3.6.5.0 Recommendations

Before leaving this section of labor a review of labor productivity is in order with recommendations toward its improvement.

Factors which affect the productivity of the Indonesian labor force are:

1. Age and automation of machinery
2. Machine speeds
3. Machine efficiencies
4. Manufacturing processes
5. Work organization and distribution
6. Work loads
7. Layout and production flow
8. Material handling
9. Degree of training

Textile Institute

The Indonesian textile industry is fortunate to have the Textile Institute, located in Bandung, which provides students with degrees in Textile Technology which are available to industry. Ways in which additional support could be provided to industry was discussed with representatives of the Institute. The

three major areas in which the Institute could broaden its scope would require additional capital and qualified experts. The three areas are:

A. Management Development

The Institute should implement special programs to improve the skills of Indonesians in the techniques of mill management. These programs should be conducted at the Institute as well as in regional areas where transportation is a problem. These programs should include:

1. Seminar
2. Special area discussion courses
3. Demonstration of modern equipment using modern techniques
4. Special refresher course

B. Instructor and Operator Training

The Institute should design courses where instructors are trained in the proper techniques and movements to perform a given task with maximum results and

minimum efforts. Once the instructors are trained, then the training of operators could be accomplished by:

1. Large Plants

   Assist the large plants in establishing their own training program for operator and technicians.

2. Small Plants

   Have adequate facilities at the Textile Institute for training operators and technicians when the plants cannot afford a full time training program.

3. Rural Cottage Industry

   Hold seminars in the rural area for plants that cannot afford sending their employees to the Institute.

C. Consulting Service

To provide additional support to the Indonesian textile industry the experts teaching at the Institute should be made available to the industry when it has specific problems. It is also recommended that when the experts go to the mills to assist in solving specific problems, they are allowed to take some advanced students with them. This would give the students first hand knowledge in problem solving.

By implementing these above recommendations, improvement would be expected in the following areas:

1. Improved technical knowledge
2. Improved Maintenance
3. Better supervision
4. Greater standardization of products
5. More strict production planning
6. Introduction of proper work incentives
7. Proper studying of work methods and time and motion studies
8. Controls of machine utilization
9. Proper in-process quality control
10. Proper training

To receive maximum benefits from labor the following changes in equipment should be accomplished.

1. Modernize existing equipment.
2. Replace all the four delivery draw frames with new high speed drawing equipment.
3. Replace all fillet card clothing with metallic clothing.
4. Increase number of blendings in the blow room
5. Install cylinder slashers with proper controls

6. Replace all non-automatic or ordinary looms with new looms
7. Replace obsolete dyeing equipment
8. Install drying equipment and eliminate drying goods in the open air

Additional Facilities Required

Over a ten year period additional employment created by an expanding textile industry results in the following average additional disciplines per year (see Exhibit 3- 14 for complete breakdown).

Textile Sector	Average Increase in No. of Employees/Yr Supervisors	Operators & Laborers
Cotton & Synthetic Spinning	75	1500
Cotton & Synthetic Weaving	70	1400
Knitting	12	445
Dyeing & Printing	39	258
	196	3603

In order to accomplish the above listed task of graduating 196 qualified personnel in textile technology and provide a basis for training 3603 operators and laborers in the various textile sectors, then additional

facilities are required at the Textile Institute. The funds required for additional classrooms, new equipment and modernization of present equipment could be accomplished for $850,000.

The present staff would have to be increased to accommodate the increase in graduates per year, conduct management development programs, train instructors and to provide consulting services.

Exhibit 3-10

MANPOWER COMPARISON ON THREE SHIFT OPERATION

	Actual Empl./ 1000 Spdls.	Reqd. Empl./ 1000 Spdls.
Spinning Sector	37.98	21.0

	Actual Looms/Empl.	Reqd. Looms/Empl.
Weaving Sector	.71	1.05

EXHIBIT 3-11

MANPOWER PRODUCTIVITY - MEAVING

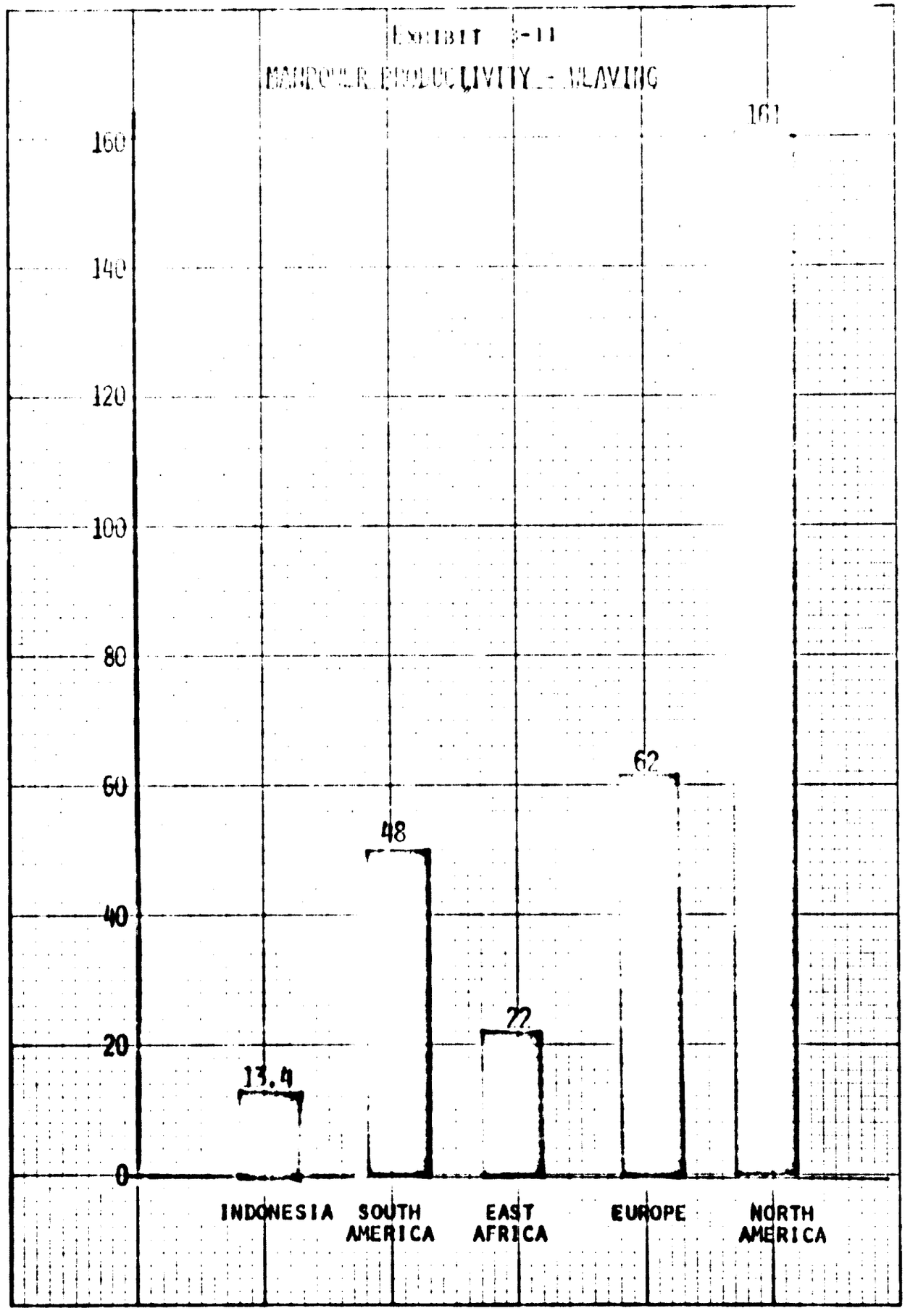


Exhibit 3-12

COMPARISON OF AVERAGE TOTAL WAGES/HOUR/UNIT OF PRODUCTION

	SPINNING			WEAVING		
Country	Avg. Total Wages/Hour in US ¢	Lbs. of 26/1 yarn produced/ 1 hour of labor	Labor cost per lb. in US ¢	Avg. total wages/hour in US ¢	Thousand yds. of weft inserted per 1 hour of labor	Labor cost per thousand yds. of weft inserted in US ¢
Indonesia	16	2.9	5.52	16	13.4	1.19
East Africa	28	3.0	9.33	28	22.0	1.27
S. America	51	10.5	4.86	55	48.0	1.15
U.S.A.	245	19.7	12.44	260	161.0	1.61
Hong Kong	35	6.9	5.07	35	56.4	.62
Europe						
Germany	132	11.7	11.28	140	74.0	1.89
Austria	94	11.1	8.46	102	63.0	1.62
France	98	10.6	9.25	100	58.0	1.72
Holland	126	11.7	10.77	126	70.0	1.80

Exhibit 3-13

COMPARISON OF AVERAGE TOTAL WAGES/HOUR/UNIT OF PRODUCTION INDONESIA SHOULD ACHIEVE AFTER MODERNIZATION AND EXPANSION THROUGH 1980

	SPINNING			WEAVING		
Country	Avg. Total Wages/Hour in US ¢	Lbs. of 26/1 Yarn Produced/ 1 Hr.of Labor	Labor Cost Per Lb. in US ¢	Avg. Total Wages/Hour in US ¢	Thousand Yds of Weft Inserted/ 1 Hr. of Labor	Labor Cost/Thousand Yds. of Weft Inserted in US ¢
Indonesia	16	5.25	3.05	16	39.2	0.41
East Africa	28	3.0	9.33	28	22.0	1.27
S. America	51	10.5	4.86	55	48.0	1.15
U.S.A.	245	19.7	12.44	260	161.0	1.61
Hong Kong	35	6.9	5.07	35	56.4	.62
Europe						
Germany	132	11.7	11.28	140	74.0	1.89
Austria	94	11.1	8.46	102	63.0	1.62
France	98	10.6	9.25	100	58.0	1.72
Holland	126	11.7	10.77	126	70.0	1.80

WERNER

Exhibit 3-14

NUMBER OF ADDITIONAL EMPLOYEES REQUIRED BY YEAR FOR ADDITIONAL PLANTS

Plant Type and Employee Classification	Year 1 1971	2 1972	3 1973	4 1974	5 1975	6 1976	7 1977	8 1978	9 1979	10 1980	TOTAL
Spinning											
Supervisors	60	60	90	90	90	90	90	60	60	60	750
Production	1200	1200	1800	1800	1800	1800	1800	1200	1200	1200	15000
Weaving											
Supervisors	40	40	60	80	100	100	100	80	60	40	700
Production	800	800	1200	1600	2000	2000	2000	1600	1200	800	14000
Knitting											
Supervisors	2	7	10	12	15	19	19	13	14	12	123
Production	12	509	524	542	316	577	337	545	546	538	4446
Dyeing											
Supervisors	30	60	30	30	30	60	30	30	30	30	360
Production	200	400	200	200	200	400	200	200	200	200	2400
Printing											
Supervisors	18									9	27
Production	120									60	180
Total Supervisors	150	167	190	212	235	269	239	183	164	151	1960
Total Production	2332	2909	3724	4142	4316	4777	4337	3545	3146	2798	36026
GRAND TOTAL	2482	876	3914	4354	4551	5046	4576	3728	3310	2949	37986

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3.7.0.0 Production Controls

3.7.1.0 General Comments

Production control is an important tool available for proper management control of any manufacturing enterprise.

Management should continually be seeking to improve its control over the activities of a company; marketing, manufacturing and administration and finance. By setting standards for both performance and cost in all areas, a way of measuring progress and performance can be established and a company's competitive position improved.

Each control must have a specific purpose and in manufacturing the emphasis is placed on controlling conditions which will insure quality products at the lowest practical cost. The object of manufacturing controls is to exercise a continuous and routine check over the whole manufacturing operation. Controls would be established over the utilization of raw materials, equipment, labor and all controllable operating expenses. Also, controls are established

to maintain uniform quality levels and reduce second quality goods.

As with all expenses, the costs of controls would be kept as low as possible while still assuring the necessary and desired degree of control. It has been proved many times that the costs of implementing and maintaining the controls will be recovered several times over.

Production controls should be present in every plant regardless of size. Size of the plant should only influence the number of persons engaged in control activities. In very small mills control functions may all be performed by one man in conjunction with other duties but in large mills the control functions would be organized by the type of control into separate departments each of which would report to one manager.

3.7.2.0 Labor Cost Control

Labor cost control's function is to insure the actual labor performance is kept in line with established standards and is a natural evolution resulting from introducing measured work assignments.

The determination of work assignments and job loads is normally achieved through time analysis of work performed. However, time analysis is not the first step. It should be preceded by work simplification and method study analysis to standardize operating conditions and methods. Time analysis determines the standard time for each element of work, together with the frequencies with which these elements occur, usually brought to a common basis such as per hank, doff, thousand picks, pound, etc.

Several requirements are necessary for establishing effective labor cost controls. These requirements have to be known for each production machine, each job classification and each type of product. These requirements are:

1. Standard work assignments
2. Standard machine production
3. Product
4. Actual machine production
5. Actual employee hours used
6. Actual hours operated

Based on standard work assignments and expected

production, standard labor costs per unit of production can be developed. The actual cost should be compared with the standard costs and the variances analyzed on a weekly, bi-monthly or monthly basis. A sample of a "Labor Cost Analysis Report" is shown in Exhibit 3 - 15.

None of the mills surveyed in Indonesia produced an effective labor cost control system. Some mills calculated the number of employees required based on "guesstimated" assignments or actual assignments but not even these were based on actual operating conditions versus standard conditions.

Section 3.6.2.0 amplifies the great need for more effective utilization of labor in Indonesian textile mills and the need for establishing some controls to measure these excessive labor costs. To help achieve this it is recommended that labor cost controls be instituted in each mill even though standard assignments and standard production have to be estimated. Estimation of standards and installation of a labor cost control report would at least give a bench mark for measuring performance and provide the tool for accumulating the data necessary for a standard cost system to be developed.

3.7.3.0 Machine Output Controls

Machine efficiency is a simple control of machine utilization which in many modern mills is carried down to individual machines and operators. Comparisons are made between machines or machine groups by shift and operators and to established standards. When variances occur between machines, machine groups, operators, or from standards, analysis of the variances will highlight the cause and corrective action may then be taken.

An important by-product of measuring machine efficiency is that the production from each machine is known. Knowing the exact production from each machine is a prerequisite for the proper production planning and scheduling of machines to insure optimum production. In addition to this, machine efficiencies have to be known before a standard cost system can be established to determine costs by product and measure the performance of the mill.

When investment costs are high, as they are in Indonesia, particularly spinning and finishing equipment, it is important to insure the optimum

utilization of equipment. This cannot be achieved without knowing machine efficiencies.

For the reasons cited above, it is recommended that machine output controls be installed in all textile plants in Indonesia.

3.7.4.0 Preventative Maintenance

The object of a preventative maintenance program is to insure that all equipment is properly maintained. Each machine is cleaned, lubricated, inspected, adjusted and worn parts replaced on predetermined frequencies. These frequencies are determined according to the type of equipment, its age and condition and the number of hours it operates.

Such periodic maintenance minimizes down-time for mechanical failure and extends the useful life of the machine. Also, product quality is improved by proper equipment maintenance.

Maintenance of equipment in Indonesia is generally poor, with the exception of several spinning mills. The installation of preventative maintenance programs would go a long way toward alleviating this situation.

Another feature of preventative maintenance programs is that employees can be trained to perform limited specialized functions making it much easier to train people who have had no previous experience in textiles.

Many machines were observed running with mechanical failures and in many cases if a machine had a breakdown on the night shift it was not repaired and returned to production until the day shift. Preventative maintenance programs are designed to eliminate this.

Where skilled labor is not readily available and the potential work force is non-industry oriented, it is necessary to minimize job skills as much as possible to get maximum utilization from the available skilled labor. Preventative maintenance programs are one of the most effective vehicles with which to achieve the degree of specialization required to minimize job skills. An example of this is that an employee could be trained to plumb spindles on a spinning frame. How to plumb a spindle is all he is required to know. It is not necessary to know anything else about the frame such as how to level the

rail or change cots as his only job is to plumb spindles. Technicians, supervisors or highly skilled personnel would be used only to follow up and spot check to see that the spindle plumber was performing his job properly.

3.7.5.0 Waste Control

Since raw material constitutes the main item of cost in most, if not all textile products, the exercise of good control over waste can considerably influence the profitability of any textile operation. The establishment of an effective waste control program requires establishing standard waste by process and product and a program for disposition of the waste produced.

In conducting a waste control program, the actual waste produced is weighed and recorded then disposed of in a predetermined manner. At regular intervals, the actual waste produced is compared to standard. If the actual waste produced exceeds standard tolerance an investigation is launched to determine and correct the cause.

It is essential in any textile operation to control

not only the waste which is unrecoverable and, therefore sold, but also the waste which is being returned to previous processes to be reworked. Very often little attention is given to controlling the amount of reworkable waste produced. An excessive quantity of waste being reprocessed is detrimental to the processing performance of the product and eventually to the quality of the finished product.

Exhibit 3-15

LABOR COST CONTROL REPORT

Department: _____

PERIOD	No. Of Operators		Production In Lbs.		Operator Hours				Analysis of Indirect Operator Hours					
					Direct		Indirect		Cleaning		Maintenance		Transporta.	
	Direct	Indirect	Stand	Actual	Stand	Actual	Stand	Actual	Stand	Actual	Stand	Actual	Stand	Actual

PERIOD	Wages		Gain or (loss)	Ratio Actual to Stand	Analysis of Wages			Cost/Unit		Units/ Operator Hour	Average wage/ operator hour	Average Yarn Count Ne.
	Stand	Actual			Normal	Overtime	Bonus	Stand	Actual			

3.8.0.0 Production Coordination and Planning

Production coordination and planning is a system of controlling, coordinating and planning production based on a thorough analysis of the productive capacity and sales requirements of the individual mills. Production planning lays out the program that the mill will follow. Production coordination could be described as both the assimilation of data to plan the program and as the method of executing the program. Production control keeps a check on the program to assure that it is being properly executed.

Two basic objectives are accomplished by production planning and control:

1. to deliver the proper quantity of the correct goods at the required time;
2. to produce these goods under the most favorable and profitable conditions for the mill.

The general objectives can be summarized as follows:

1. screen orders and accept only those that can be met;
2. allow for profit consideration before

accepting an order;

3. keep close control over inventory fluctuation of stock;
4. direct sales effort toward slow moving goods and anticipate demand for fast moving goods;
5. know in advance work loads ahead of processing machines and departments;
6. process optimum lot sizes in the best sequence;
7. maintain balanced work load in departments;
8. insure smooth flow of work through the plant;
9. provide a means for long range planning.

3.8.1.0 Coordination - Sales and Production

Indonesia does not have a very well developed marketing system for its textile products. When this situation exists it is important that there be close coordination between sales and production, even to the extent of developing a formal system for coordinating sales and production. This has not been done even

in the mills that are large enough to justify a formal system.

If all mills were running on a three shift basis at 100% capacity, the degree of planning required to coordinate production with sales, inventory levels, purchasing and finance would be very high because of the continuous rate of production and the ease with which excessive and unwanted inventory can accumulate.

Communication between the marketing and the manufacturing divisions is important at all stages in the operation of a company. Sales and production coordination comprise the actual relating of sales requirements or potential with the mill capacities, and of supplying to the sales department information rapidly and accurately regarding production, delivery dates, etc., and assuring that these promises are fulfilled. It functions as the main artery of communications between the manufacturing and marketing division, and as such is an extremely important facet of any textile operation.

The manufacturing function of this coordination is known as production planning. A definition of production planning is: a means of integrating and coordinating the use of material, labor and machines

to achieve optimum production and profit and to meet sales requirements.

In very small textile operations, the coordination between sales and production may exist in a limited sense in that responsibility for both sales and production are vested in the same person. Larger companies require a formal system of sales and production coordination.

3.8.2.0 Production Planning

The purpose of production planning is to achieve the following benefits:

1. increased production and higher efficiencies;
2. minimum interruptions, idle machines and idle labor that are caused by unbalanced production flow;
3. control over and reduction in in-process inventory;
4. prompt delivery of finished goods;
5. efficient production by relieving the department heads and foremen of the necessity to do their own planning, thus allowing them to devote more time to supervising their departments;

6. capability of pinpointing production bottlenecks and all interruptions of planned production.

Production planning works best when a plant has an effective production control system, which has previously been described.

3.8.3.0 Inventory

3.8.3.1 Raw materials

Raw material inventories were at a dangerously low level while the Werner team was in Indonesia. The last shipment of cotton, under the PL480 program, was late in arriving forcing some mills to curtail production. All of the spinning mills were concerned about the dock strike in the U.S. and expressed fear that they could operate under their present production program no more than two to two and a half months without receiving new supplies of cotton.

A three month inventory of raw cotton is expected according to information received from the mills; the Central Bureau of Statistics, and Handley Importers. This amount of cotton is not sufficient when we realise

the long delivery time required. A four to five month inventory of raw cotton would reduce the possibility of curtailing production because of strikes or other causes. The majority of the spinning mills do not have warehouse space to inventory up to five months of raw cotton. It is recommended that the Indonesian Government assist the spinner by providing warehouse space for inventory of one to two months of raw cotton. This would be used in emergency situations.

3.8.3.2 Supplies

The inventory of supplies and repair parts is inadequate. This is obvious when one observes the number of machines not operating because of lack of repair parts. The main reasons are:

1. Some machinery manufacturers are no longer in business, therefore, alternative sources for supplies have to be located.
2. Some countries that supplied machines to Indonesia will not furnish supply parts due to political difficulties between the countries. Alternative sources must be

found through a country that is friendly to both Governments. By placing the order with the friendly country, they in turn place the order to the country of machine origin. Then the supplies are shipped in reverse order resulting in a long lead time.

3. The machine country of origin is located such a long distance from Indonesia long lead times are required.
4. Custom difficulties when an order is not properly filled. Some plants complained that vital supply parts were at the docks and customs would not release them because of error in paper work and/or improper shipments.
5. Mill management not placing orders on time. This is created through either not having a maximum, minimum reorder control procedure, lack of interest or lack of capital.

It is recommended that steps be taken by the Indonesian Government to start standardizing equipment. By doing this central supply houses could be set up in Indonesia relieving the mill from carrying excessive

inventory, reducing lead time, and pressure could be brought to bear upon the manufacturer for faster delivery and price concessions.

3.8.3.3 In-Process

The in-process inventory of stock was at a minimum in all plants observed. In this area management should be complimented.

3.8.3.4 Finished Goods

The amount of finished goods inventory was extremely low. The spinning mills are running yarn counts that they can move to the weavers and knitters immediately. They do not produce yarn against future orders. By changing these yarn counts they are not able to keep a good machinery balance increasing the fixed overhead cost per pound of yarn produced.

The weaving, dyeing and finishing sections are operating essentially as the spinners. They curtail production when the slack season occurs and they have a very small inventory of fabric. If they had the working capital available, they would be able to

stabilize production, building inventory during the slack season; selling same. When the busy season occurs this would reduce some of the imports that are now entering the country. This is covered in detail in the marketing section.

APPENDIX B

Program of technical visits, excluding U.N.D.P., U.N.I.D.O. and Director General Department of Industry in Djakarta.

Team	U.N.I.D.O. Expert	Indonesian Counterpart
A	Mr. Robert T. Fields	Mr. Santosa
B	Mr. Zonnie A. Pendarvis	Mr. Trimuljono
C	Mr. Charles K. Willner	Mr. Rozy Asnani

These visits were conducted from July 19th through August 23, 1971.

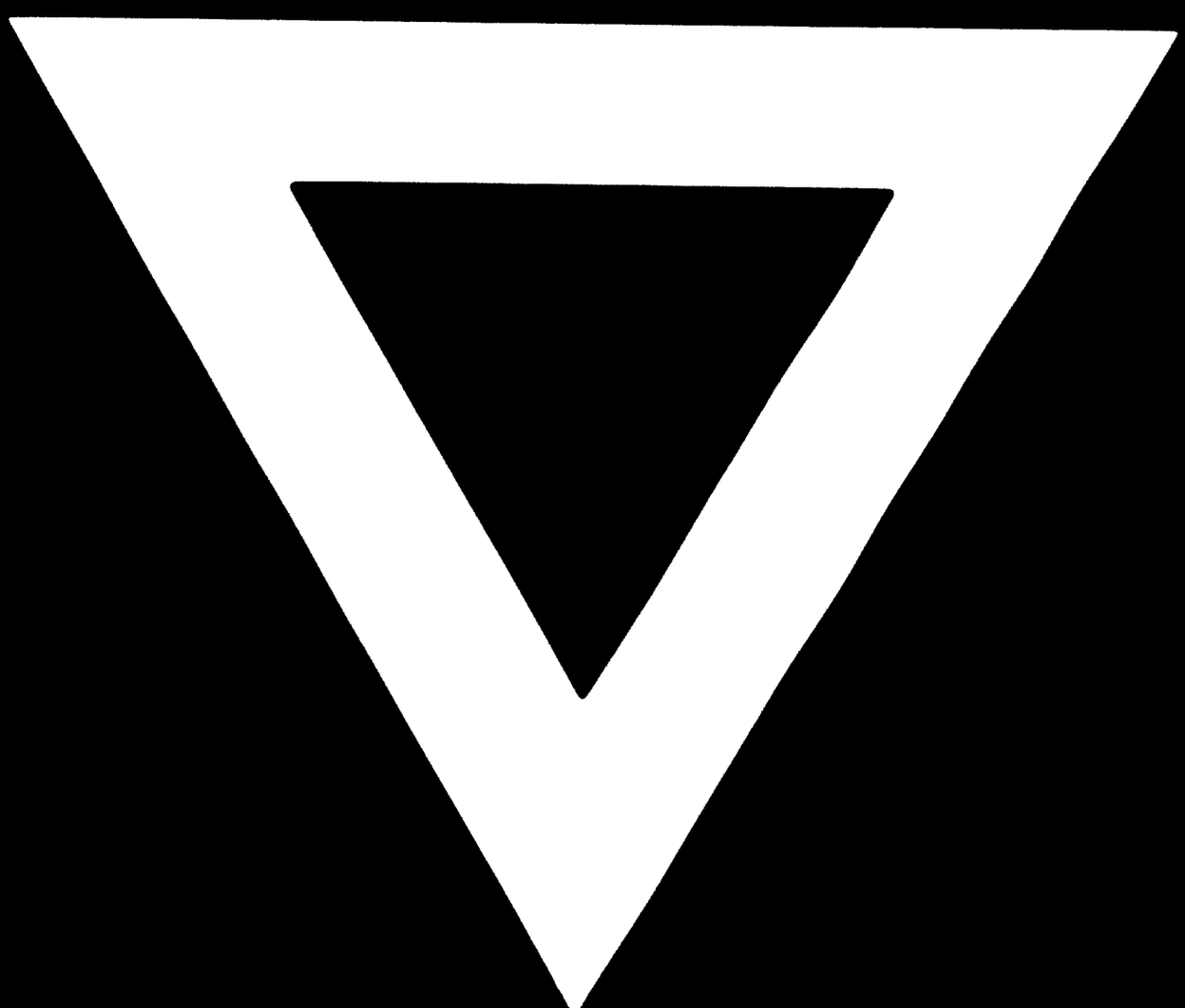
Team	Plant Visited
A	Pinza Dijap
A	Daya Mulia
C	N.V. Siliwangi Knitting Factory
C	P.T. The New Asia Industries Co. Ltd.
C	Mulia Knitting Factory
CB	Gloria Knitting Factory
AB	P.N. Sandang
AB	Patel Bekasi
C	Shang Knitting
C	P.T. Pabrik Radjut Persodjo
C	P.T. Pabrik Kaos Aseli
ABC	Inspector of Industry for West Java
BC	T. Jipadung Spinning Mill
A	BTN Mill

Team	Plant Visited
AB	Wisma Usaha
A	Famatex
A	Naintex
B	Bandjaran Spinning Mill
B	Tarumatex Mill
C	P.T. R.G.M.
C	Bandung Indah
C	Edy Sudarso - Sin London
A	Induk Madjalaya
A	P.T. Lotjeng
B	Tjandi Djaya Madjalaga
B	Tjimanggis Mill
B	Lugal Djaya Mill
B	P.T. Bandung
C	Saluyu
C	Peradjutan C.V. Langsung
C	ITT Bandung
AB	ITT Bandung
AB	Tjimalaka Mill
AB	Garout Sarong Mill
AB	Tjilatjap Spinning Mill
C	Inspector of Industry from Central Java
C	Slamet Widodo

Team	Plant Visited
C	Pusat Koperasi Angkatan Darat
AB	Texin Mill
C	N.V. Tongam Knitting Factory
C	N.V. Pantjatunggal Knitting Mill
C	Tong Am Knitting Factory
AB	Inspector of Industry for Central Java
B	Djantra
B	Indotex
B	Damaitex
A	Sandratex
A	Asaco Mill
A	Semarang Textile Mill
C	P.T. Colombo
AB	Sukuntex Kudus
AB	Dayamanunggal Printing Mill
C	Inspector of Industry for East Java
AB	Setjang Spinning Mill
AB	GKBI
B	Batari
B	PP Sangidu
B	Karis Plant I
B	Karis Plant II
A	Batik Institute
A	Wondatex

Team	Plant Visited
A	Hand loom Industry Wonosari
AB	Infitex
AB	Batik Printing Plant
C	P.T. Radjut Djatim Baru
C	P.T. Pabrik Kaos
AB	Inspector of Industry for East Java
AB	Kamadjaja Mill
B	Kantjil Mas Bangil
AB	Imbritex
AB	Kasri Mill
C	N.V. Java Knitting Factory Ltd.
C	N.V. Matraco Knitting
B	Kasa Husada
B	Grati Spinning Mill
A	Ratatex
A	PT Kesono
AB	Inspector of Industry Bali
AB	Balitex
AB	Tohpati Spinning Mill
AB	Hand Loom Industry of Bali
B	Director of Industry North Sumatra
B	Sima Concern PT
B	Pasar

Team	Plant Visited
B	N.V. H & J My E. Simanjuntan
B	T.D. Pardede Text. Ltd. Plant I
B	T.D. Pardede Text. Ltd. Plant II



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