FEASIBILITY STUDY ON THE RENOVATION OF CIPADUNG/BANJARAN MILLS, P.T. INDUSTRI SANDANG I IN THE REPUBLIC OF INDONESIA (SUMMARY)

DECEMBER, 1991

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the Feasibility Study for Renovation of Cipadung and Banjaran Mills, P.T. Industri Sandang I and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to the Republic of Indonesia a study team headed by Mr. Masayoshi Wada, Manager, Toyobo Engineering Co., Ltd. from February 1991 to March 1991.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

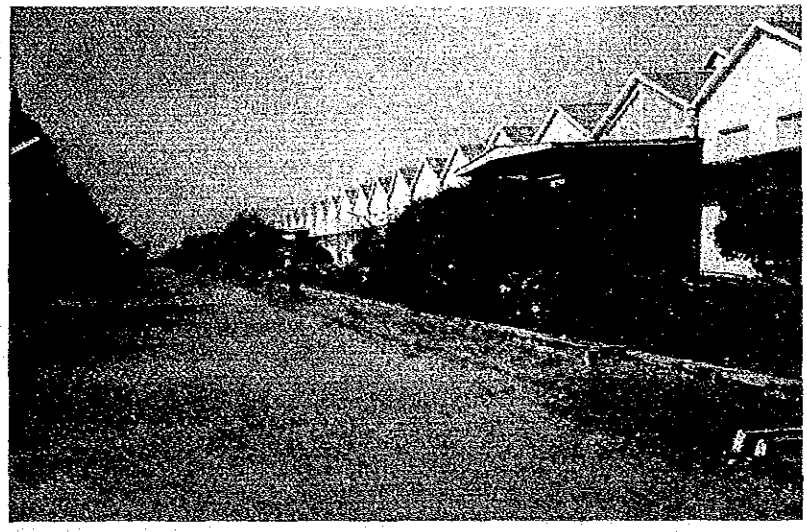
I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relationship between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

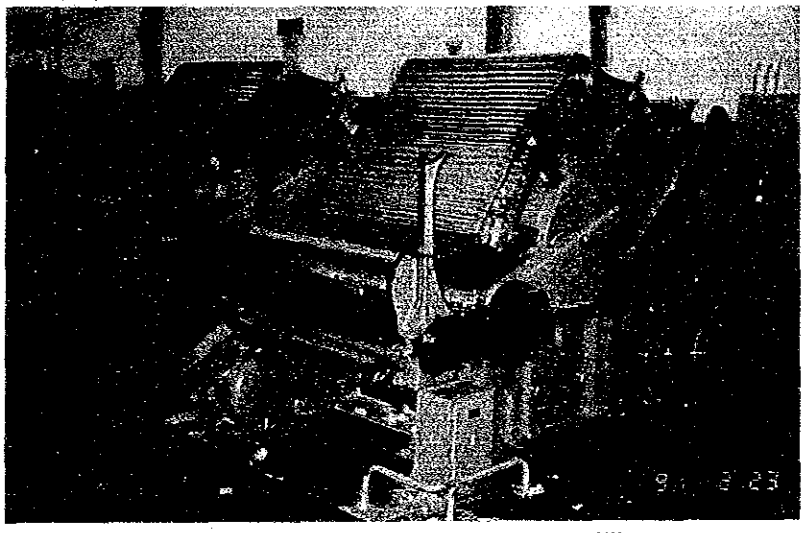
December, 1991

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency



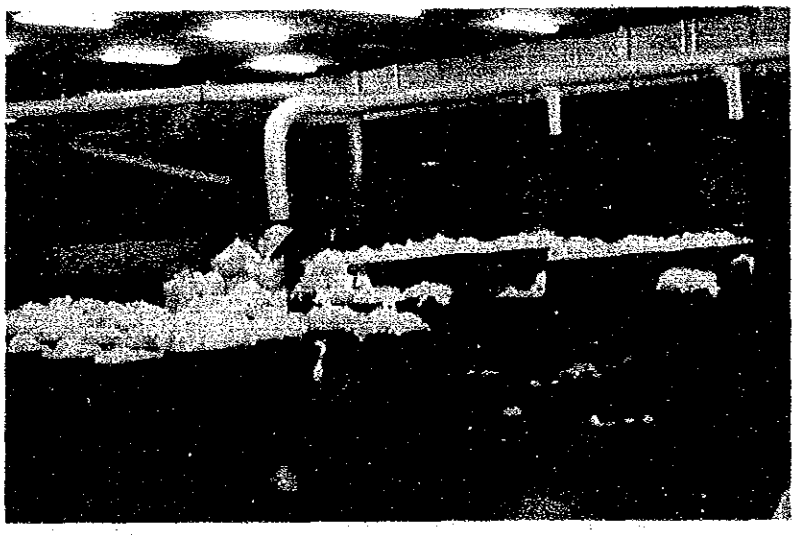
1. Exterior View of Banjaran Mill



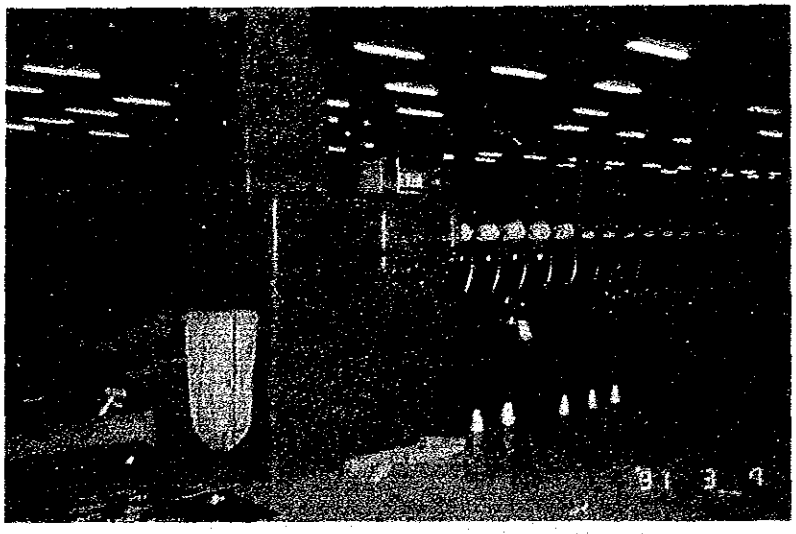
2. Carding Machines of Banjaran Mill

3. Winding Room of Banjaran Mill

4. Front of Cipadung Mill



5. Blow Room Process of Cipadung Mill



6. Autowinder of Cipadung Mill

SUMMARY OF REHABILITATION PLAN

(Outline of Rehabilitation Plan)

	Banjaran I		Banjaran II		Cipadung Mill	
	Present	Post rehabilitation	Present	Post rehabilitation	Present	Post rehabilitation
Production Equipment	China-made machines of 1964 and 1965 74 Ring frames(416 spindles) 30,784 spindles 9,000 rpm	Introduction of new machines and modification of existing carding machines 35 Ring frames(960 spindles) 33,600 spindles 14,000～16,000 rpm Establishment of combing system	Japan-made machines of 1974 78 Ring frames(432 spindles) 33,696 spindles 11,800 rpm	Rehabilitaion of existing machines 78 Ring frames(432 spindles) 33,696 spindles 15,000 rpm Production specialized in P/C Ne 45	UK-made machines of 1962 79 Ring frames(372 spindles) 29,388 spindles 9,300 rpm	Introduction of new machines and modification of card 50 Ring frames(720 spindles) 36,000 spindles 13,500～14,000 rpm Production specialized in synthetic fibre by 2 inch spinning
Production Quantity	12,200 bales (1989)	23,016 bales	13,881 bales	18,824 bales	14,738 bales	35,673 bales
Product Mix	CE Ne 40 55.8% CE Ne 40 22.5% C/P Ne 20 6.1% P/C Ne 40/2 4.8% P/C Ne 20 0.9% Average Ne 30.3	CM Ne 32 28.4% CM Ne 40 23.7% CM Ne 50 15.6% P/C Ne 20 6.7% P/C Ne 40 4.7% P/C Ne 40/2 4.4% C/P Ne 20 7.0% C/P Ne 40 4.9% C/P Ne 40/2 4.6% Average Ne 34.7	P/C Ne 45 64.2% P/C Ne 40 6.5% C/P Ne 40 11.2% CM Ne 40 16.6% Average Ne 40.5	P/C Ne 45 100%	P/R Ne 45 26.5% P/R Ne 30 8.3% R Ne 30 28.1% OE Ne 20 15.0% Average Ne 40.5	P/R Ne 20 43.9% P/R Ne 30 27.5% P/R Ne 40 13.5% P/R Ne 45 10.0% P/R Ne 40/2 5.0% Average Ne 28.0
Contract power supply	4,000 KVA	6,600 KVA	Included in the supply to Banjaran I		2,770 KVA	3,500 KVA
Required water volume	500 m³/day	1,700 m³/day			400 m³/day	900 m³/day

Note : CE : Cotton carded yarn, CM : Cotton combed yarn, P/C : Polyester/Cotton 65/35 blended yarn, C/P : Polyester/Cotton 35/65 blended yarn, R : Rayon, OE : Open end spun yarn

(Financial & Economic Evaluation)

Case 1 ··Rehabilitation in Banjaran Mill only, Case 2··Rehabilitation in Cipadung Mill only, Case 3··Rehabilitation in both Mills, Case A··100%loan, Case B··70 % loan 30% equity

	Case 1-A	Case 1-B	Case 2-A	Case 2-B	Case 3-A	Case 3-B
INVESTMENT (MILLION RP)	92,152	90,323	67,981	66,914	160,133	157,237
〃 (HUNDRED MILLION YEN)	65	64	48	47	113	111
ROI BEFORE TAX (%)	31.73	32.52	27.48	25.31	28.81	29.48
ROI AFTER TAX (%)	28.69	28.18	22.53	21.86	26.11	25.53
ROE BEFORE TAX (%)	—	34.38	—	25.98	—	30.83
NPV AFTER TAX (10%)	80,637	77,435	38,417	36,006	119,054	113,442

	Case 1	Case 2	Case 3
ACCUMULATED COVER RATIO (YEAR)	1.92	1.58	1.77
PAYBACK PERIOD (YEAR)	3.1	3.8	3.6
SALES REVENUE (M.Rp)	67,101	45,010	112,111
PROFIT AFTER TAX (%)	10.67	8.89	9.95
BREAKEVEN SALES AT 5TH YEAR (M.Rp)	51,922	38,032	89,870
BREAKEVEN OPERATION RATIO AT 5TH YEAR(%)	77	84	80
ERR (%)	38.52	30.79	35.24

Constant price in 1991

CONTENTS

Tables and Figures

Abbreviation

Unit

D	Denier
Ne	English Yarn Count.
Bale	400 pounds
V	Volt
KV	Kilovolt
A	Ampere
VA	Volt-ampere
KVA	Kilovolt-ampere
MVA	Megavolt-ampere
W	Watt
KW	Kilowatt
KWH	Kilowatt-hour
HZ	Hertz
rpm	Revolution per Minute
ϕ	Diameter
mmH	Height
mmW	Width
mmL	Length
mm	Millimeter
cm	Centimeter
m	Meter
km	Kilometer
in	Inch
mm^2	Square Millimeter
cm^2	Square Centimeter
m^2	Square Meter
km^2	Square Kilometer
m^3	Cubic Metre
ℓ	Litre
g	Gram
gf	Gram Force

Kgf	Kilogram Force
Kg	Kilogramme
ton	Ton
lb	Pound
cal	Calorie
Kcal	Kilocalorie
USRT	US Refrigerating Ton
mmAq	Millimeter Aqua (H_2O)
hr	Hour
min	Minute
sec	Second
Y	Year
M	Month

Technical Terms

HT	High Tension
LT	Low Tension
DB	Dry Bulb (Temperature)
WB	Wet Bulb (Temperature)
RH	Relative Humidity
OA	Outer Air
DA	Dry Air
CV%	Coefficient of Variation
U%	Uster%
IPI	Imperfection Indiator
BL	Blowing
CE	Carding
Pr-CM	Pre Combing
CM	Combing
Pr-DF	Pre Drawing
DF	Drawing
FF	Roving
RF	Ring Spinning

AW	Auto Winder
DW	Double Winder
RTW	RT Winder
DTW	Double Twister
RT	Ring Twister
BC	Blow Cleaner
SS	Steam Setter
DC	Dust Collector
AJL	Air Jet Loom

Textile Terms

P	Polyester
C	Cotton
P/C	Polyester/Cotton
P/R	Polyester/Rayon
CB	Cotton Combed Yarn
CD	Cotton Carded Yarn

Financial & Economic Terms

FOB	Free on board
¥	Japanese Yen
Rp	Rupiah
Th. Rp	Thousand Rupiah
M. Rp	Million Rupiah
BEP	Breakeven Point
DBEP	Discounted Breakeven Point
EMIP	Equivalent Maximum Investment Period
DCF	Discounted Cash Flow
NPV	Net Present Value
FRR	Financial Rate of Return
DRR	Economic Rate of Return
ROI	Return on Investment
ROE	Return on Equity

CRR	Capital Rate of Return Ratio
SCF	Standard Conversion Factor
SWR	Shadow Wage Rate
CIF	Cost, Insurance & Freight
GDP	Gross Domestic Product

INTRODUCTION

This is a summary of the report of the feasibility study on the renovation of Cipadung and Banjaran Mills in P.T. Industri Sandang I in the Republic of Indonesia (Thereafter referred to as the "Study").

The objective of the Study was to diagnose the present conditions of the Banjaran and Cipadung Mills of P.T. Industri Sandang I and to prepare renovation plans with emphasis on upgrading of product quality, stabilization of production and rationalization of production process, thereby strengthening its market competitiveness, and contributing to its sound development.

The Study was also aimed at providing technical guidance in terms of production control and maintenance in the course of the field study.

The study consisted of a field study conducted in Indonesia and analytical work performed in Japan. During the field study, the facilities and equipment of both mills were examined in detail and various information collected. On-site technical guidance was also conducted by the members of the study team. The renovation plans were formulated through analyses of the data and information collected in the field study.

The field study lasted from February 4, 1991 to March 5, 1991. The members of the study team were as follows :

Name	In charge of	Belongs to
1. Masayoshi WADA	Team leader, Market survey	Toyobo Engineering Co,.Ltd
2. Kengo TSUMORI	Financial/economic analysis, Cost calculation	ditto
3. Hiroo MATSUBARA	Analysis of raw material, Production control	ditto
4. Teruo KINOSHITA	Product analysis, Design of equipment	ditto
5. Toshihiko YAMAMORI	Utility and Electricity	ditto
6. Yasuyuki MUKUNOKI	Economy and industrial survey, Architecture	ditto

In the course of the field study, the team visited and met various authorities/companies and its personnel concerned in Indonesia in order to obtain data and information necessary for the study.

CONCLUSION

The results of financial analysis are as follows.

1) Financial and economic feasibility;

   It is concluded that all these cases are financially feasible.

   Case 1 FRR (ROI) after tax : 28.69%

   Case 2 FRR (ROI) after tax : 22.53%

   Case 3 FRR (ROI) after tax : 26.11%

2) The results of economic analysis are as follows:

   Case 1 ERR : 38.52%

   Case 2 ERR : 30.79%

   Case 3 ERR : 35.24%

3) Moreover, rehabilitation/renovation plans of Banjaran and Cipadung Mills will contribute to stable employment and stimulation of economy in the region.

Therefore, it is recommended that this plan should be implemented.

ADVICE

It is necessary to carry out a renovation plan to modernize spinning mills, to produce yarns of high quality with high productivity and to gain high profits.

Special attention is required to the following points. As for these points, large investment is not required.

1) Materials, cotton in particular, should be purchased as efficiently and energetically as private companies, by taking quality and productivity into consideration for the purpose of cost reduction and quality upgrading.

2) In Japan, "5-S" principles are put forward to manage mill, that is "Seiri" (Arrangement), "Seiton" (tidiness), "Seiso" (Cleanliness) and "Shitsuke" (Discipline). Also in Indonesia, the management must provide comfortable working environment and let employees clean their workplace every day. Then, they will increasingly love their mill and jobs.

3) It is proposed to make an effort to simplify the organization of the mill and to reduce the labor cost by reducing the number of workers. At the same time, the bounds of responsibility and authority should be clarified. Since the management section, in particular is overstaffed, it needs to be improved.

4) It should be clarified that the mill is responsible for quality control and take measures according to measurement data.

5) The most important factor is "man" among "4Ms" (i.e. man, material, method and machine) in a manufacturing plant. Since the basic organization and systems for education and training have been already established, it is suggested to improve the current methods as pointed in this report. Giving incentive, for example, may be effective to enhance employees' will to work and prevent them from changing their employment.

6) Plenty of electric power is necessary to carry out the renovation plan.

1 TEXTILE INDUSTRY IN INDONESIA

1-1 National Development Plans and the Textile Industry

Indonesia is now in its third year of the Fifth 5-Year Plan (from April 1989 to March 1994). The First 5-Year Plan was started in 1969 and during 20 years covering the period from the First to the Fourth 5-Year Plan, the overall economy of Indonesia has achieved a substantial growth rate as shown in the table below.

Table 1-1 Annual Average GDP Growth Rate

(Unit:%)

Period	Total GDP	GDP per capita	Agriculture	Manufacturing	Others
1969-1973	8.4	7.8	4.1	13.3	11.9
1973-1981	7.9	4.3	4.2	14.4	9.0
1982-1985	4.0	3.4	3.8	9.2	3.0
1986-1989	6.0	3.8	3.4	10.2	5.7

(Source) Biro Pusat Statistik (BPS)

The growth in the industrial sector of Indonesia during the previous Fourth 5-Year Plan has been at a high rate of approximately two times the average GDP growth rate. For the Fifth 5-Year Plan, the target for the growth rate of the industrial sector has been set to the highest level of 8.5% in comparison to the annual average growth rate of 5%. During the initial stage, the policy of shifting from imports substitution to export orientation has been steadily implemented from the latter half of 1980.

Since 1983 industrial policies have focused on getting rid of dependence on petroleum and direct and indirect promotion of exports have been successively implemented. Indonesia is striving to strengthen export competitiveness of its non-petroleum industries, particularly, the textile industry which has been developing at a rapid rate and contributing to increased export and the creation of work opportunities.

The development and prospect of the textile industry in terms of production equipment and volume is shown in Table 1-2 and 1-3.

Table 1-2 Development of Textile Industry

(Number of Equipment)

Industry	Unit	Pre PELITA	End of PELITA I (73/74)	End of PELITA II (78/79)	End of PELITA III (83/84)	End of PELITA IV (88/89)	Estimate PELITA V (93/94)
Fiber making	Unit		3	5	11	13	18
Spinning	Spindle	481,780	729,620	1,741,110	2,464,000	3,480,000	5,800,000
Weaving	Loom	35,335	53,691	68,272	96,350	116,499	180,000
Knitting	Machine	5,853	6,720	8,400	10,788	18,917	20,000
Garment	Machine	3,527	6,250	12,800	44,566	93,051	128,000

Source: Asosiasi Pertekstilan Indonesia (API)

Table 1-3 Development of Textile Industry

Unit: Ton

Type of products	1965	1970	1975	1980	1985	1989	End PELITA V
Fiber							
Viscose Rayon					34,200	66,055	73,700
Polyester			3,846	53,790	74,950	104,638	203,500
Yarn (total)	14,058	33,032	80,795	214,777	340,540	617,868	750,900
Weaving Yarn	14,058	33,032	75,852	179,500	265,660	481,960	535,100
Polyester Fil.				25,159	63,200	123,195	183,800
Nylon Filament			4,943	10,118	11,680	12,713	32,000
Fabric (total)	61,290	60,349	136,706	281,451	335,845	603,926	727,100
Woven					285,470	513,392	618,400
Knitted					50,375	90,534	108,700
Garment				61,600	94,680	139,800	485,900
Dyestuff					630	3,982	7,000

Source : API

1-2 Current Situation of the Textile Industry

1-2-1 Overview

Although the Indonesian economy suffered from falling of oil prices in the mid-1980' s, the economy showed a recovery since 1987 with the growth rate of 3.6% for that year, 5.7% for 1988 and 7.4% for 1989.

Amid rapid growth of Indonesian economy, export growth of textile industry is

significant.

With the reevaluation of the currencies in South Korea and Taiwan, both of which are textile exporting countries, and the subsequent rise of labor cost in these countries, there have been an increasing number of trade inquiries for textile goods to be exported from Indonesia.

With the growing investment in the textile industry from foreign countries including South Korea and Taiwan, the production capacity of this industry has been expanded. Although the export of textile goods was as small as $144 million in 1980, it had increased to US$1,025 million by 1987 and to US$1,426 million in 1988, and it reached to US$2,032 million in 1989. The textile export recorded US$2,917 million in 1990.

The production volume shows continued yearly increase as seen in Table 1-4. The domestic production of raw material in 1989 recorded a total of 325,000 tons; 100,000 tons for polyester fiber, 120,000 tons for polyester filament, 14,000 tons for nylon filament, 58,000 tons for rayon fiber, and 33,000 tons for cotton.

Imported raw material amounted to 352,000 tons of which cotton was the main import totaling 266,000 tons. Also yarn and fabric imports reached 141,000 tons. With respect to trade balance in 1989, imports consisting primarily of raw material added up to 496,000 tons or US$1 billion (average US$2 per kg) while the export was 249,000 tons or US$2 billion (average US$ 8 per kg).

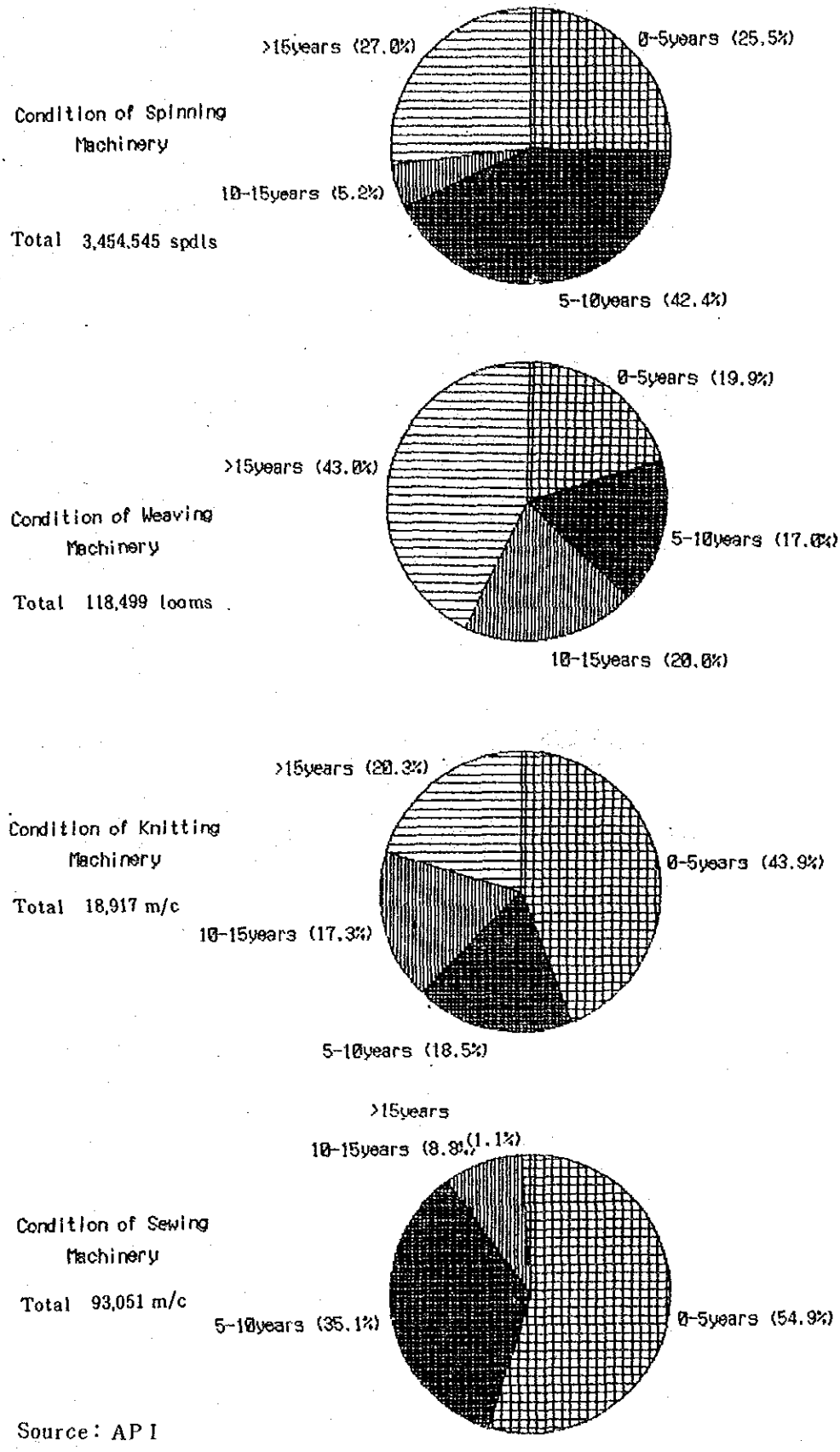
The figures clearly indicate that the textile industry has been contributing to the earnings of foreign currencies with the balance of textile trade of more than one billion dollars.

The export of non-petroleum and non-gas products that Indonesia is seeking to expand accounted for more than 50% of the export amount in 1987 and, more than 60%, in 1988. Among the non-petroleum and non-gas products, textile products took the second place in terms of export value replacing natural rubber, and in 1989 the amount of export of natural rubber had decreased while garments export showed a significant increase. The export market expanded to U.S.A., Europe, Middle East and Japan.

1-2-2 Production Capacity

As shown in Table 1-3 there is growing investment in production equipment, reflecting the favorable conditions in the export market, and it is expected that the spinning industry in Indonesia will become the scale of 4 million spindles before long.

The recent boom in the garment industry has been prompted by the entry of the enterprises from South Korea, Taiwan, and Hong Kong, seeking for cheap labor in Indonesia. The existence of obsolete production equipment that have been in service for more than 15 years is and will be a bottleneck for value adding and quality upgrading of Indonesian textile products. (See Figure 1-1)



Source: API

Figure. 1-1 Condition of Textile Produtrion Equipment (19889/1989)

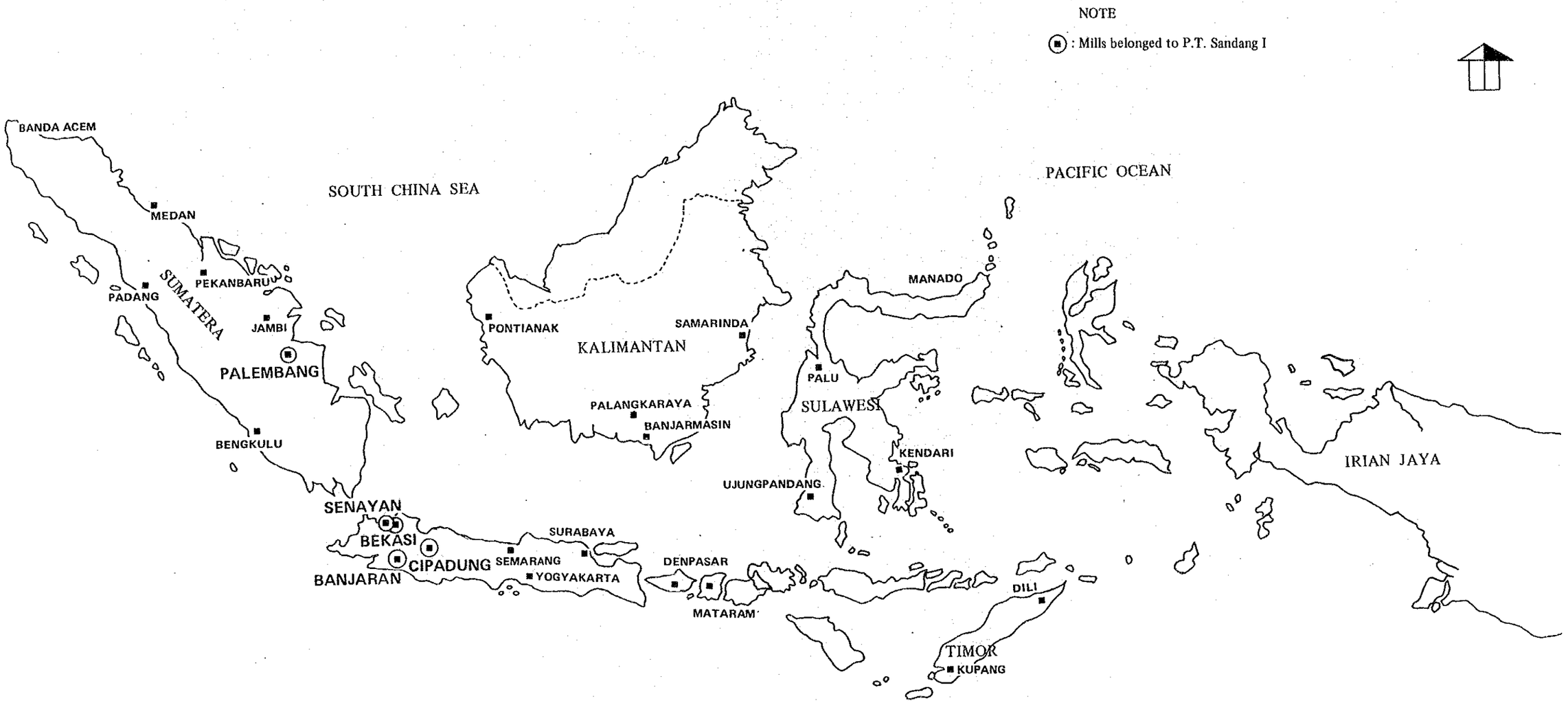


Figure 2-1 Mill Locations of Sandang I

2 MILL HISTORY AND LOCATION

2-1 P.T. Industri Sandang I

P.T. Industri Sandang I (herein after referred to as "Sandang I"), which is one of the two state-owned textile companies under the jurisdiction of the Ministry of Industry, owns five mills; four mills in the western part of the Province of Java and one mill in the island of Sumatera. (See in Figure 2-1.)

Succeeding to PNPR Leppin Karya Yasa established in 1961, PN Industri Sandang was founded in 1967 as the only state-operated spinning enterprise. In 1977 PN Industri Sandang was divided into two companies: P.T. Industri Sandang I covering west of Western Java and P.T. Industri Sandang II covering the east of Central Java. Cooperate profile of Sandang I as of 1990 is shown below.

Established	:	1977
Location of Head Office	:	JL Patal Senayan I No. 5 Jakarta
Capital	:	US $ 45 million
Number of spindles	:	222, 998 spindles/1,200 rotors
Number of employees	:	Approximately 7,000

2-1-1 Scale of Equipment and Production Volume

Sandang I has 9 units in 5 mills. The number of equipment and production volume in 1990 are listed in Table 2-1.

Table 2-1 Number of Equipment and Production Volume

		No. of Facilities		Production Volume		No.of Unit
		No. of Spindles	No. of Looms	Yarn(bales /Month)	Cloth(1000m /year)	
1	Pabriteks Senayan	60,240	508	28,904	14,200	4
2	Patal Banjaran	64,570	-	24,025	-	2
3	Patal Cipadung	29,388 (+1,200rotors)	-	12,752	-	1
4	Patal Bekasi	39,600	-	8,911	-	1
5	Patal Palembang	29,200	-	111,552	-	1
Total		222,998 (+1,200rotors)	508 (All Shuttle)	86,144	14,200	9

Source: P.T. Industri Sandang I, 1990

Of the five mills owned by Sandang I, only Pabriteks Senayan possesses a fully-integrated process plant with spinning, weaving, and finishing equipment.

The scale of the spinning equipment of Sandang I which holds approximately 230,000 spindles is nearly equal to that of Sandang II, and accounts for almost six per cent of the total spinning equipment of Indonesia which is approximately 3,800,000 spindles as of 1990.

The products are mainly cotton yarn and polyester/cotton blended yarn of Ne. 20 to Ne. 40, all of which are directed mostly to the domestic market. The spinning equipment in Indonesia has been increasing mainly in the private sector for the past several years reflecting a favorable market situations of yarns.

The state-operated spinning enterprises, i.e. Industri Sandang I and P.T. Industri Sandang II, which accounted for more than 20% of the total spinning equipment in 1984, now occupy a little more than 10%.

With the rapid expansion in the private textile industries, the competition in the textile market has become keen.

In a struggle for survival textile companies are concentrating efforts on improving the efficiency of their organizations as well as modernizing their facilities and equipment in order to upgrade the quality of their products.

Under these circumstances, Sandang I is forced to review its business, to devise a means to restructure its organization, and to modernize its facilities and equipment. In January, 1990, a new business plan consisting of the following major points was announced as the "Corporate Plan" in compliance with the above necessities.

1) To transfer Senayan 2nd Spinning Mill to Bekasi.

2) To move remaining equipment of Senayan to Karawan.

3) To rehabilitate Patal Banjaran, Patal Cipadung,Patal Bekasi and Patal Palembang.

This Study is concerned with the rehabilitation of Patal Banjaran and Patal Cipadung.

2-1-2 Earning Capability

The production quantity, sales amount, and gross profit on sales during the past three years (from 1988 to 1990) of Sandang I are shown in Figure 2-2.

The textile industry from 1987 to 1989 was active, and each mill of Sandang I was able to make considerable profits during this period. But in 1990 adverse conditions for industries such as higher raw material cost and lower product prices caused some textile

companies to fall into deficient operation. Despite these adversities, Sandang I was somehow able to show a profit as the entire group.

As far as Patriteks Senayan, Patal Cipadung, and Patal Palembang are concerned they were forced to operate at deficits due to declining efficiency caused by deterioration of production equipment. In contrast, Patal Banjaran was able to earn a profit of more than 3,000 million rupiah during this period which was realized mainly by the production of polyester/cotton blended yarn at its relatively new Second Mill.

The sewing thread produced at Patal Bekasi also enjoyed steady sales and recorded a profit of 1,100 million rupiah. As stated in the Cooperate Plan, dismantling and transferring of Pabriteks Senayan and the renovation of Banjaran I, Patal Cipadung and Patal Palembang will be considered indispensable in order to reorganize the structure of Sandang I into such a strong and competitive enterprise that can survive business recession.

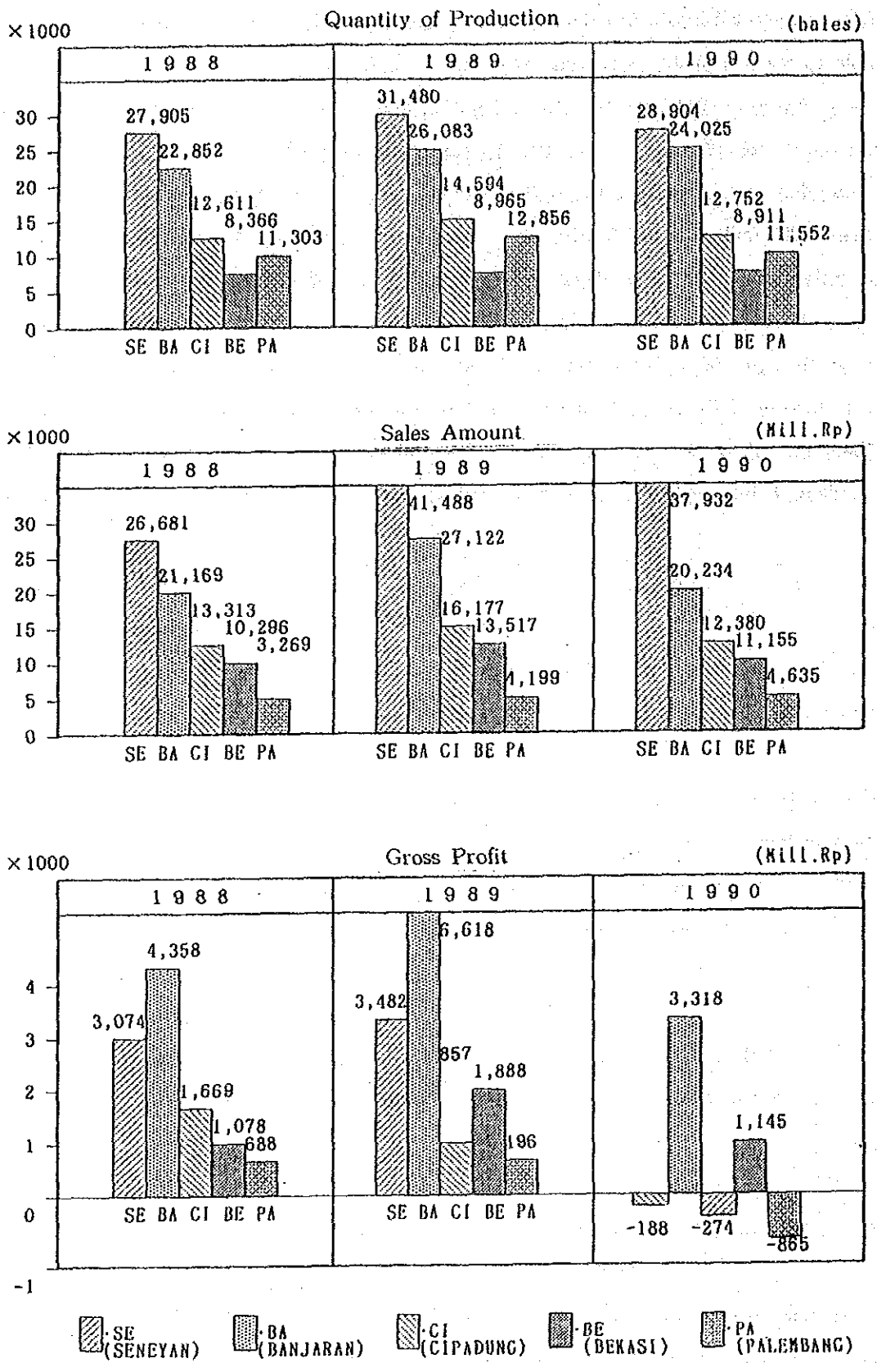


Figure. 2-2 Quantity of Production, Sales Amount and Gross Profit: Sandang I

2-2 History of Patal Banjaran and Patal Cipadung

2-2-1 Patal Banjaran

Patal Banjaran, a spinning mill located 20 ㎞ south of Bandung, consists of the First Mill (30,874 spindles) and the Second Mill (33,696 spindles).

The construction of the First Mill started in 1965 with the funds from China and Japan. Operation of this plant commenced with the scale of 30,000 spindles in 1967 and full scale operation began in 1968. 12,199 bales/year and 10,931 bales/year of cotton carded yarn and polyester/cotton blended yarn were spun respectively in 1989 and 1990 mainly using equipment made in China.

The construction of the Second Mill began in 1971 with financial assistance from the Japanese government, and production started in 1973. In 1979, the number of spindles increased to 3,000 and reached the current production scale. The production equipment is entirely made in Japan, and production of cotton combed yarn and polyester/cotton blended yarn reached 13,880 bales in 1989 and 13,093 bales in 1990, respectively.

2-2-2 Patal Cipadung

Patal Cipadung, located 13 ㎞ east of Bandung, is a spinning mill that was constructed in 1961 with the technical and financial assistance from England. The facility is equipped with 29,388 spindles and 1,200 rotors of open end spinning machines. In 1969 some machinery was imported from Japan for polyester/rayon blended yarn, and currently polyester/rayon blended yarn, rayon yarn, cotton open end yarn are produced.
Production reached 14,594 bales in 1989 and 12,730 bales in 1990.

2-3 Mill Location

Bandung is the provincial capital of the West Java and located at 6° 55' south latitude and 107° 35' east longitude.
The city is located at 750 meters above sea level and 120 ㎞ southeast of Jakarta. With the construction of the railway connecting Bandung to Jakarta in 1909, the city rapidly developed as a sightseeing spot and a summer resort. With the First Asian African Conference held in Bandung in May, 1954, the city immediately gained international fame. In recent years, various research institutions such as the Bandung Institute of Technology have been established, and Bandung now became a city of science and education.
Many factories of various sizes are constructed in the peripheral areas, taking advantage

of the location such as abundant water resources and pleasant climate.

The development of textile industry in particular has been prominent, and Bandung district has become an outstanding production area for textile products together with Tangeran in the suburb of Jakarta.

3 MILL DIAGNOSIS

3-1 Buildings and Compounds

The Banjaran Mills occupy a total area of 25 hectares. The First mill spans 170 meters from north to south and 87 meters from east to west. The Second mill, spanning 190 meters from north to south and 70 meters from east to west, is located to the south of the First mill behind a warehouse. The mills are equipped with 64,480 spindles for staple fiber spinning.

Cipadung Mill, a staple fiber spinning mill, occupies a total area of 26 hectares with production factory spanning 213 meters from north to south and 70 meters from east to west.

Table.1 Outline of Banjaran and Cipadung Mills

	Banjaran Mill	Cipadung Mill
-Production Mill		
First Mill	14,782m² (32%)	
Second Mill	13,630m² (30%)	12,000m² (47%)
-Warehouse	5,178m² (11%)	4,600m² (18%)
-Office • Company House	4,339m² (9%)	5,080m² (20%)
-Utilities, Electricity	8,143m² (18%)	3,675m² (15%)
Total	46,072m² (100%)	25,355m² (100%)

Source: Sandang I

3-2 Production

The mill is operated by four groups working 24 hours per day under three shifts. The actual working time for each shift is 7 hours 30 minutes.

(1) The current production of each mill is shown below.

	Prodiuct mix			Production quantity	Number of spindle
Banjaran First Mill	Cotton	Ne 40	55.8%	bale	30,784
		Ne 30	22.5%	12,200(1989)	
	C/P	Ne 20	6.1%	10,932(1990)	
	P/C	Ne 40/2	4.8%		
	P/C	Ne 20	0.9%		
	Avarage Ne 30.3				
Banjaran Second Mill	P/C	Ne 45	64.2%	bale	33,696 (432 x 78)
	P/C	Ne 40	6.5%	13,881(1989)	
	C/P	Ne 40	11.2%	13,093(1990)	
	CM	Ne 40	16.6%		
	Average Ne 40.5				
Cipadung Mill	P/R	Ne 45	26.5%	bale	29,388 (372 x 79)
	P/R	Ne 30	8.3%	14,738(1989)	
	R	Ne 30	28.1%	12,875(1990)	
	Cotton OE	Ne 20	15.0%		
	Average Ne 31.3				

(2) Problems of production

(a) Banjaran I

About five percent of the cotton fibre that is to be returned to the blowroom as waste is used to make Ne 20.

Such a production practice should not be done and it should be consumed by blending with raw cotton. Also it is recommend that returned cotton should be kept below five percent.

However, it should be noted that this method is not recommended if the cotton is not blended evenly, because this will weaken the strength of a single yarn and increase of flies at the roller part.

(b) Banjaran II

The actual quantity of spinning yarn produced from 1989 to 1990 was 100.6% of the planned quantity. It would not be so wise to produce carded yarn Ne 40, judging from the current production equipment.

Although this mill is specially designed for the production of polyester/cotton

(65/35), blended yarn, it tends to produce low count yarn. This tendency should be amended because spinning low count yarn with the equipment designed for high count yarn is not economically efficient and may cause the reputation of Sandang I to fall.

By changing product mix, it should start producing higher count yarn in order to gain a reputation in the market of yarn.

(c) Cipadung Mill

A problem was found in huge gap of between planned and actual in terms of yarn count and production volume, although predicting market requirements for polyester/rayon blended yarn may be difficult.

3-3 Quality

(1) The results of yarn test

(a) Banjaran I

Despite the high deviation of yarn count in the negative side of Ne 30 cotton yarn, the strength of a single yarn is low and the strength fluctuation ratio is also high. This is also revealed by the fact that the IPI value of thin place (2.8 times the Japanese average characteristic value) and those of thick place (1.7 times the Japanese average characteristic value) are inappropriate. This is also reflected in the fluctuation of the USTER chart and the periodical irregularity of the spectrogram. A front roller part of the first pass drawframe needs to be adjusted in order to redress the above number. as for Ne 20 U% and IPI numbers for thick place (2.1 times the Japanese average characteristic value) were inappropriate. This also affects its twist fluctuation.

In order to correct these figures, the settings of condition of the pre-spinning process have to be reconsidered to improve the parallelness of sliver.

Polyester/cotton (65/35) blended yarn Ne 45 shows a very high fluctuation in yarn count. It is necessary to stabilize the lap weight to reduce the fluctuation at longer intervals, and to decrease the periodic irregularity of the spectrogram by adjusting the irregular revolution of the front bottom roller of the drawing frame.

(b) Cipadung Mill

Deviation of yarn count of polyester/rayon Ne 30 is considerably high in the positive side, and the fluctuation of single yarn strength is also excessive.

Therefore, it is necessary to stabilize the lap weight and to adjust the front roller

part of drawframe.

Polyester/rayon Ne 45 also shows low single yarn strength due to high deviation of yarn count in the positive side. It is also necessary to stabilize lap weight and to adjust front roller part of drawframe.

It is also necessary to minimize rubbing at the fibre passage part after roving in order to reduce the nep of IPI value.

The common problem of yarn irregularity, which appears periodically, must be solved as soon as possible. Because the instrument measuring spectrogram is obsolete, evaluating the quality only by the value of U% is not trustful. It is necessary to evaluate using both the USTER chart and visual check by the yarn board.

(2) Methods of Quality Control

Standard control items and testing methods for all spinning mill at PT Sandang I are specified. It is not appropriate, however, items for which no measures can be taken even with bad testing results (i.e. U% of carding sliver) and those which will not be changed once being set (i.e. rotation of drawing and roving) are found among control items. Although there are control sheets for each and every item, it is difficult to read the control limits and target values at a single glance. A new "easy-to-see" control method should be enforced in order to understand long term change, transitions and trends.

Also, a system that will correspond to customers' needs for higher grade products should be established.

3-4 Production Equipment

(1) Condition of production equipment

(a) Banjaran I

Most of the machines were made in China in 1964 and 1965.

The machinery, including accessories, is in obsolete condition, and obtaining spare parts is nearly impossible. Further, it is of little benefit to repair or fix them, because all of the machines are of old models. In order to produce quality goods, all the machines must be replaced by new ones.

(b) Banjaran II

Most of the machines were manufactured in Japan in 1974, and have been used for 16 years. It is possible to improve the quality and quantity of products by the same machines if spare parts are replaced and repair is done.

However, the lap machines in the blowing process, CK-7 carding machines and lap formers are worn out, and their quality of products is sub-standard. There are some machines which need to be replaced because of the above reasons. The carding machines can be used for open end spinning.

(c) Cipadung Mill

Except for drawing frames and the open end spinning frames (BD-200), almost all of the machines were made by PLATT of England in 1962.

Since Cipadung Mill is in operation for 26 years, the machinery is now in obsolete condition. This ring frame has 50 ㎜ ring and 10 inch lifter, which are not suitable for staple fibre spinning. Moreover obtaining supplies of spare parts from PLATT is nearly impossible because PLATT no longer exists.

With such obsolete equipment remaining in operation, it is difficult to produce high quality products demanded by the users, even if the production machinery were to be modified and repaired. Therefore, it is necessary to replace most of the equipment except for certain types of machines.

(2) Purpose and Importance of Maintenance

Although Implementation schedule sheets for regular maintenance and operation guidelines exists for both mills, problems such as the overall deterioration of machines due to long-term use, difficulty in securing spare parts and sub-standard maintenance techniques, are degrading the quality of products.

It is necessary to reconsider the importance and the purpose of maintenance. The purpose of maintenance is to keep machines and equipment in perfect condition. The following three points summarize what the perfect conditions of machines and equipment are.

- To provide excellent quality of goods produced by machines and equipment.
- To achieve maximum performance of machines and equipment.
- To maintain maximum operation life of machines and equipment.

The maintenance procedures must satisfy these purposes. In other words, it is not possible to maintain the maximum performance and the standard of a machine if it is used continually over a long period of time.

In order to maintain high operating ability to extend the life of the machinery, and to create products of good quality, it is necessary to do cleaning, overhauling, fixing, and oiling, checking functions and standards, ordering parts and controlling the maintenance

costs.

Maintenance is a daily activity to keep the facilities and equipment in good condition in order to produce the maximum profit from investment. Maintenance and operation must be done in parallel like wheels of a vehicle, in order to keep production in a smooth way. As machinery and equipment become more complex, maintenance techniques are becoming more important. Therefore, the following must be checked:

- Whether maintenance is conducted according to standard procedures.
- Whether standard parts are used.
- Whether perfect products are obtained under normal conditions after maintenance.
- Whether maintenance is implemented according to plans elaborated from a long-term view point.
- Whether there are no difference between budgeted and actual cost of maintenance.
- Whether the individual skill level of technicians is improved.

3-5 Organization and personnel

The organization structure is shown in Figure 3-1 by taking Banjaran Mill as an example. The personnel is shown in Tables 3-1, 3-2 and the personnel allocation by operation department and years of experience are shown in Figures 3-2 to 3-5.

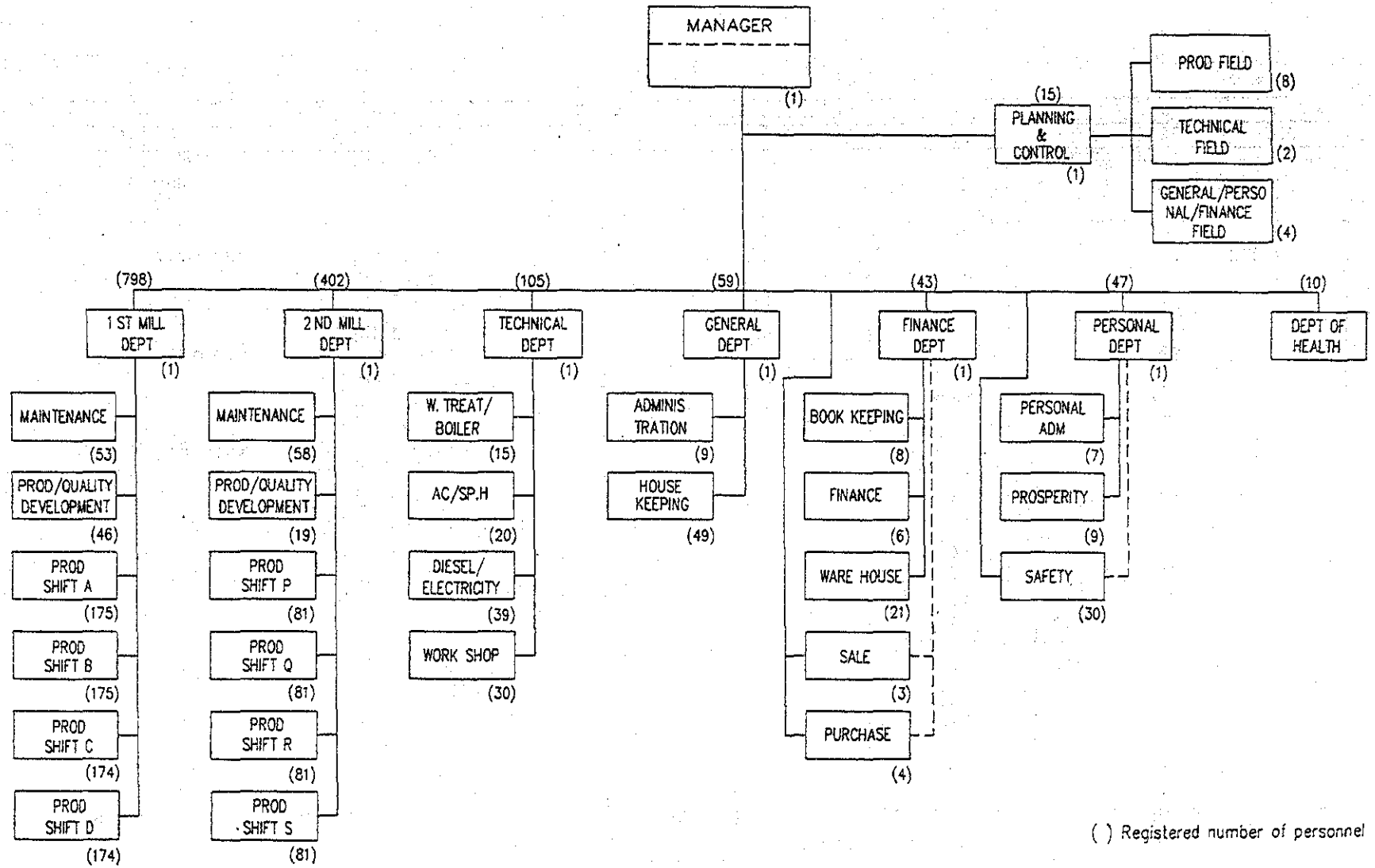


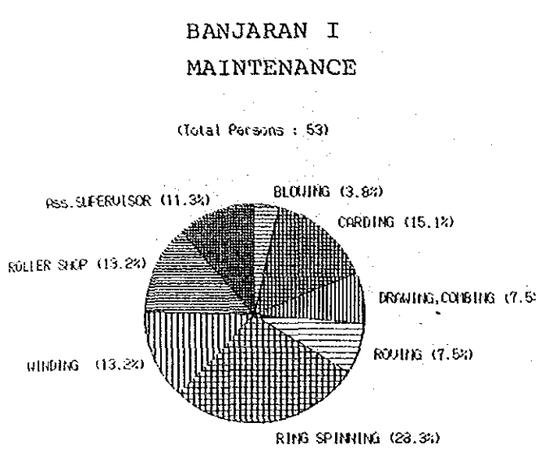
Figure. 3-1 Banjaran Mill Organization Structure

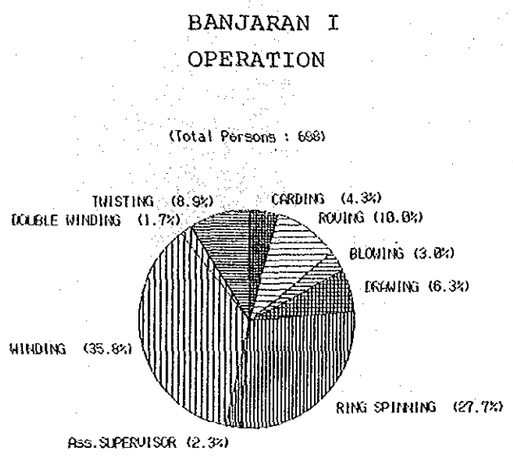
Table 3-1 Organization and Personnel of Banjaran Mill

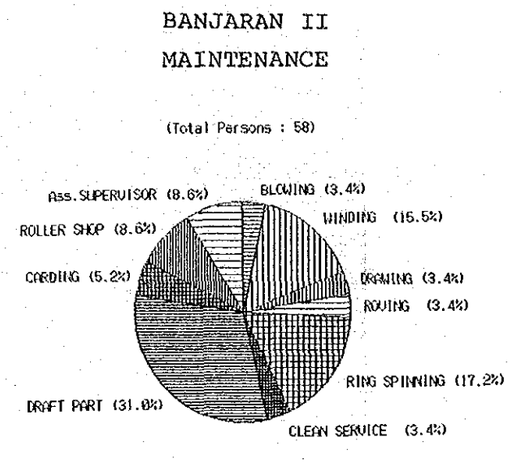
Mill Manager	Dept chief		Supervisor		Ass. Supervisor	Foreman	Operator	%	Total	%	%
1	B-I		Production	4	12	28	654	89.4			
	Production	1	Maintenance	1	5	7	40	5.5	798	53.9	53.9
			Laboratory	0	4	5	37	5.1			
							(731)	(100)			
	B-II		Production	4	8	24	288	83.7			
	Production	1	Maintenance	1	4	8	45	13.1	402	27.2	27.2
			Laboratory	1	4	3	11	3.2			
							(344)	(100)			
			Electric	1	4	13	21				
	Utility	1	Utility	2	3	12	18		105	7.1	
			Workshop	1	3	5	21				
	General	1	Admiinistration	1	3	1	4				
			House Keeping	1	2	1	45		59	4.0	
			Production	2	1	1	4				
	Planning	1	Technical	1	1				15	1.0	
			General	1	3						
			Financial	1	2		3				
			Book Keeping	1	2		5				
	Financial	1	Ware house	1	2	3	14		43	2.9	18.9
			Sale	1	1		1				
			Parchase	1	1		2				
			Personal	1	2	1	3				
	Personal	1	Prosperity	1	2		6		47	3.2	
			Safety	1	1	4	24				
	Health	1			1		8		0	0.7	
								(Mill Manager)	1		
1		8		29	71	116	1255		1480		100
		0.5%		2.0%	4.8%	7.8%	84.8%		100%		

Table 3-2 Organization and Personnel of Cipadung Mill

Mill Manager	Dept chief		Supervisor		Ass. Supervisor	Foreman	Operator	%	Total	%
1			Production	3	12	28	507	86.1		
	Production	1	Maintenance	1	4	8	51	8.6	654	75.1
			Laboratory	1	4	3	31	5.3		
							(589)	(100)		
			Electric	1	3	9	17			
	Utility	1	Utility	1	1	5	8		75	8.6
			Workshop	1	2	6	18			
			Administration			1	1			
	General	1	Administration	1	3	1	9			
			House Keeping	1	2	1	33		52	6.0
			Production	1	1					
	Planning	1	Technical	1	1				12	1.4
			General	1	2					
			Administration		1		3			
			Finance	1	2		2			
			Book Keeping	1	2		3			
	Financial	1	Ware house	1	2	2	6		28	3.2
			Sale	1			1			
			Purdiase	1	1		1			
			Personal	1	2		3			
	Personal	1	Prosperity	1	1		4		44	5.1
			Safety	1	2	4	24			
	Health	1			1		3		5	0.6
									(Mill Manager) 1	
1		7		21	49	68	725		871	100







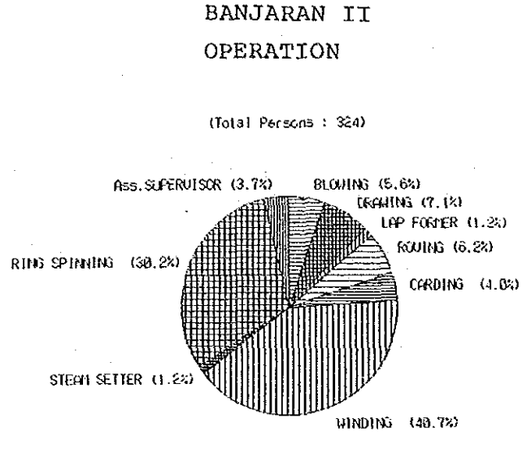
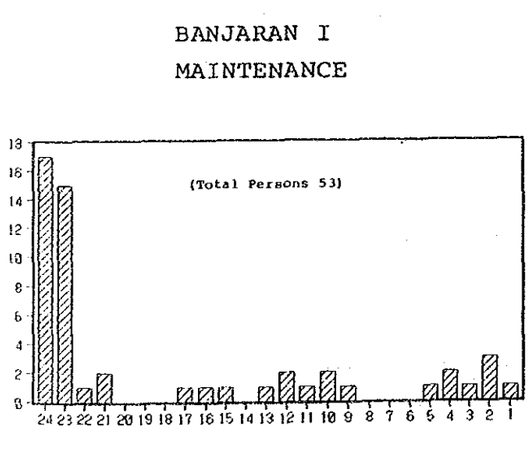
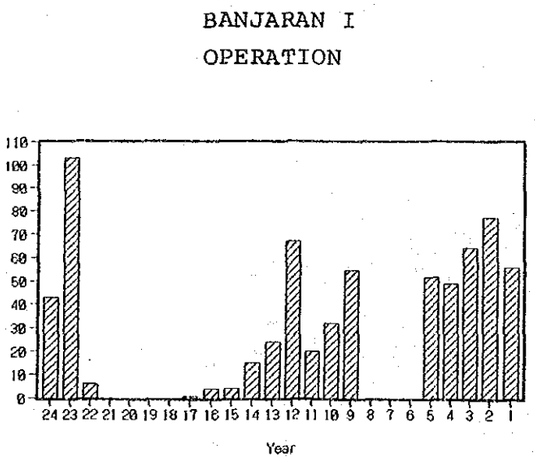
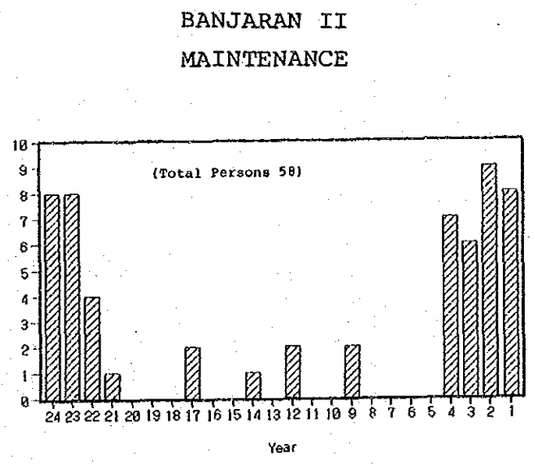


Figure. 3-2 Number of Personnel by Process







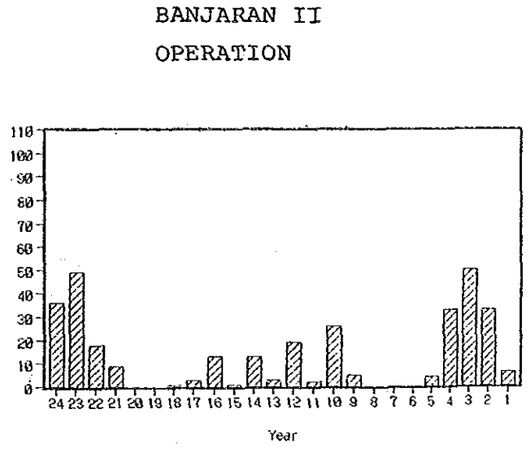
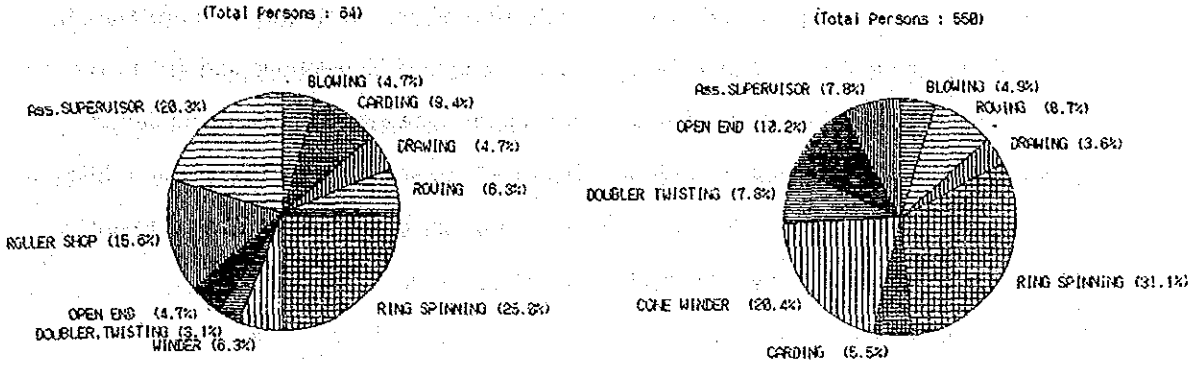
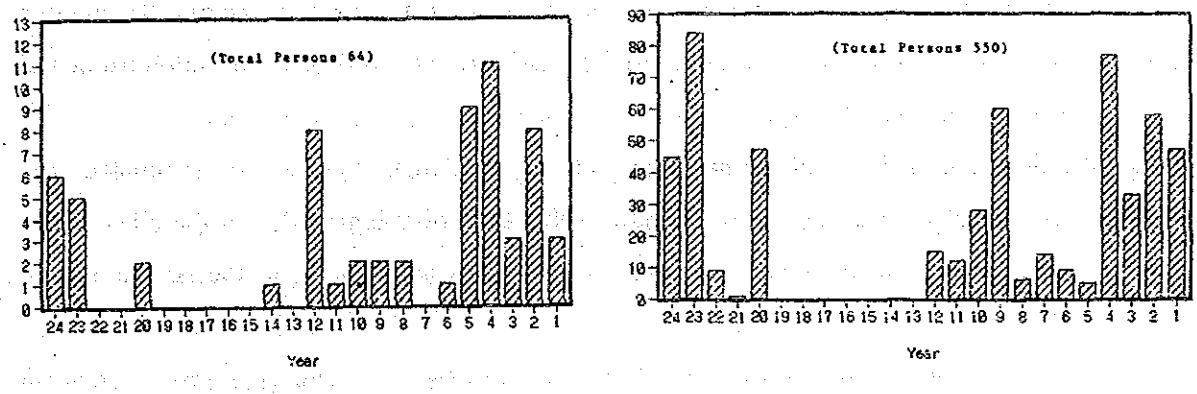


Figure. 3-3 Number of Personnel by Years of Service



(1) Maintenance Dep. (2) Production Dep.

Figure. 3-4 Number of Personnel by Process (Cipadung)



(1) Maintenance Dep. (2) Production Dep.

Figure. 3-5 Number of Personnel by Years of Service (Cipadung)

(1) Organization

The followings are the findings of the field study.

a) Demarcation of responsibility between the Planning and Control Department who directly report to the plant manager and the production line is not clear. Only the production line should be responsible for production because the production involves personnel, equipment and education.

b) There are six departments who report to the plant manager. It is better to simplify these six departments into three: production, engineering and administration, or into two: production, which includes engineering, and administration, in order to facilitate communications of instructions and orders. By doing this, the time for coordination

among the department heads will be minimized, cooperative relationship between production and sales will be stronger, and the administration of the mill will be more smooth.

c) Generally speaking if organization becomes more complex, instructions and orders become too diverse and real intention of instruction cannot always be fully under stood.

d) Workers should be educated in ways in which each person can do two or three different types of jobs. Then they will be capable of helping each other among departments and sections, thereby equalizing the work load.

(2) Personnel

(a) Banjaran Mill

1) The Personnel allocated for other than the production department at the Banjaran mill accounts for as high as 18.9 % of the total employees compared to that of private companies in Indonesia, and this number should be lowered below 15 %.

As for the number of operation workers, the production efficiency cannot be improved if the number is increased, unless measures are taken to decrease the number of defective products by intensifying the maintenance activities and minimizing the roving and yarn breakage.

2) Even though the facilities and equipment at the Banjaran I are superannuated, the number of maintenance personnel is less than that of Banjaran II. On the other hand, there are too many people at the production management and in the laboratories in this mill.

While rationalizing the number of personnel as a whole, appropriate personnel arrangement in response to such problems need to be considered.

3) In order to decrease the number of personnel per bale at the Banjaran II, the number of personnel above the level of foreman should be decreased and its percentage should be lowered from the current 16.6 % to below 10 %. Operators should be educated in such a way that they can act on their own judgment.

Managers should make sure that the efforts of individual workers can be recognized by everybody.

4) There are too many workers in winding process at Banjanran II, where automatic winders are the main equipment, even though the number includes the packing workers. The number of drums per worker should be increased.

5) According to the distribution of processing personnel separated by the number of years of service, the pattern is to hire only during prosperous periods.

Even though the working positions are determined by the vocational aptitude test during hiring, training of workers to handle more than two types of jobs should be considered, and replacement of positions should also be practiced.

6) For maintenance personnel, maintenance ability does not directly commensurate with the number of years of service. The personnel who has a feel for maintenance should be appointed to the maintenance section with priority.

Sometimes the labor conditions for maintenance workers are not always favorable. For example, no allowance is paid for their late night work, and their promotion is slow.

In order to intensify the maintenance activity, the working conditions of maintenance personnel should be ameliorated.

(b) Cipadung Mill

1) It is recommended that the number of maintenance personnel should be at least 10% of the workers relating to production.

In the case where the machinery are obsolete and deteriorated, the number of maintenance personnel should be kept even more.

2) The percentage of the ring spinning operators is 37.9% of the total number of workers. 32% may be an appropriate number for this. As a matter of fact, maintenance for the roller parts is now insufficient and end breakage is frequently observed due to eccentricity of the position of the bottom apron.

As a measure to cope with this situation, the number of machines per operator has been decreased, and the actual performance is held steady.

However, what should be done is to perform a special maintenance on the roller parts in order to restore normal condition of machines and to increase the number of machines per operator.

3) 33.8% of the workers have more than 20 years of employment period. The existence of a significant gap between such workers and the younger group may become a major problem in the future.It is recommended that the number of younger employees should be increased so that the personnel structure would become well balanced.

4) More than 50% of the maintenance workers have been employed for less than five years. This may be one of the reasons why the condition of maintenance of the machinery of this mill is below standard. It is necessary to raise the level of maintenance in all production units in the future.

Priority should be given to the maintenance of the spinning frames in order to recover their performance.

4 MARKET

4-1 Projected Demands For Textiles

Indonesia' s overall exports in 1990 marked an increase of 15.9% over the previous year.

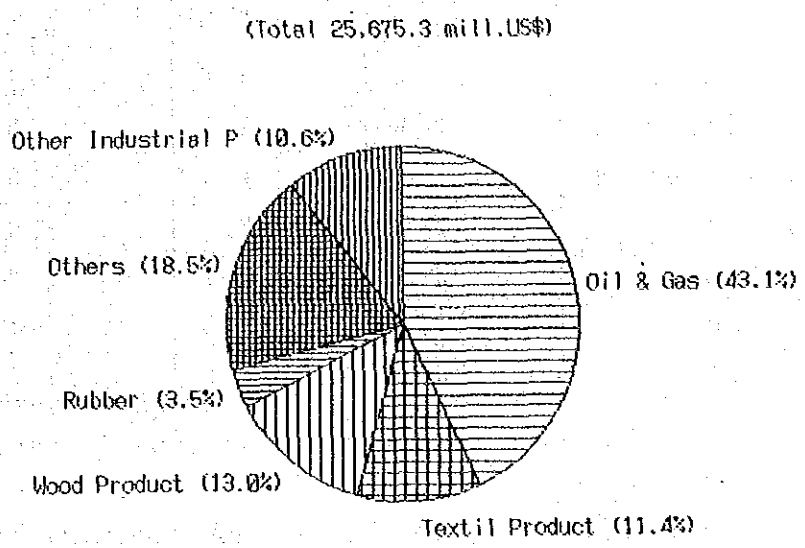


Figure 4-1 Indonesian Export 1990

The export of non-oil/natural gas which has been promoted as the government policy has somewhat dropped to 56.9% from 60.8% of the previous year. However, the export of textile and its products marked an increase of 43.6% over the previous year recording 2.917 billion dollars. Because the domestic consumption is still very limited in Indonesia like in other developing countries, the market for the Indonesian textiles has been mainly expanded abroad in accordance with the above-mentioned export promotion policy adopted by the government. The recent characteristics of Indonesia textile sales are its export orientation.

4-1-1 Domestic Market

According to FAO Statistics, Indonesia' s textile consumption amounts to 1.9 kg per capita compared with the world average, 7.3 kg per capita in 1986.

Table 4-1 Per Capita Textile Consumption

unit : kg

	1984	1985	1986
Indonesia	1.8	1.9	1.9
Malaysia	8.4	6.9	6.3
Singapore	18.3	21.6	29.1
Thailand	2.9	2.8	2.8
Philippines	1.3	1.4	1.6
India	2.2	2.3	2.4
Pakistan	2.4	2.1	1.8
Japan	17.8	17.8	17.7
U.S.A.	23.5	22.6	25.6

Source : FAO Statistics

According to the projections made by the Ministry of Industry, per capita textile consumption in Indonesia is expected to increase to 1.98kg during the first year of the Fifth Five Year Plan, and to 2.22 kg by its final year, at an annual growth rate of 3%. According to a list formulated on the basis of import-export statistics and the amounts of production (Table 4-2), however, it is estimated that per capita consumption has already reached over 3 kg in 1989.

This implies that structural changes are taking place within Indonesia, spurred by the recent economic development of the country. As the domestic consumption of textiles is expected to increase in the coming years, the annual rate of growth will be certainly greater than 3% projected by the government. In terms of total quantity of consumption, an annual growth of over 5% can be anticipated by integrating the expected population increase, of 1.9%, into the projected consumption per capita.

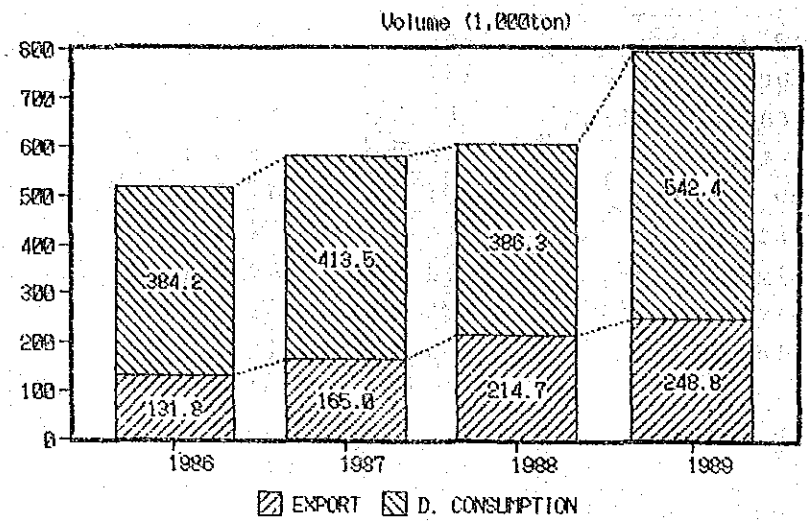
Table 4-2 Textile Demand and Supply in Indonesia

unit 1,000ton

		1986	1987	1988	1989
Import	Fiber & Raw Mat.	232.1	281.9	247.8	351.5
	Yarns & Fabrics	68.8	65.0	74.7	141.3
	Garment	0.8	0.9	1.1	2.8
	sub total	301.7	347.8	323.5	495.7
Domestic Production	Cotton	8.0	4.2	2.5	2.5
	Polyester SF	78.0	80.9	99.6	100.0
	Polyester Fil.	70.4	82.2	104.4	120.0
	Nylon Fil.	11.8	12.0	12.0	14.0
	Rayon SF	46.1	51.4	59.0	59.0
	sub total	214.3	230.7	277.5	295.5
Supply Total		516.0	578.5	601.0	791.2
Export	Fiber & Raw Mat.	3.4	3.6	15.5	12.3
	Yarns & Fabrics	71.9	107.8	135.2	147.6
	Garment	56.5	53.6	64.0	88.9
	sub total	131.8	165.0	214.7	248.8
Domestic Consumption		384.2	413.5	386.3	542.4
Consumption Per capita(kg)		2.29	2.43	2.22	3.09
Population (mill)		168	170	174	175.6
Export Share in Supply %		25.5	28.5	35.7	31.4

4-1-2 Overseas Market

Foreign markets account for as much as approximately 30% of sales of the Indonesian textile industry. The growth in textile exports in recent years, promoted by the government policy, is remarkable, recording an annual growth rate of over 40% over the previous year. The composition of the exported products remain unchanged with garments which have high value-added accounting for over 50%, and fabrics, approximately 30%. Lately, there has been little growth in the exports of yarns.



Source : P.T Industri Sandang I

Figure 4-2 Textile Export and Domestic Demand

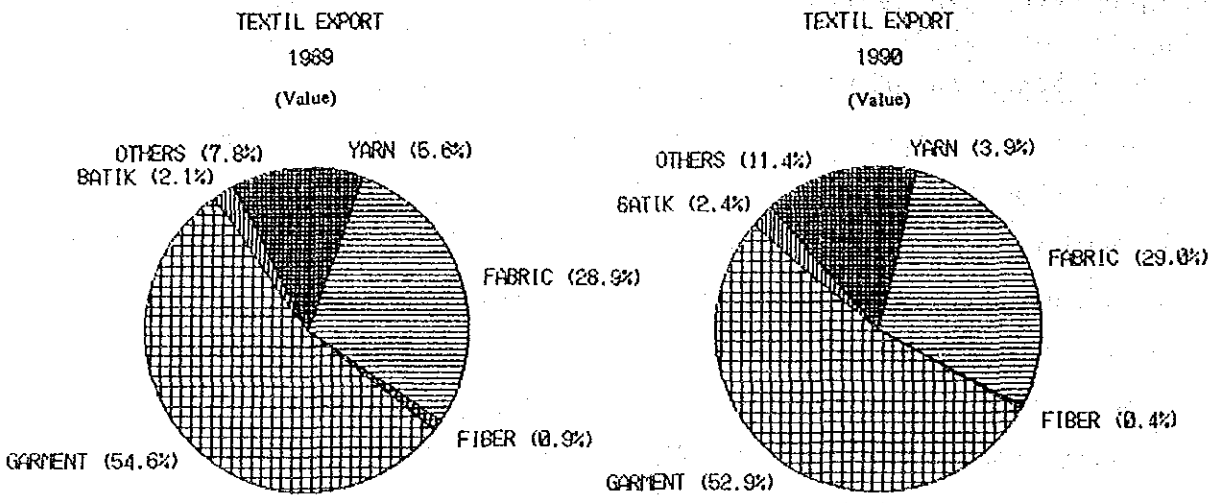


Figure 4-3 Composition of Textile Import

Among the overseas markets, the U.S. is by far the largest followed by EC.

Table 4-3 Value of Textile Exports by Destinations(1989).

Country of Destination	Value (000 US$)	Distribution (%)
USA	640,893.00	31.57
CANADA	50,215.00	2.47
LATIN AMERICA	11,602.00	0.57
EC	539,469.00	26.57
OTHER EUROPE	44,449.00	2.19
ASEAN	288,517.00	14.21
OTHER ASIA	214,677.00	10.57
AFRICA	8,958.00	0.44
MIDLE EAST	176,244.00	8.68
AUSTRALIA	48,920.00	2.41
OCEANIA	6,336.00	0.31
Total	2,030,280.00	100.00

Source : BPS

4-2 Supply

4-2-1 Production

Figure 4-7 shows the recent changes in the amounts of yarn production of the Indonesian textile industry. Indicated in Figs. 4-4, 4-5 and 4-6 are the figures obtained by integrating the projections made by the Ministry of Industry. Further increase in the demands for yarns can be expected, because the actual values of the period up to 1990 exceeded the projections made by the Ministry prior to the execution of the Fifth Five Year Plan, and the growth has been particularly remarkable for those products made of yarns, such as fabrics and knits.

The investments in spinning equipment which reached their peak in 1989 have slowed down because of the difficulty of financing due to high interest rates and credit squeeze that took place in line with the tight money policy adopted by the Indonesian government. In addition, the cut down of power supply to newly constructed plants has further discouraged the investments, forcing cancellation of some of the small-scale garment production projects. The new facilities for spinning and fiber-making as up-stream industry for which the license has already been acquired are nevertheless expected to be constructed. To 3.8 million spindles (those for acrylic spinning excluded) available as of the end of 1990, 1.3 million are expected to be added by the end of 1991, and the total is certain to be approximately 5 million.

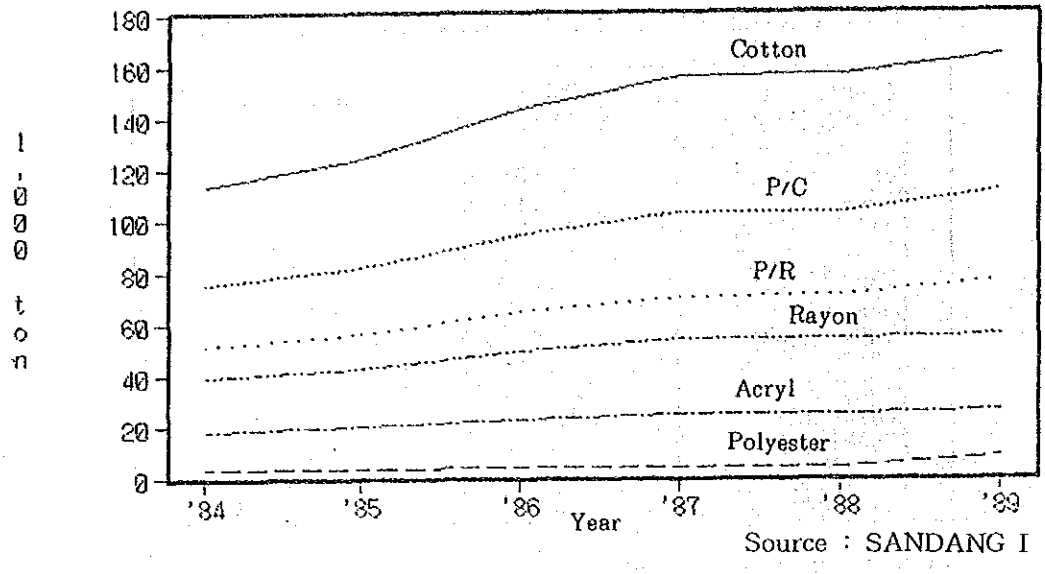


Figure 4-4 Spinning Equipment and Production Volume

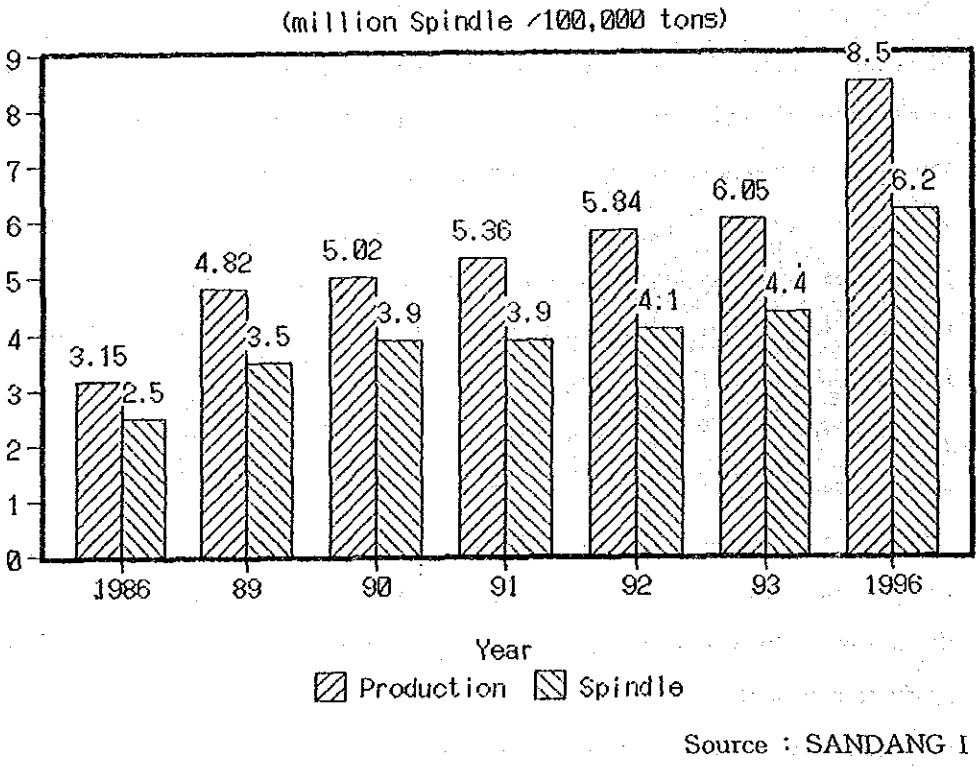
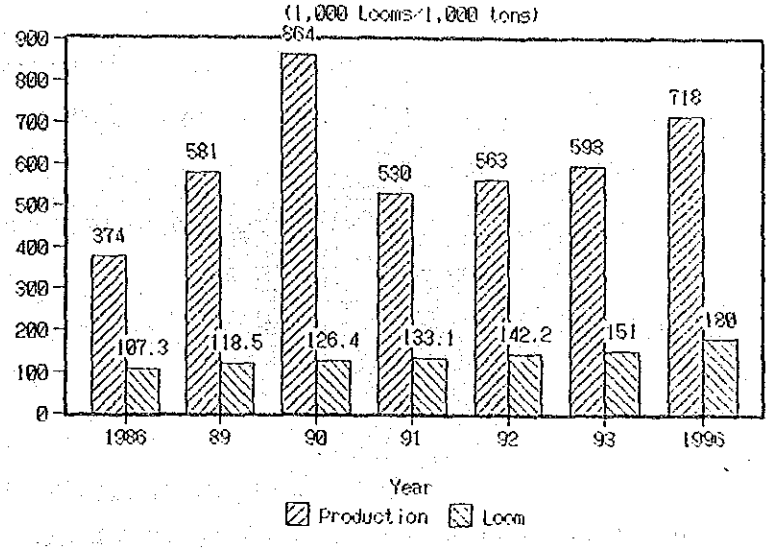


Figure 4-5 Weaving Equipment & Production Volume



Source :SANDANG I

Figure 4-6 Knitting Equipment & Production Volume

As for the spun yarns which are the focus of the present project, the amounts of production of different kinds of yarns, such as, cotton, polyester/cotton, polyester/rayon,and rayon, have been fairly stable and the share of each kind remains almost unchanged. The cotton yarn accounts for slightly more than 1/3 of the total production, polyester/cotton, 1/4, and polyester/rayon and rayon yarns together account for approximately 30%.

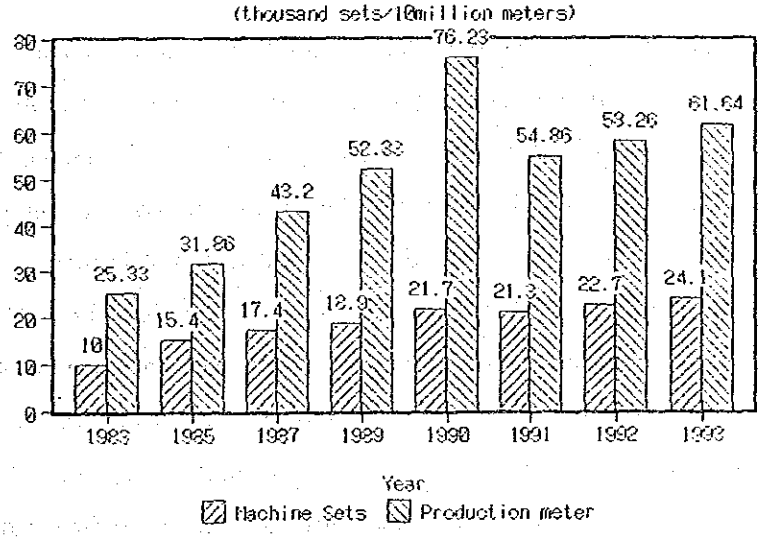


Figure 4-7 Growth of Spun Yarn Production

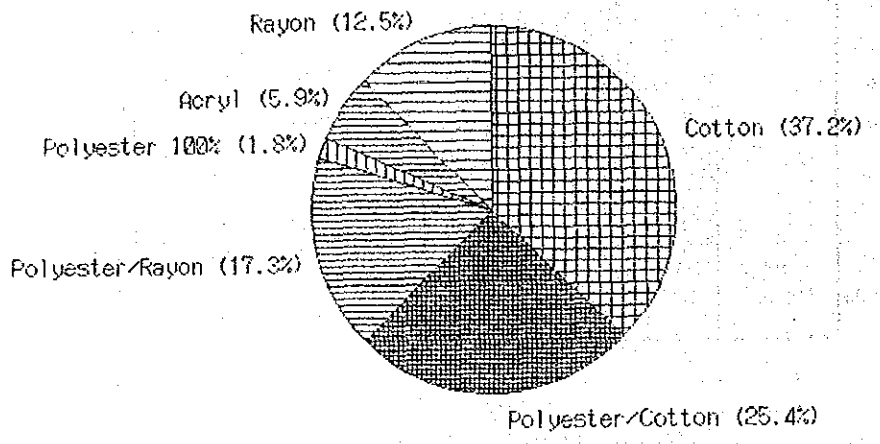


Figure 4-8 Prodution of Spun Yarn 1989(Total 440.7th.ton)

4-2-2 Imports

As shown in Table 4-2, raw materials account for an overwhelming proportion among those products related to textile production imported to Indonesia. The value of the imported raw materials accounts for about 50% of the total, and 70%, when yarns are added. Out of the imported raw material, the cotton is the most at nearly 40% of the total.

4-3 Supply and Demand Analyses

The recent condition of supplies and demands for textiles in Indonesia is as indicated in Table 4-2 above. The Indonesian textile industry is capable of satisfying the domestic demand while also greatly contributing to the earning of foreign currencies through exports in accordance with the government policy. Considering the targets set by the Fifth Five Year Plan as well as the projections made by the Ministry of Industry, it is certain that the textile industry of Indonesia will continue to grow significantly in the coming years. As mentioned earlier, the production has already exceeded the target set by the Five Year Plan. The consumption and exports are also expected to grow to a considerable extent in the coming years. As for consumption, however, since the proportion of exports is to become even greater, it will increasingly necessary for the Indonesian textile industry to shift its emphasis from yarns to those products with higher value-added, such as, fabrics and secondary products, by taking advantage of the country' s low labor cost. Lower cost of labor is an important source of competitiveness for the Indonesian textile industry. Such a shift in emphasis is particularly important because the overseas demand for products with high value-added is expected to increase. Domestic consumption will also grow with

the improvement of the country' s standard of living, and that should give rise to demands for new products such as the fashion-related items, for instance.

Given these expectations, in making the future plans for the spun yarns of the present project, one must realize the importance of producing those which are internationally competitive.

Quick delivery or low price, per se, cannot be a competitive edge in the international as well as domestic markets, unless the quality of yarn itself is improved. Reportedly, even under the present unfavorable market condition, the high quality yarns for the newly-introduced knitting and air jet machines are already short in supply.

Outlined below are projected supply and demand for yarn in the next 10 years.

4-3-1 Analysis of Supply and Demand

(1) Projected production

As for man-made fiber and filaments, for which domestic production is promoted, the projected production capacities of the near future computed on the basis of the number and scale of applications for plant expansion and of information provided by the industry sources are as follows:

	* **	
Nylon filament	(41 + 5)ton/day	16,100 ton/yr
Polyester filament	(424 + 218)	224,700
Polyester fiber	(330 + 335) * Present demand	232,750
Rayon	(195 + 25) ** Projected demand	77,000
	total	550,550

The projected production of the above fibers and filaments in the year 2000, computed similarly on the basis of applications for facility expansion and other estimates, is as follows:

Nylon filament	levels off	17,500
Polyester filament	additionally increases	300,300
Polyester fiber	(industry sources)	278,000
		(See Chapter 6)
Rayon fiber	(if the facilities are expanded)	150,000
	total	745,500ton/yr

Of the above, the fibers are used as materials for spun yarns, while the filaments are put in the weaving machine as yarn.

The estimated amount of filament yarn production in the year 2000 is 317,500 tons. As for cotton, which is mostly imported, it is expected that there will be a natural increase in production owing to the projected worldwide expansion of the cotton-growing land. On the other hand, according to the industry sources, the number of spindles in operating conditions and the amounts of materials consumed for 1989 and 1990 are as follows:

	Number of spindles in operation	Amount of production
1989	300 million	485 thousand tons
1990	350	567

(1,620 tons/10 thousand spindles)

Material consumption (in thousand tons)

cotton	Rayon	Acryl	Polyester
268	69	30	118
315	80	30	142
56%	14%	5%	24%

According to the projections made by the Ministry of Industry, given the expected expansion in the spinning facilities by the year 2000, it is presumed that there will be 580 million spindles producing 751 thousand tons of yarn in 1994, and 620 million spindles (all not necessarily in operating conditions) producing 850 thousand tons in 1996. Such projections, however, appear slightly too optimistic considering the growth to date. Since nearly 100 million of the spindles currently available are deteriorated due to their extended operation of over 15 years,they are bound to be either temporarily kept out of use or put totally out of operation someday in the near future. As the partly offsets the expected expansion of the facilities, the number of spindles in operating conditions by the year 2000 should be somewhere between 500 and 600 million, in which case, the projected production of spun yarn would be:

550 million spindles x 1,620 tons = 891 thousand tons

The expected total production of filament and spun yarn combined for 2000 then would be:

318 thousand tons + 891 thousand tons = 1,209 thousand tons

(2) Projected imports

Presented below are the annual amounts of yarn for weaving use imported from 1983 to 1987.

(unit : ton)

1983	1984	1985	1986	1987
12,845	13,220	14,186	25,923	24,183

Source:Capricorn Indonesia Consultaut Inc.

The amount for 1988 is estimated to be around 19,000 tons. While the yarn imports up to 1987 increased at an annual rate of 5 to 10% in proportion to the growth in demand, it seems stable at the level of around 20 thousand tons from the late 80s: an amount which should be sufficient to cover the estimated rise in the demand for weaving yarn caused by the increased availability of various facilities, such as, those for spinning, weaving, and for polyester and rayon fiber production. Consequently, assuming that the imports of weaving yarn grow at an annual rate of 5%, the total amount in the year 2000 is supposed to be:

20,000 tons x $(1.05)^{10}$ = 32,600 tons

4-3-2 Future Demands

(1) Domestic demand

Assuming the growth rate of 5% per year as in the case above, the expected annual demand for 1989 is 542.7 thousand tons, and that for 2000 is 884 thousand tons. The figure was obtained by multiplying the amount in 1989 by $(1.05)^{10}$.

(2) Exports

The annual amounts of exports from 1987 to 1990 are as follows:

unit : Th. tons

	1987	1988	1989	1990
	165	215	249	312
increase over previousyear	+25.2%	+30.1%	+15.7%	+25.5%

The exports increased by 137% from 1986 to 1990, which is equivalent to 24% per year. Although the exports will still be promoted by the government policy in the coming years, it is unlikely that they will continue to grow at such a high pace. If the annual growth rate set reasonably low at 10%, then the amount of exports in 2000 will be:

312 thousand tons x $(1.1)^{10}$ =809 thousand tons

(3) Total demand

From the above estimates, the total demand in 2000 will be:

809 + 884 = 1,692 thousand tons

4-3-3 Balance of Supply and Demand

By the calculations presented above, it is certain that the demand will exceed supply. However, if the growth rate of weaver and knitter, for which the spun yarn is used, is 6% per year, the figure for 2000 will be :

567 thousand tons x $(1.06)^{10}$ =1,015.4 thousand tons

According to this calculation, the amount obtained is sufficiently greater than the estimated production and imports of the spun yarn for the same year.

Judging from the above macro economic projection of the balance between supply and demand, it is expected that the Banjaran and Cipadung Mills will enjoy stable market shares. Moreover, with the improvement in product quality achieved through rehabilitation, both mills should be able to secure even greater shares.

The renovation of the deteriorated facilities and equipment at both Banjaran and Cipadung Mill is indispensable for improving the productivity and product quality, as well as for expansion of employment opportunities. The renovation is also necessary for the purpose of reinforcing the exports as stated by the government policy and for disseminating the technologies to the other mills.

4-4 Merchandising and Pricing

4-4-1 Product Plans

As the descriptions listed above refer only to the current market conditions, good selling products today may become unpopular in the future, depending on the condition of international economy. Such being the case, it is imperative to plan the product mix carefully on a long-term basis without persisting in the expected results of the immediate future. Installation of equipment capable of accommodating any changes in the production plans is a great advantage for any mills. However, even with such equipment,it is impossible to produce filament yarn at these two mill. Under such restrictions, the product mix at the Banjaran and Cipadung Mills are recommended as follows:

1) High grade, fine count combed yarn number counts, which are profitable and popular worldwide for a long time.

2) P/C yarn for polyester fiber fabrics which are durable, fashionable, and easy to care. (stable domestic supply of the materials is another advantage of producing the P/C yarns.)

3) Rayon blended yarn which is practical and has the scarcity value.

The production of No. 45 P/C yarn, which is to be the central product under 2) above, shall be concentrated at the Banjaran II in order to cut down the cost and enable quick response to price changes. Likewise, the Cipadung Mill should be designated to specialize in man-made fiber yarn.

The product mix at the Banjaran I should be concentrated on the high quality cotton combed yarn as well as polyester blended yarn of any blending ratio and any yarn counts to meeting diverse user needs.

4-4-2 Pricing

Indicated below are the changes in prices of polyester/cotton blended yarn Ne 45 and combed yarn Ne 40 (CM40), both of which are representative spun yarns, within the Indonesian market(in average annual price per bale).

	P/C 45/1	CM 40/1	P/R 30/1
1986	Rp740, 000	Rp774, 000	Rp850, 000
1987	1, 130, 000	1, 293, 000	950, 000
1988	1, 143, 000	1, 360, 000	1, 000, 000
1989	1, 184, 000	1, 382, 000	1, 170, 000
1990	1, 144, 000	1, 371, 000	1, 100, 000
1991	1, 148, 000	1, 381, 000	1, 100. 000

While the prices of both cotton and cotton blended yarns had been on the rise up to 1989 (at an annual rate of 1 to 3%), they started declining between 1990 and the first half of 1991.

In Japan, on the other hand, the market price of cotton yarn, which had been gradually falling since around 1984, began to pick up in 1986 and 1987 as shown in Fig. 4-8. Although the price was stagnated for a while after that, it has continued to rise again since 1989. While it is misleading to compare the Indonesian and Japanese markets by the same criteria due to the different structures and business practices of the two countries, the fluctuation of market prices, nevertheless, is undoubtedly common to both. Meanwhile, the market price of cotton in New York which has been rising since 1985

is expected to stabilize at a modest level because of the worldwide increase in the cotton farming land. The low cost of cotton should then positively affect the profitability of cotton yarn.

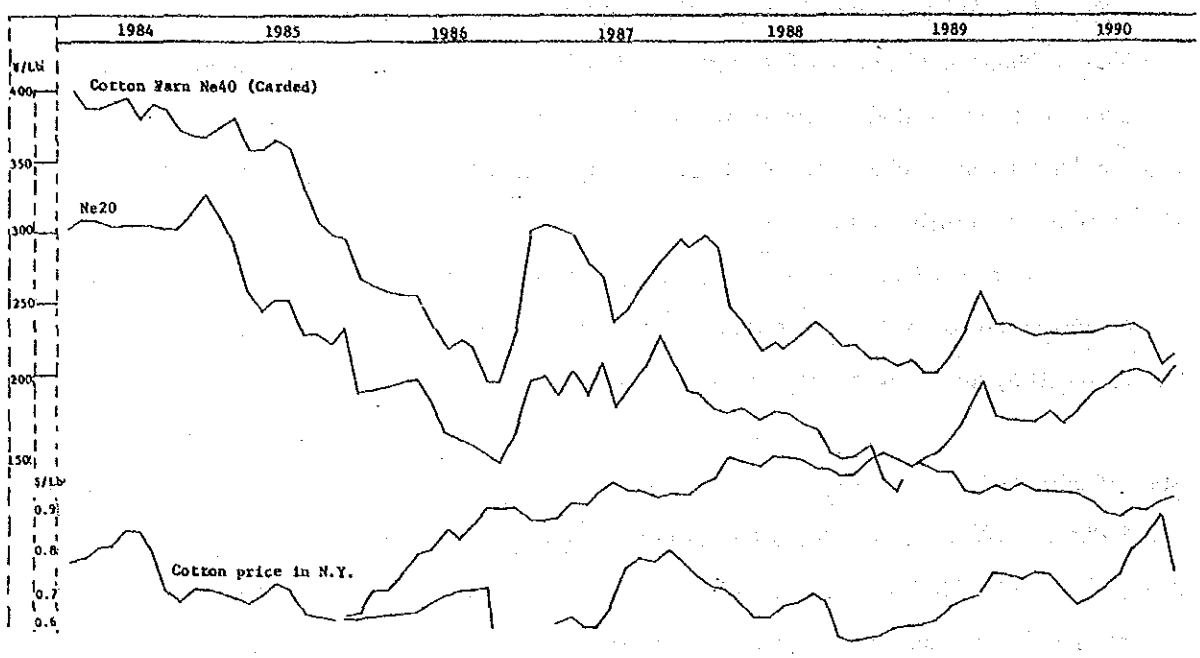


Figure. 4-9 Transition of Yarn And Cotton Price

The selling price of major brands of yarns, according to the local survey conducted in February 1991, were as follows:

Unit : Rupiah/bale

CM 32	1,450,000
CM 40	1,550,000
CM 50	1,950,000 (export)
P/C 45	1,230,000
P/C 30	1,050,000

When a follow-up survey was conducted in August 1991, the price of combed yarn was found to be on the rise. The price of CM40, for instance, was over 160 million rupiah per bale. (The prices surveyed were those indicated by the manufacturers of top technological standards within Indonesia which have recently either newly-installed or renewed their facilities.)

4-4-3 Product Mix

The table below is a summary of the final product mix and estimated sales price of the products.

CM 32	1,500,000	C/P 40	1,300,000
CM 40	1,700,000	C/P 40/2	1,500,000
CM 50	2,000,000	P/R 20	1,050,000
P/C 20	1,050,000	P/R 30	1,150,000
P/C 40	1,150,000	P/R 40	1,250,000
P/C 45	1,250,000	P/R 45	1,300,000
P/C 40/2	1,350,000	P/R 40/2	1,400,000
C/P 20	1,150,000		

(Unit : Rupiah/bale)

The above product mix should be revised as needed to make it match the market trends. In terms of sales strategy, yarns with high value-added (e.g. combed yarns) should be sold as raw fabrics with higher value to be used by the garment industry.

Both foreign and domestic investments to hopeful garment manufacturers, whose exports of garments to the U.S. and Europe are expected to rise, are rapidly increasing, and the demand for fabrics is certain to rise as a result. The domestic high quality fabrics produced with high technological standards should be able to replace those which are currently imported. While many of the polyester or rayon containing blended yarns have been conventionally sold to manufacturers of fabrics for domestic use, it is necessary to devise ways to switch the target to materials for grey and printed fabrics for export.

5 Raw Material

5-1 Volume of Raw Material Used in Indonesia

The number of spindles in the actual operation in Indonesia was 3,500,000 in 1990, and it is estimated to increase to 3,800,000 in 1991. The production volume with these facilities in 1990 is broken down as follows.

Type	Total Production	Domestic	Material Imported
Cotton	315,000t	33,000t	282,000t
Rayon Fiber	75,000t	75,000t	——
Acrylic Fiber	30,000t	——	30,000t
Polyester Fiber	142,000t	116,000t	26,000t
Total	562,000t	224,000t	338,000t

Indonesia will continue to rely overwhelmingly on cotton imports. However, under the government policy, there is no doubt that measures will be taken to increase the domestic production of polyester and rayon. Although Indonesia totally depends on import for its demand of acrylic fiber at present time, but it is likely to be produced domestically in the future. Thus the bottle neck of raw material in Indonesia will ultimately be cotton, which is consumed in much quantity but solely imported.

5-2 Cotton

5-2-1 Supply

The U.S. which has the second cotton production volume in the world has a large share and the biggest exporter to Indonesia.

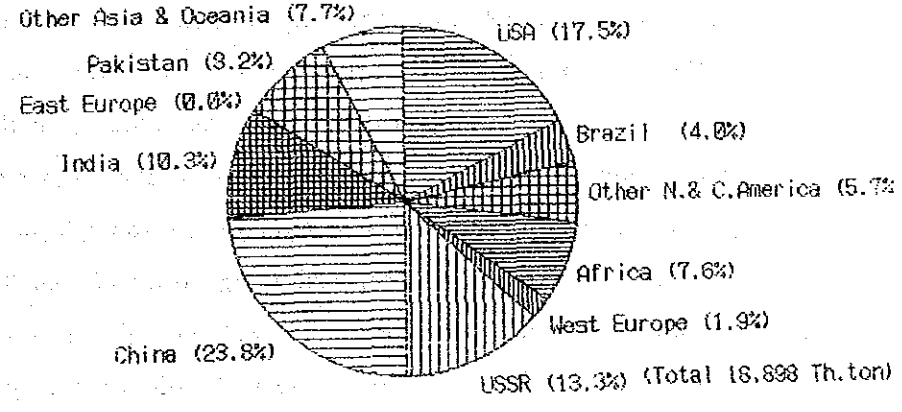


Figure 5-1 World Cotton Production ('90/'91)

The cotton yield in the world during the past 10 years was lowest during 1980 to 1981 and has been increasing since then. According to an optimistic projection it will exceed 19 million tons for 1991/1992.

The countries such as China, U.S.A., India, Pakistan, Turkey, Greece are where production volume of cotton has been increasing while those countries where the production has been decreasing include the U.S.S.R., Egypt, and Sudan.

Table 5-1 Indonesian Cotton Import by Countries (1989)

Country of origin	Volume (ton)	Value (US$'000)	Market Share %	
			Volume	Value
U.S.A.	81,741	127,111	31.2	34.0
PAKISTAN	45,627	55,770	17.4	14.9
AUSTRALIA	31,043	46,956	11.8	12.6
BRAZIL	30,200	43,562	11.5	11.7
PEOP.REP.OF CHINA	20,502	28,756	7.8	7.7
U.S.S.R.	16,062	17,264	6.1	4.6
MEXICO	11,426	15,918	4.4	4.3
IVORY COAST	6,651	10,191	2.5	2.7
TANZANIA	1,385	2,300	0.5	0.6
OTHER AFRICA	9,939	15,547	3.8	4.2
OTHER COUNTRIES	7,690	10,383	2.9	2.8
TOTAL	262,264	373,761	100.0	100.0

5-2-2 Prices

(1) Market Price of Cotton

Because cotton is a commodity market item, the price of cotton fluctuates accordingly, and price index of the New York cotton market price is used as the cotton market price.

The cotton market price will undergo significant changes depending upon the world cotton harvest volume, the supply and demand of fiber products, and consumer taste for cotton products. The New York market price has been recovering after dropping to a bottom price during the latter half of 1986 and has now reached a high price of over 90 cents in June and July of 1990 for the first time in 10 years.

However, the current high price of cotton may slowly drop since the Department of Agriculture of U.S.A. is drafting a policy to adjust the American cotton price (currently

independent from international pricing) and the world cottons production is increasing during 1991 and 1992.

(2) Purchasing Prices

Cotton currently purchased by Sandang I is either imported directly or through trading companies in Indonesia. The actual purchasing prices from June to September 1990 is shown below.

	Grade	Staple Length	Rp/kg	Cent/LB
Ne 30-40	M	1"	2963	69
	M	1 1/32"	3089	72
	M	1 1/16"	3220	75
	M	1 3/32"	3293	77
	M	1 1/ 8"	3467	81
	SM	1 3/32"	3467	81
	SM	1 1/ 8"	3618	84

The estimated prices in 1993 which is the year when rehabilitation projects are expected to start are listed below.

	Grade	Staple length	Rp/kg	Cent/LB
Ne 30-40	SM	1 1/ 8"	3568	83
	SM	1 3/32"	3439	80
	M	1 1/ 8"	3310	77
	M	1 3/32"	3181	74
	M	1 1/16"	3095	72
Ne 50	Peru pima	1 5/ 8"	5159	120
	USA pima	1 7/16"	5588	130

Exchange Rate US$ 1=1954 RP

5-3 Polyester and Rayon-Fiber

5-3-1 Capacity of Man-made Fiber Production Facilities of Indonesia

Man-made fibers produced for spinning in Indonesia are polyester fiber and rayon fiber while Indonesia depends upon import for its demand for acrylic fiber.

In Table 5-2, production capacities of man-made fibers including filaments and their planned expansion are listed by company. It indicates that polyester and rayon will be self-sufficient very soon.

The current production capacity of polyester fiber of Indonesia is 116,000 tons a year and an additional 12,000 tons a year is supplemented by import. This total amount of 128,000 tons of polyester fiber is spun on 3,500,000 spindles.

Table 5-2 Man-made Fiber Production Capacity in Indonesia

(ton/day)' as of December 1990

	NYLON		POLYESTER		RAYON	Total
	FY	SF	FY	SF	SF	
I.T.S	28		11+28	55		94 +28
INDACI	13+5					13 + 5
TIFICO			80+20	78		158 +20
KUMA FIBER				52		52
SOLO SYNTHETICS				55		55
YASINTA			100	+80		100 +80
TEXMACO			85			85
POLYSINDO EKA				30		30
SULINDAFIN			52	60+15		112 +15
VASTEX			24	(+60)		24 (+60)
BITRATEX				(+50)		(+50)
INDO RAMA			+80	+70		+150
PAN ASIA			72	(+60)		72 (+60)
INDO BARAT					120	120
SOUTH PACIFIC					75+25	75+25
SAMDANG USAHA			(+30)			(+30)
DAN LIRIS			(+60)			(+60)
Total Present	41		424	330	195	990
Total Projected	5		218	335	25	583
Total (Present+Projected)	46		642	665	220	1573

Note: + is indicates number of units to be expanded in 1991.

(+) indicates number of units to be expanded after 1991

5-3-2 Prices of Polyester and Rayon Fibers

Purchasing prices of man-made fibers are shown in the table below.

Rp/kg

Type	I /90	II /90	III /90	IV/90	I /91
Polyester Fiber	3,250	2,700	2,650	2,700	2,750
Rayon Fiber Regular	4,400	4,400	4,400	4,400	4,400
Rayon Fiber High Tenacity		4,550	4,550	4,550	4,550

The prices of polyester fiber and rayon fiber are influenced by the supply and demand both in domestic and international markets as well as by the consumer taste. However, there is a tend among the polyester fiber makers in Indonesia to increase the production capacity, and neibouring countries are currently doing the same. As consequence, Malaysia and other countries are aggressively exporting their polyester fiber to Indonesia. Prices of polyester fiber in Indonesia will tend to decline gradually.

The international tendencies are that the production of rayon fiber is declining due in large part to the restriction in pulp resources. Thus, prices of rayon fiber are expected to continue at the present rate.

Based on the above, prices of polyester fiber and rayon fiber for the renovation project have been set as fol lows.

- Polyester staple of 1.5 denier or 2.0 denier: 2,200 Rp/kg
- Rayon staple of 1.5 denier or 2.0 denier: 4,400 Rp/kg

5-4 Waste Disposal

The waste of polyester fibers, rayon fibers cannot be sold.

The waste of 100% cotton can be sold at the prices given in Table 5-3.

Table 5-3 Prices of Wastes

Distinction	Kind of Waste	Price Rp/kg
Dropping Waste	Under Blow Room Machinery	110
	Under Carding Machine	110
Flat Strip	Flat of Carding Machine	150
Noil	Comber Noil	2,200
Sweeping Waste		150

6 RENOVATION PLAN

6-1 Outline of Plan

The following table shows the outlines of the Corporate Plan formulated by Sandang I and the renovation prepared by the Study Team.

	Present	Corporate Plan of Sandang	Rehabilitation Plan
Banjaran First Mill	Product Type Cotton Carded Yarn P/C Blended Yarn C/P Blended Yarn Average Ne 30.3 Facility Capacity 30,784 Spindles 9,000 rpm 12,200 bale (Year 1989)	 Cotton Carded Yarn Cotton Yarn(open-end) C/P Blended Yarn Ne 28.4 41,584 Spindles 784 Rotor 13,000 rpm 34,000 bale/year	 Cotton Combed Yarn P/C Blended Yarn C/P Blended Yarn Ne 34.7 33,600 Spindles (960×35 Unit) 15,000 rpm 23,000 bale/year
Banjaran Second Mill	Product Type Cotton Combed Yarn P/C Blended Yarn C/P Blended Yarn Average Ne 31.3 Facility Capacity 33,696 Spindles 12,000 rpm 13,880 bale (Year 1989)	 P/C Blended Yarn Ne 45 38,016 Spindles 14,000 rpm 17,753 bale/year	 P/C Blended Yarn Ne 45 33,696 Spindles 15,000 rpm 18,824 bale/year
Cipadung Mill	Product Type C(includedO.E.) Yarn P/C Blended Yarn P/R Blended Yarn Average Ne 31.3 Facility Capacity 29,388 Spindles 12,000 rpm 14,594 bale (Year 1989)	 P/C Blended Yarn Ne 32.2 36,016 Spindles 13,000 rpm 15,425 bale	 P/R Blended Yarn (Rayon & other synthetic fiber) (2 inches spinning) Ne 28.0 36,000 Spindles 13,500-14,000 rpm 35,673 bale

6-2 Production Item

(1) Annual Production and Raw Material Consumption

Table 6-1 Annual Consumption of Raw Material

Mill	Product type		Production (bale/year)	Aannual consumption Kg	
				Cotton	Polyester
B-1	Cotton combed yarn	Ne 32	6,536	1,540,085	—
		40	5,462	1,287,017	—
		50	3,581	843,795	—
	P/C 65/35 yarn	Ne 20	1,550	127,830	188,450
		40	1,090	89,893	132,523
		40/2	1,020	84,120	124,012
	P/C 35/65 yarn	Ne 20	1,600	245,056	104,747
		40	1,125	172,305	73,650
		40/2	1,052	161,125	68,871
	Sub-total		23,016	4,551,226	692,253
B-II	P/C 65/35	Ne 45	18,824	1,552,432	2,288,637
	Total		41,840		

Note : Yield of cotton combed yarn calculated at 0.77.
Polyester calculated at 0.97.

Table 6-2 Annual Production and Raw Material Consumption Cipadung Mill

Product type	Production (bale/year)	Annual consumption Kg	
		Polyester	Rayon
P/R 65/35 Ne 20	15,665	1,904,544	1,025,520
P/R 65/35 Ne 30	9,835	1,195,776	643,872
P/R 65/35 Ne 40	4,836	587,964	316,596
P/R 65/35 Ne 45	3,567	433,752	233,556
P/R 65/35 Ne 40/2	1,770	215,196	115,872
Total	35,673	4,337,232	2,335,416

Note : The yield has been calculated at 0.97 as the same as polyester/rayon.

It is planned to use imported cotton mainly from U.S.A. and polyester and rayon fiber of domestic production.

For Ne 20, 2 denier polyester will be used to eliminate yarn unevenness and reduce the number of neps.

It should be fully rocognized at purchasing the cotton that how to select the cotton for the raw material to input is very important and the quality, cost and productivity of the yarn are much influenced by its selection.

The mixture propotion of the type of cotton mainly used should be unchanged and kept within 30% to 40% and for those which occupies remaining 60% to 70%, various types should be purchased as needed taking into consideration the cost and quality at that time.

(2) Quality Target

Internationally acceptable quality standards are set as target shown in the table 6-3.

Table 6-3 Yarn Quality Target

Mill	Type	Single Yarn Strength (g)	U%	Thin	Thick	Nep
				(Pieces / 1,000m)		
Banjaran I	Cotton Combed Ne 30	298-339	11.0-10.2	17-5.5	95-48	150-85
	Cotton Combed Ne 40	226-251	11.5-10.6	25-10	160-95	160-120
	Cotton Combed Ne 50	209-231	11.8-10.8	22-10	77-42	130-70
	P/C Ne 20	606-677	10.0- 9.3	9.1-2.8	42-18	58-35
	P/C Ne 40	288-388	12.4-11.6	48-22	100-60	110-70
Banjaran II	P/C Ne 45	243-266	12.8-12.4	67-33	120-73	140-80
Cipadung	P/R Ne 20	562-701	11.5-10.0	23-8.1	60-27	62-28
	P/R Ne 30	375-464	12.2-10.5	40-17	84-40	90-48
	P/R Ne 40	281-343	12.7-11.5	58-26	110-55	120-70
	P/R Ne 45	250-302	13.0-11.8	68-32	120-60	130-78

The range of 25 - 50% of USTER statistics which are recognized internationally is adopted.

6-3 Production Equipment and Facilities

The equipment of Banjaran I and Cipadung Mill are so obsolete that they should be renewed. The equipment of Banjaran II which is relatively new can be partially rehabilitated. The features of each mill are stated below.

Renovation of Banjaran I has been designed on the assumption of spinning cotton combed yarns Ne 40, 50 and polyester/cotton 65/35 or 35/65, blended yarns of Ne 20, 40, 40/2, not only for weaving use but for knitting use.

Rehabilitation Plan of Banjaran II has been formulated on the assumption of producung mainly the polyester/cotton blended yarn Ne 45. Cipadung Mill, using the raw material with 38 ㎜ cut, however, in the rehabilitation plan, it is to be designated as a spinning mill specialized to produce man-made fiber using materials with cut lengths of 44 ㎜ - 51 ㎜. The major types of man-made fiber are those with round section, and therefore, the degree of entwining among the fibers is low. The spinning for fiber cut length of 2-inch which is the leading type of machine employed for spinning man-made fibers, is designed to enable smooth spinning by setting the cut length at 51 ㎜ to compensate for the low degree of entwining. The spinning for fiber cut length of 2-inch is to be adopted at Cipadung Mill as the mill designated to spin exclusively the man-made fibers. Cipadung Mill can spin not only polyester/rayon blended yarn but also rayon and polyester 100% yarns for garment and industrial use.

6-3-1 List of Equipment

Table 6-4 shows lists of major production machines and their numbers.

The mark (N) that appears in the column of quantity indicates new equipment to be purchased. (RE) indicates that existing machines will be utilized by applying partial rehabilitation. (E) indicates to utilize existing machines as they are.

Table 6-5 shows the list of auxiliary equipment to be newly purchased.

Table 6-6 shows the list of laboratory equipment to be newly purchased.

6-3-2 Production Flow Chart

The flow of process is shown in the flow chart of Figure 6-1 to Figure 6-3.

The machines marked with double circles are planned to be rehabilitated. Those with single mark are to be newly installed.

6-3-3 Layout of Production Machines

The plans of machine layout for each mill are shown in figure 6-4 to 6-6.

Table 6-4-(1) List of Main Production Machines

-Banjaran I -

Item No	Machine/Equipment	Quantity
	Blowing Section	
RBS-1-1	Blow Room Machinery	3 lines (N) 4 scutchers
	Carding Section	
RBS-1-2	Semi High Production Card(to be rehabilitated)	48 sets (RE)
	Combing Section	
RBS-1-3	Lap Former	4 sets (N)
RBS-1-4	Combing Machine	27 sets (N)
	Drawing section	
RBS-1-5	Drawing Frame (Pre-drawing for polyester fiber)	1 set (N)
RBS-1-6	Drawing Frame (1st & 2nd Drawing)	7x2=14 sets (N)
	Roving Section	
RBS-1-7	Roving Frame	10 sets (N)
	Spinning Section	
RBS-1-8	Ring Spinning Frame	35 sets (N)
	Winding Section	
RBS-1-9	Automatic Cone Winder (Magazine Type)	12 sets (N)
RBS-1-10	Double Winder(2ply)	1 set (N)
RBS-1-11	Double Twister	8 sets (N)
RBS-1-12	Thermo Setter	1 set (N)

Table 6-4-(2) List of Main Production Machines

-Banjaran II-

Item No	Machine/Equipment	Quantity
	Blowing Section	
RBS-2-1	Blow Room Machinery	2 lines (RE) 4 scutchers
	Carding Section	
RBS-2-2	Semi High Production Card	35 sets (RE)
	Combing Section	
RBS-2-3	Lap Former	2 sets (N)
RBS-2-4	Combing Machine (TOYODA CM-8)	14 sets (RE)
	Drawing Section	
RBS-2-5	Pre-Drawing Frame (For polyester fiber.HARA D-1200)	3 sets (E)
RBS-2-6	Drawing Frame (HARA CHERRY D-800F)	3 sets (E)
	Roving Section	
RBS-2-7	Roving Frame (TOYODA FL=16)	8 sets (RE)
	Spinning Section	
RBS-2-8	Ring Spinning Frame (TOYODA RY)	78 sets (RE)
	Winding Section	
RBS-2-9	Winding Machine (MURATA MACH splicer)	9 sets (E)
RBS-2-10	Automatic Cone Winder (Magazine type)	3 sets (N)
RBS-2-11	Steam Setter (ASHIDA AV AV)	2 sets (E)

Table 6-4-(3) List of Main Production Machines

-Cipadung Mill-

Item No	Machine/Equipment	Quantity
	Blowing Section	
RCS-1	Blow Room machinery	2 lines (N) 4 scutchers
	Carding Section	
RCS-2	Carding Machine	48 sets (RE)
	Drawing Section	
RCS-3	Drawing Frame (HARA D 400MT)	4 sets (E)
RCS-4	Drawing Frame	14 sets (N)
	Roving Section	
RCS-5	Roving Frame (TOYODA FL-16)	2 sets (E)
RCS-6	Roving Frame	7 sets (N)
	Spinning Section	
RCS-7	Ring Spinning Frame	50 sets (N)
	Winding Section	
RCS-8	Automatic Cone Winder (Magazine Type)	14 sets (N)
RCS-9	Double Winder	1 set (E)
RCS-10	Double Twister	7 sets (N)
RCS-11	Roving Waste Opener	1 set (E)

Table 6-5 List of Auxiliary Equipment to Be Newly Purchased

-Banjaran I -

Item No	Equipment/Accessories	Quantity
RBA-1-1	Roving Stripper	1 set
RBA-1-2	Can with Spring & Caster	260 set
RBA-1-3	Can with Spring & Caster for Drawing & Roving	1,730 sets
RBA-1-4	Bobbin for Roving	50,400 sets
RBA-1-5	Bobbin for Ring Spinning	134,400 sets
RBA-1-6	Cart for roving	12 sets
RBA-1-7	Carrier for steame setter	16 sets
	- Banjaran II -	
RBA-2-1	Gum cot grinding machine with attachment	1 set
RBA-2-2	Can with Spring & Caster for Carding	250 sets
	- Cipadung Mill -	
RCA-1	Roving Stripper	1 set
RCA-2	Gum Cot Grinding Machine with attachment	1 set
RCA-3	Can with Spring & Caster for Carding	296 sets
RCA-4	Can with Spring & Caster for Drawing & Roving	1,170 sets
RCA-5	Bobbin for Roving	54,000 sets
RCA-6	Bobbin for Ring Spinning	144,000 sets
RCA-7	Cart for Roving	12 sets

Table 6-6 List of Laboratory Equipment to Be Newly Purchased

-Banjaran I -

Item No	Equipment	Quantity
RBL-1-1	Evenness Testing Installation (U%)	1 set
RBL-1-2	Yarn Fault Classifying Installation with Existent R.T Winder to be modified	1 set

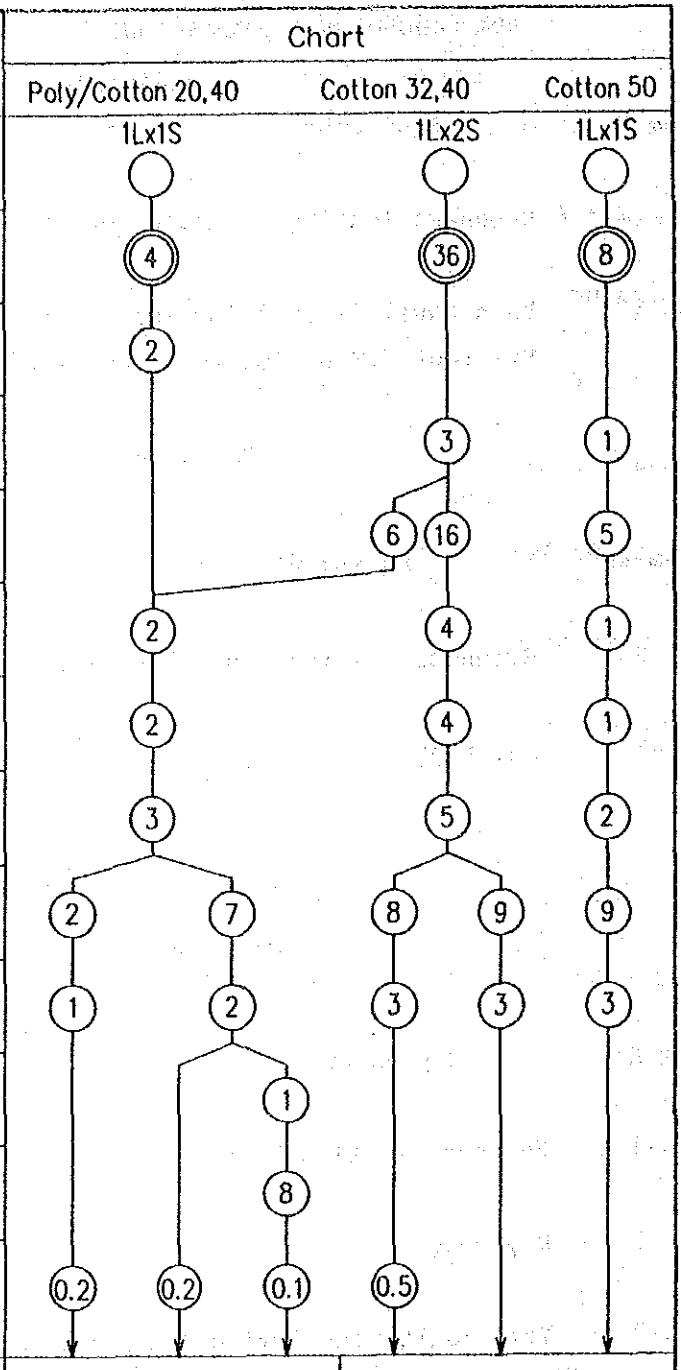
- Banjaran II -

Item No	Equipment	Quantity
RBL-2-1	Evenness Testing Installation (U%)	1 set
RBL-2-2	Dry Range	1 set

- Cipadung Mill -

Item No	Equipment	Quantity
RCL-1	Evenness Testing Installation (U%)	1 set
RCL-2	Dry Range	1 set
RCL-3	Yarn Fault Classifying Installation with Existent R.T Winder to be modified	1 set

Main Machinery	No. of M/C
Blow Room Machinery	3 line
Carding Machine	48
Pre-Drawing Frame	2
Pre-Comber	4
Comber	27
1st-drawing Frame	7
2nd-drawing Frame	7
Simplex Fly Frame	10
Ring Spinning Frame	35
Automatic Winder	12
Double Winder	1
Two-for-one Twister	8
Steam Setter	1



Production LBS/Shift	Blended Yarn			Combed Yarn		
	Ne 20	Ne 40	Ne 40/2	Ne 32	Ne 40	Ne 50
	1208.0	872.4	778.6	2539.1	2123.1	1391

○ New Machine ◎ Rehabilitation Machine

Figure 6-1 Process Flow Chart of Banjaran I

Main Machinery	No. of M/C	Chart
		Polyester 65/Cotton 35
Blow Room Machinery	2line	1Lx2S 1Lx2S
Carding Machine	35	15 20
(2D/Frame) Pre-Drawing Frame	3	3
Pre-Comber	2	2
Comber	14	14
(4D/Frame) 1st-drawing Frame	3	3
(4D/Frame) 2nd-drawing Frame	3	3
Simplex Fly Frame	8	8
Ring Spinning Frame	78	78
Automatic Winder	12	9 3
Steam Setter	2	2
Production LBS/Shift		Blended Yarn Ne 45 7311.9

○ New Machine ◎ Rehabilitation Machine

Figure 6-2 Process Flow Chart of Banjaran II

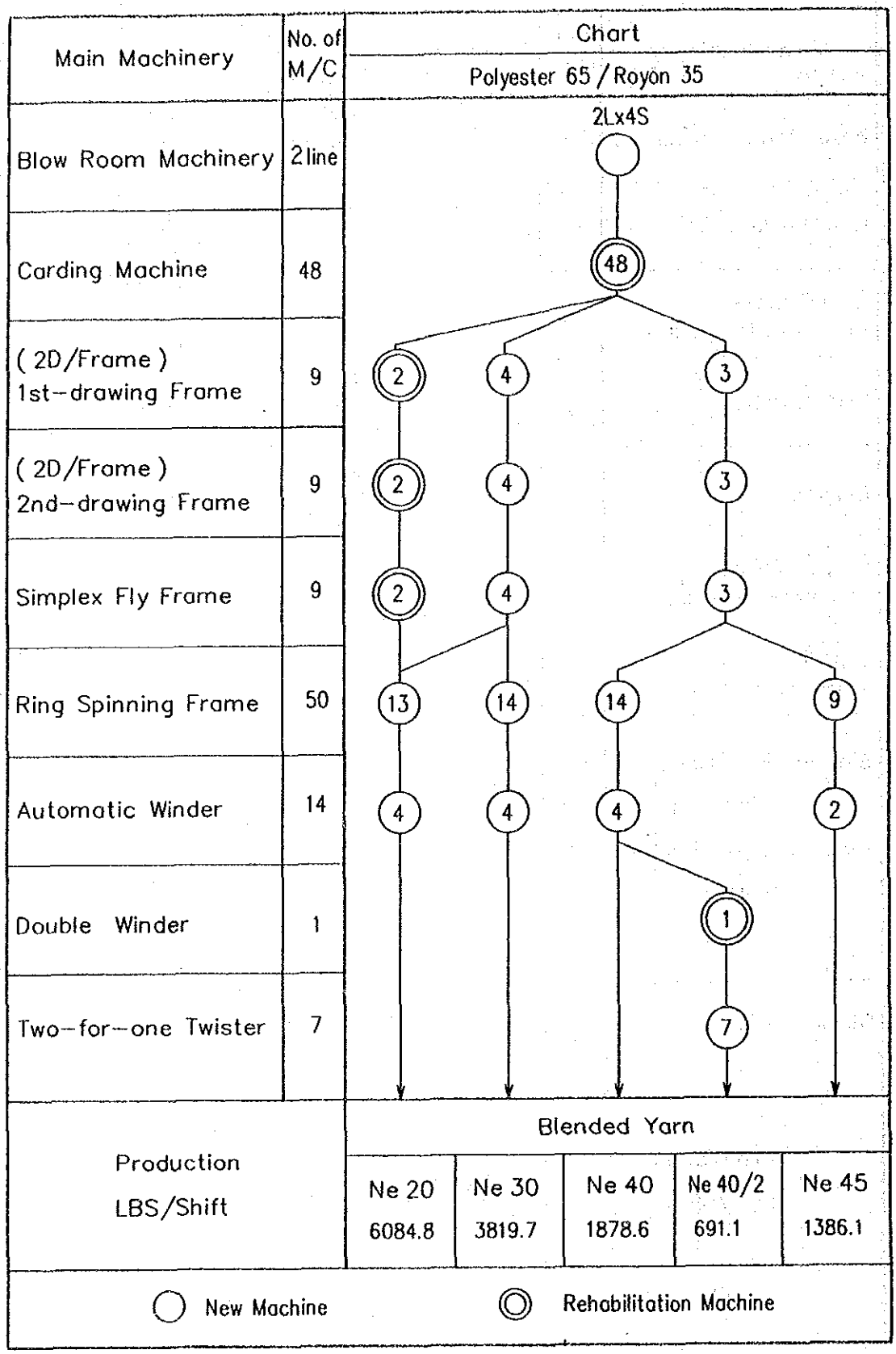


Figure 6-3 Process Flow Chart of Cipadung

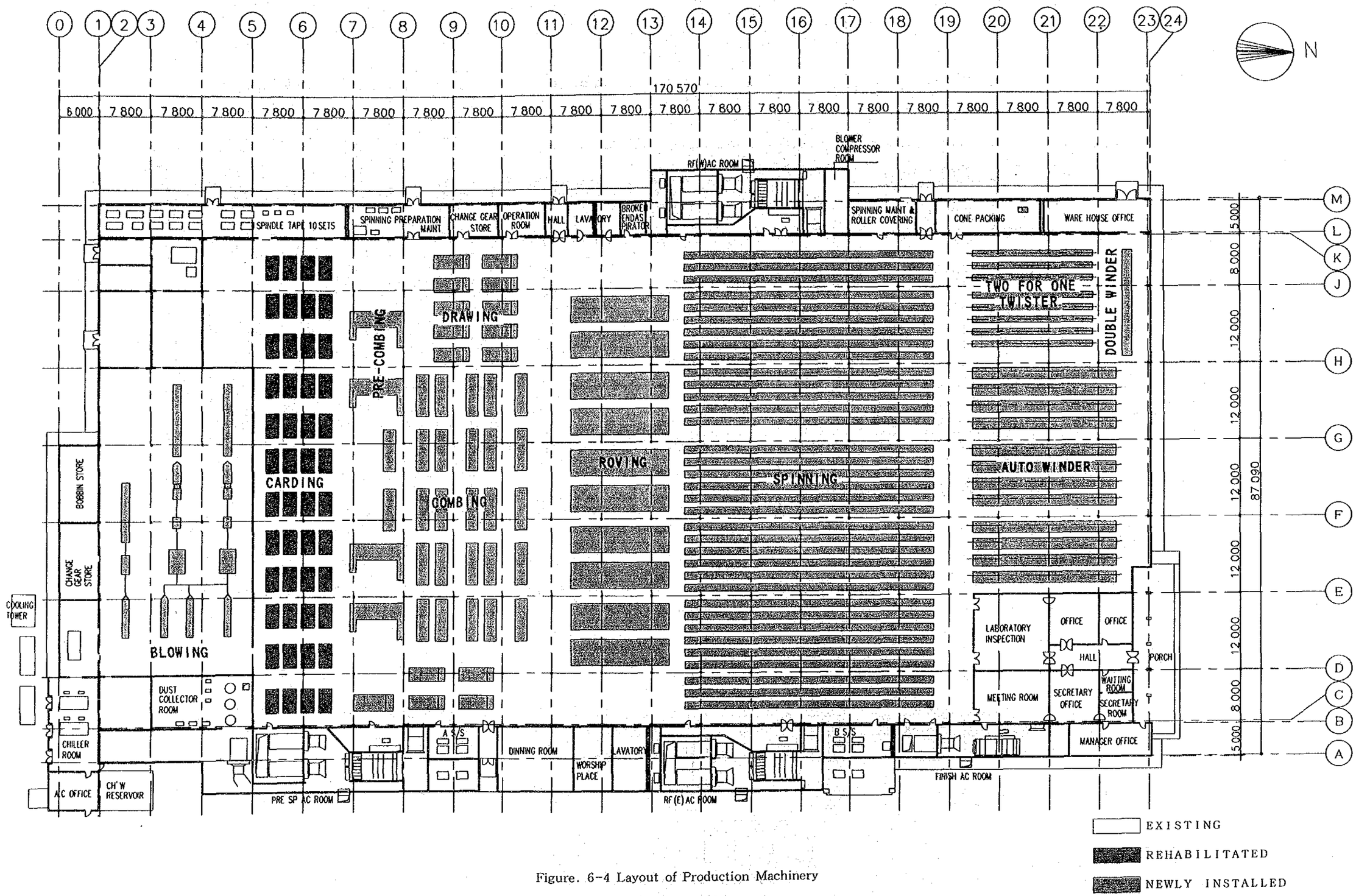


Figure. 6-4 Layout of Production Machinery

(Banjaran I)

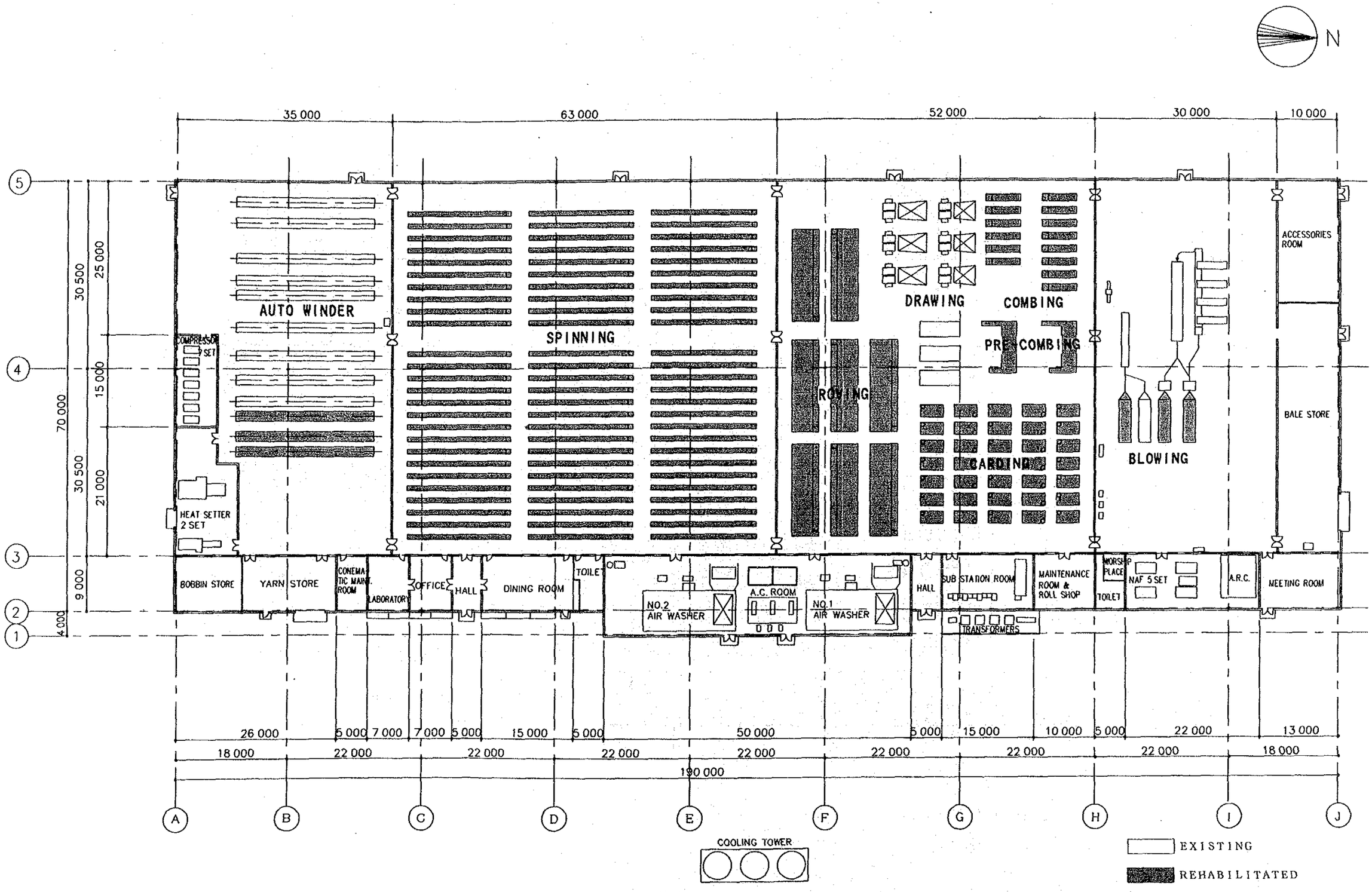


Figure. 6-5 Layout of Production Machinery

(Banjaran II)

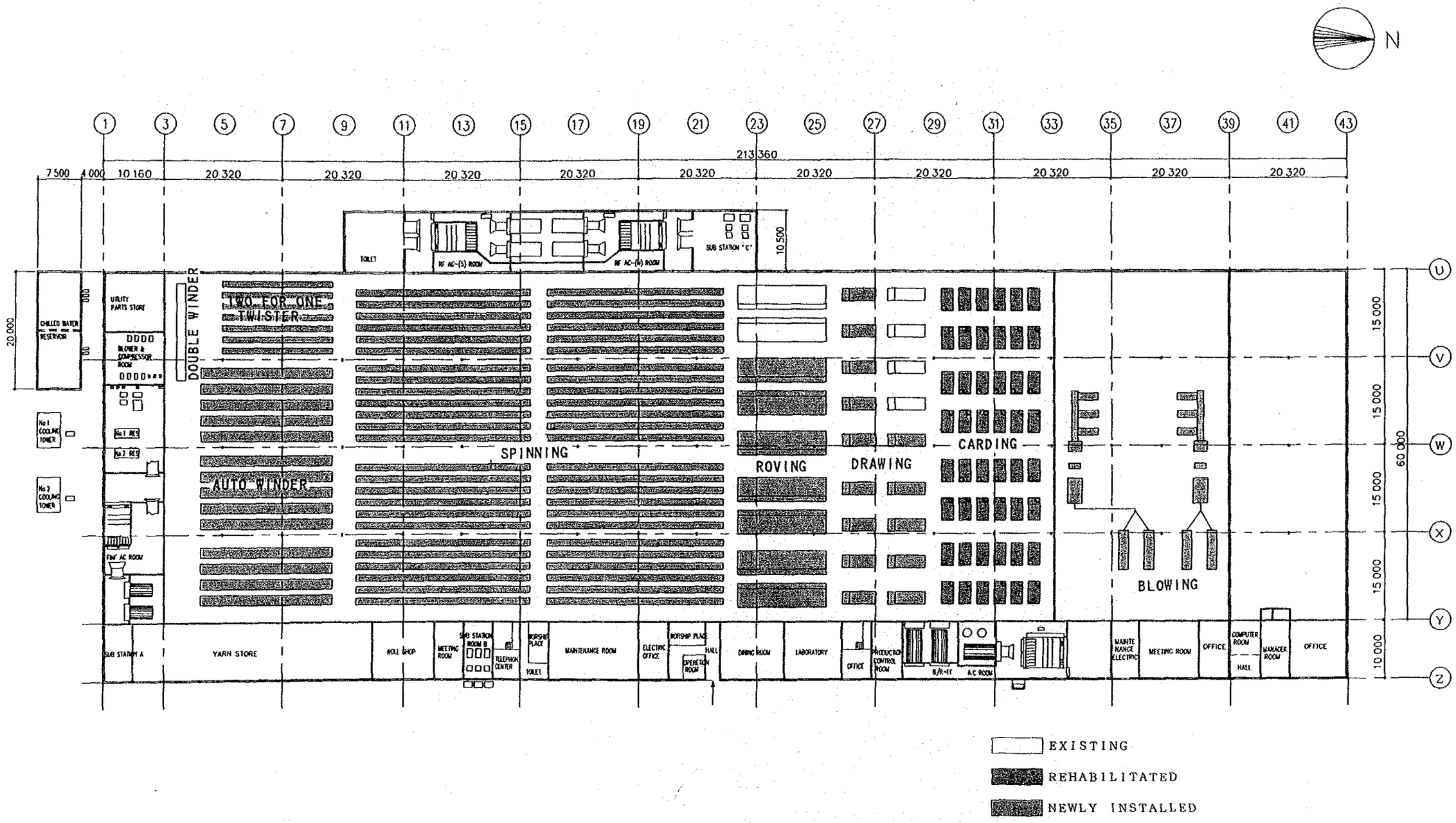


Figure. 6-6 Layout of Production Machinery

(Cipadung)

6-4 Utility Facilities and Equipment

6-4-1 Power

(1) Power Supply

The electricity supply shall be increased to accommodate the renovation of the facilities and the resultant increase in the amount of production.

Contract power supply	present		post renovated
Banjaran Mill:	4,000 KVA	→	6,600 KVA
Cipadung Mill:	2,770 KVA	→	3,500 KVA

In-house generators will not be taken into consideration and the existing one will be kept in reserve.

(2) Electricity Facilities

a) Banjaran Mill

The power receiving cable facilities will be increased to accommodate the increase of power supply. All of the electrical facilities, i.e. transformer facilities, low tension distribution lines and lighting equipment in the first mill will be replaced. The transformer for power distribution will be maintained as it is. The transformer facilities in the second mill will be used as they are. A part of wiring of low tension distribution lines and lighting equipment will be changed to accommodate the change of layout in production machines.

b) Cipadung Mill

The transformer capacity in existing incoming station is insufficient so that one set of 1,500 KVA and circuit breaker cable will be installed. Substation facilities and low tension distribution lines in the mill will be renewed.

Transformers for power distribution will be reused as they are.

6-4-2 Water Supply

Both mills can receive the following amount of water supply by using the existing facilities.

. Amount

Banjaran Mill	About 1,700m³/day
Chipadung Mill	About 900m³/day

6-4-3 Air Conditioning

(1) Banjaran Mill

a) First Mill

15,350m³/min., i.e. 858.2 USRT is required. One set of 580 USRT will be added to

two existing sets of 250 USRT.

Airconditioning facilities will be replaced. Supply ducts can be reused. Return air ducts will be installed.

b) Second Mill

Refrigerator facilities and airconditioning equipment will be used as they are but airconditioner and filter equipment will be repaired.

(2) Cipadung Mill

The airconditioning load will increase from 10,000m³/min to 14,400m³/min. The chiller is obsolete and will be changed.

Two sets of 580 USRT will be installed to accommodate the requirement of 800 USRT. All the facilities will be replaced except for the existing supply branch duct which can be reused in the prespinning and winding processes. The existing return branch duct will be reused in the pre-spinning and winding processes. The main duct and the underground duct in the spinning process will be installed.

6-4-4 Environmental Maintenance

In general, the textile factory for fiber spinning designed in this renovation project would not cause pollution.

Noise problem may sometimes occur only in the case the factory is close to the residential area.

6-5 Construction Work

Various parts of the building have become obsolete and deteriorated, requiring various remodeling and modification work to be performed.

(1) Banjaran Mill

Te production facilities for the First Mill are scheduled to be completely replaced. Various parts of the building have become obsolete and deteriorated, requiring various remodeling and repairing work to be performed. However, for the Second Mill, use of the existing production facilities will be continued except for the carding machines, and the renovation work will involve only the modifying and repairing of part of the floor.

No new building will be constructed except for the airconditionning room. Since the flow of men and material will remain unchanged, there will be hardly any changes in the entire layout of the mill at the time of its renovation.

(Expansion)

Mill No.1: Air-conditioning room
Mill No.2: None

(Remodeling)

Mill No.1: Floor, underground duct, machine foundation, ceiling, partition, doors and windows
Mill No.2: Floor (partial), machine foundation (partial)

(Repair work)

Mill No.1: Wall mortar, roof, valley gutter, outside down pipe, toilet (one place only), ceiling
Mill No.2: None

(2) Cipadung Mill

Like Banjaran Mill, the construction of an air-conditioner room is the only extension work required on the building. Also scheduled is the construction of toilets (for both male and female) by using the space under the supply duct, which should solve the current shortage of toilets at the mill.

So as not to alter the flow of men and materials, few changes will be made on the overall layout of the mill.

(Extension works) Air-conditioner room (Part used for construction of new toilets)
(Remodeling works) Floor, underground ducts, partitions, machine foundation, doors and windows, interior drainage
(Repair work) Wall mortar, ceiling, toilets

6-6 Work Implementation Schedule

A proposal for the work implementation schedule (See Figure 6-7) has been prepared, and the proposal is made on the following premises.

(1) The period of time from signing of the consulting agreement to the signing of contractor (supplier) agreement is 12 months.

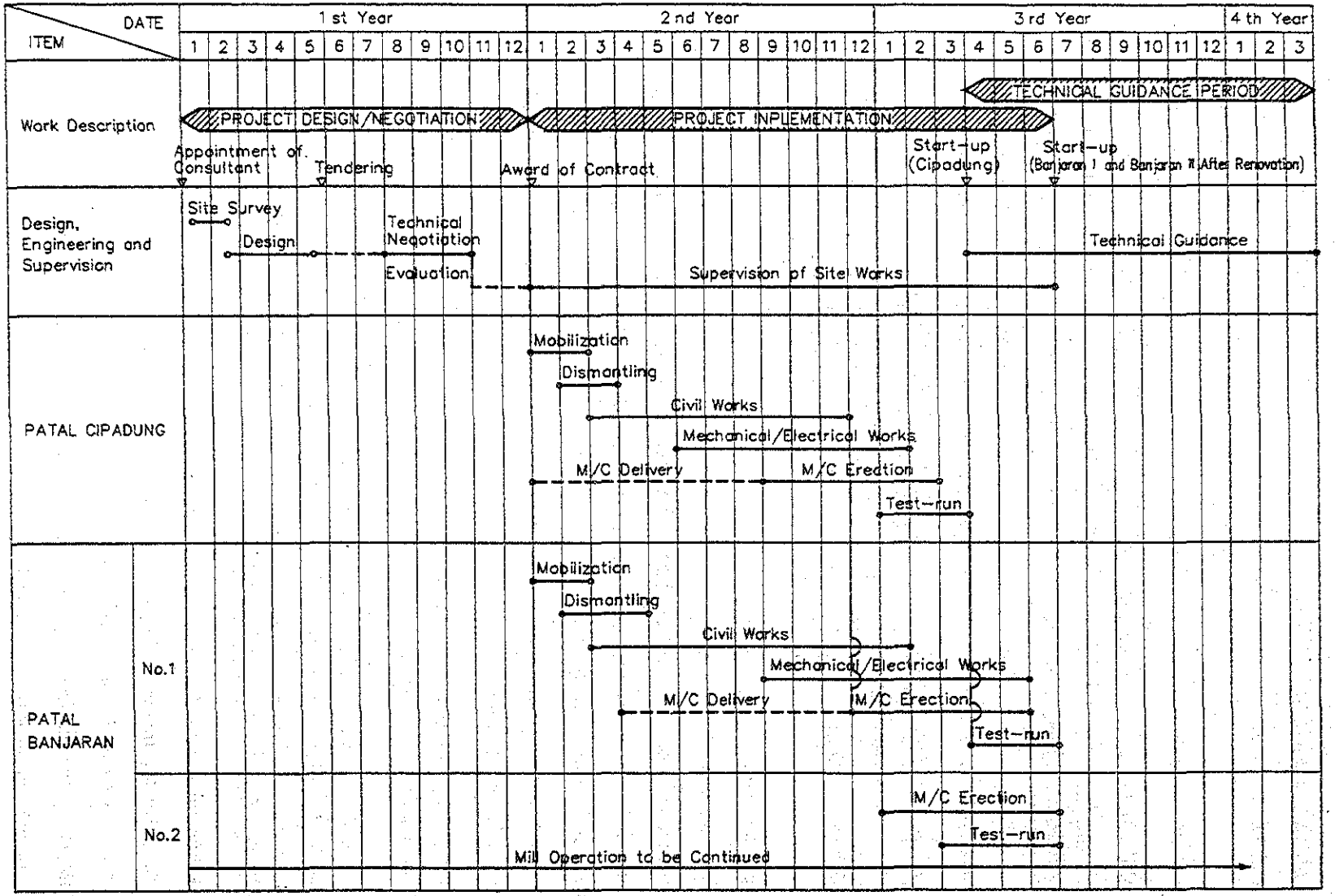


Figure 6-7 Renovation of Banjaran/Cipadung Mill

Tentative Implementation Schedule

(2) The construction period is assumed to require 18 months.

For the smooth installation of machines and performance tests, machine installation and tests for Cipadung Mill will be performed three months earlier than Banjaran Mill. Consequently, Cipadung Mill will commence operation 15 months after start of work on the project and three months earlier than the start of operation of Banjaran I.

(3) For Banjaran Mill II the main renovation will be limited to 35 sets of carding machines and introducing pre-drawing frames. Modification will be performed step by step while continuing the present production. The modification work will be completed at the same time when operation of Banjaran I starts.

(4) The period of technical training by a training firm will be for one year after completion of Cipadung Mill.

6-7 Operation Plan

6-7-1 Personnel

The local staff plans before and after operation are described below.

a) Administration Department

Banjaran Mill

From the start up of rahabilitation of the First Mill, the work load of the administration department should be minimized, although the work load of the Second Mill will remain unchanged. This would possibly allow the number of local staff to be reduced to the proper number when renovation of the First Mill and rehabilitation of the Second Mill have been completed. The number of local staff in the administration department will not be changed thereafter.

Cipadung Mill

The number of local staff will be reduced to the proper number when renovation is completed, and full scale operation starts.

b) Auxiliary Department

Banjaran Mill

All work and maintenance will be performed with the present number of local staff until the project for the Second Mill is completed. After the project starts, the number of local staff will be reduced to the proper level as in other departments.

Cipadung Mill

The present number of local staff will be kept until the project is completed. After the

project has been completed, the number of local staff will be reduced to the proper level as in other departments.

c) Production Department

Local staff force in the production department will be reduced to the proper level when renovation is completed, and full scale operation starts.

The table 6-7 and 6-8 shows the changes in the number of personnel over the project period.

6-7-2 Operation Plan

For an organization to work properly and efficiently, it should be simplified as much as possible so that the jurisdiction of authorities can be made clear. The following organization is recommended.

6-7-3 Education and Training Program

After the renovation is completed, the production technologies for the new equipment, technique of related quality control and preventive maintenance, control technology and knowledge of peripheral machines and equipment must be completely acquired.

Table 6-7 Change in the Number of Personnel

Banjaran Mill

	Dept.Chief	Supervisor	Ass. Supervisor	Foreman Operator	Total	Decrease %
Present						
Banjaran I	1	5	21	771	798	
Banjaran II	1	6	16	379	402	
Utility	1	4	10	90	105	
Administration	5	14	24	131	174	
Total	8	29	71	1,371	1,479	
Construction Period						
Banjaran I	1	6	21	498	526	34.1
Banjaran II	1	6	16	379	402	0
Utility	1	4	10	90	105	0
Administration	5	13	20	91	129	25.9
Total	8	29	67	1,058	1,162	21.4
Decrease %	0	0	5.6	22.8	21.4	
After Start Up						
Banjaran I	1	6	21	498	526	34.1
Banjaran II	1	6	21	344	372	7.5
Utility	1	4	9	65	79	24.8
Administration	5	13	20	91	129	25.9
Total	8	29	71	998	1,106	25.2
Decrease %	0	0	0	27.2	25.2	

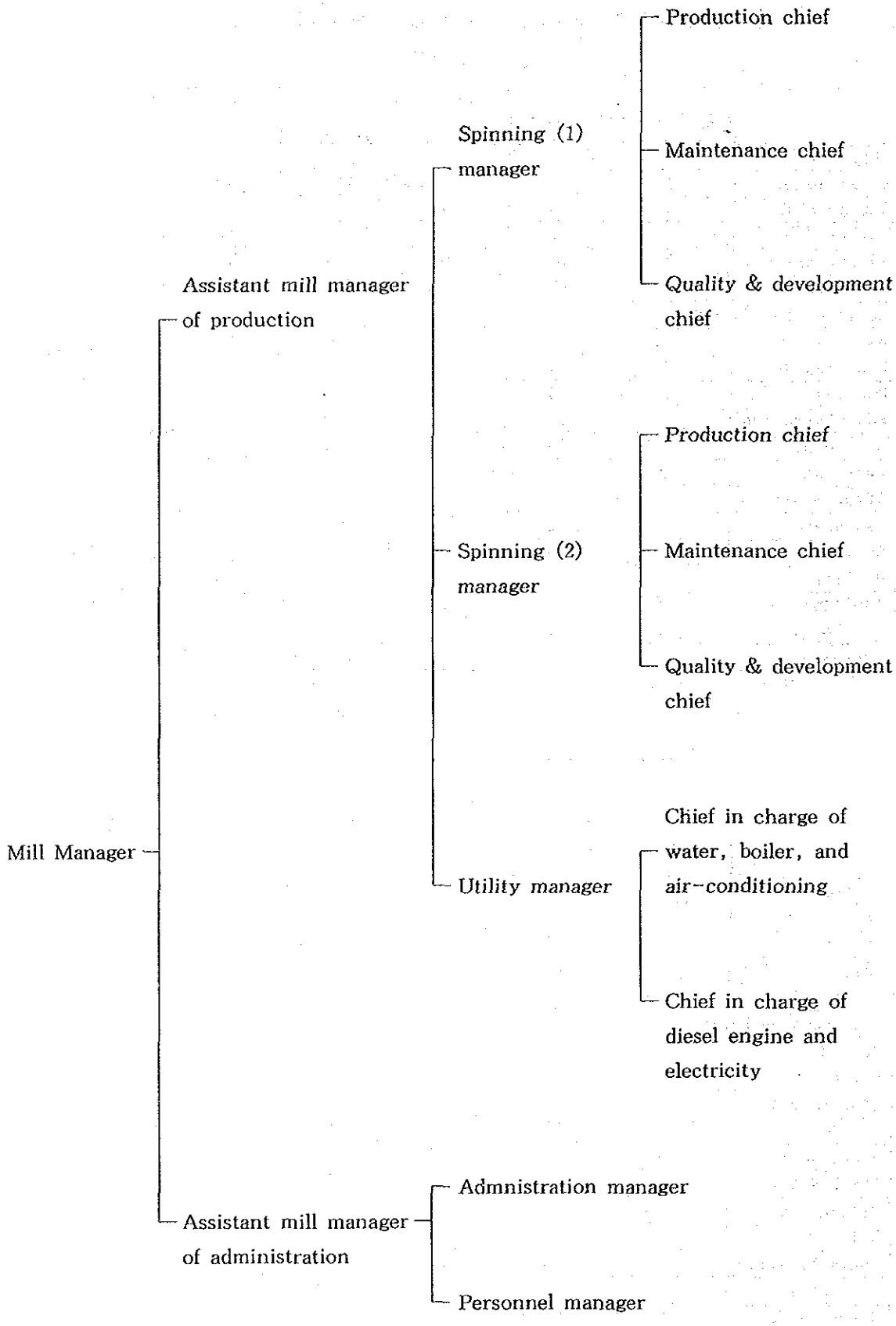
Note: Mill manager is not included.

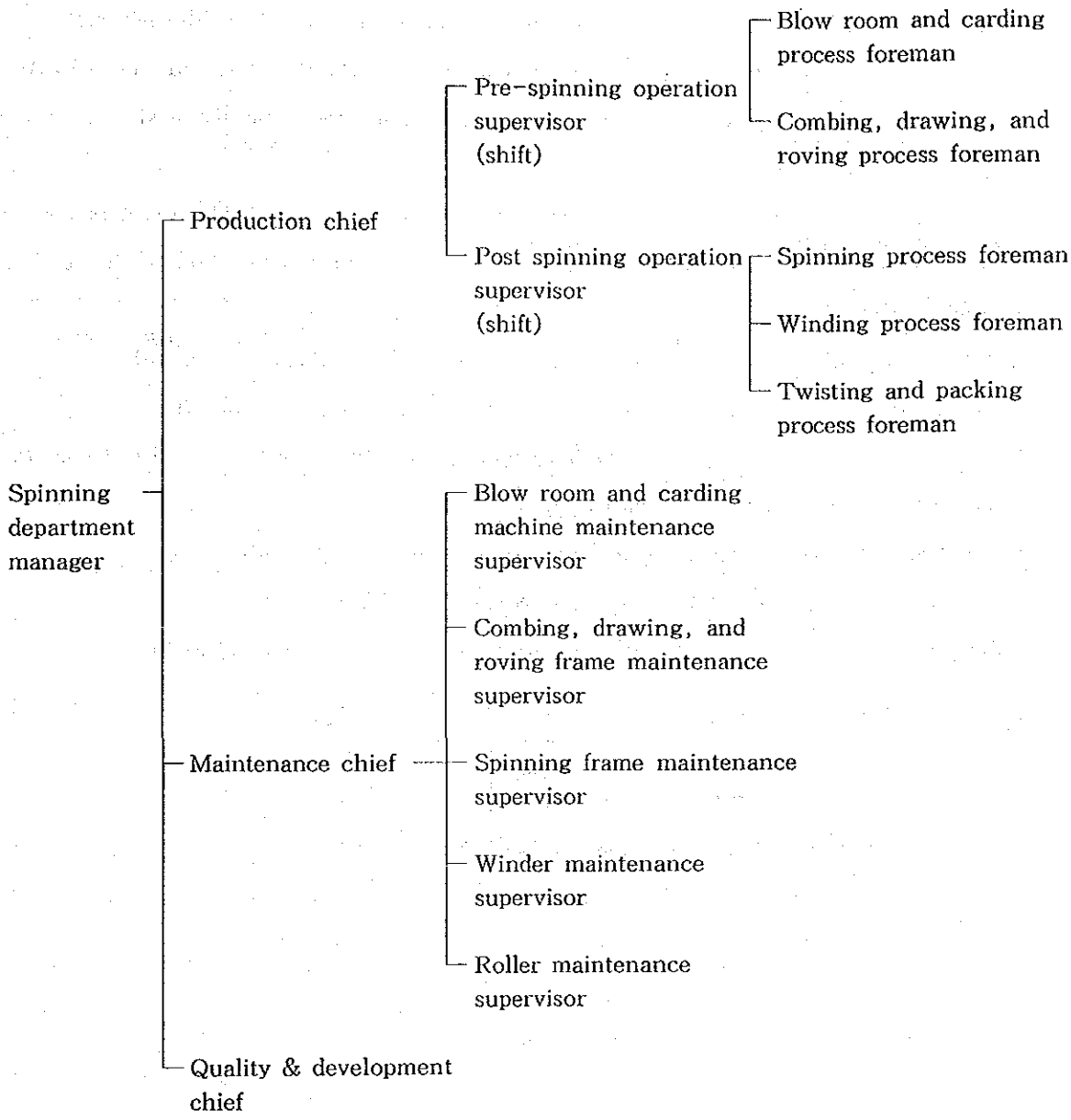
Table 6-8 Change in the Number of Personnel

Cipadung Mill

	Dept.Chief	Supervisor	Ass. Supervisor	Foreman Operator	Total	Decrease %
Present						
Production	1	5	20	628	654	
Utility	1	3	6	65	75	
Administration	5	13	23	100	141	
Total	7	21	49	793	870	
Construction Period						
Production	1	6	21	511	539	17.6
Utility	1	3	6	65	75	0
Administration	5	13	19	79	116	17.7
Total	7	22	46	655	730	16.1
Decrease %	0	+4.8	6.1	17.4	16.1	
After Start Up						
Production	1	6	21	511	539	17.6
Utility	1	3	5	53	62	17.3
Administration	5	13	19	79	116	17.7
Total	7	22	45	643	717	17.6
Decrease %	0	+4.8	8.2	18.9	17.6	

Mill manager not included


Mill Manager
Assistant mill manager of production
Spinning (1) manager
Production chief
Maintenance chief
Quality & development chief
Spinning (2) manager
Production chief
Maintenance chief
Quality & development chief
Utility manager
Chief in charge of water, boiler, and air-conditioning
Chief in charge of diesel engine and electricity
Assistant mill manager of administration
Admnistration manager
Personnel manager


Spinning department manager
Production chief
Pre-spinning operation supervisor (shift)
Blow room and carding process foreman
Combing, drawing, and roving process foreman
Post spinning operation supervisor (shift)
Spinning process foreman
Winding process foreman
Twisting and packing process foreman
Maintenance chief
Blow room and carding machine maintenance supervisor
Combing, drawing, and roving frame maintenance supervisor
Spinning frame maintenance supervisor
Winder maintenance supervisor
Roller maintenance supervisor
Quality & development chief

Education and training should be carried out with consistency from the preparation of detailed design, equipment selection, rehabilitation, installation, test run, and to actual operation. The short-term training for management technique in advanced countries is also required.

Tentatively total training period will be 27 months : 15 months during the construction of Cipadung Mill plus 12 months after the start up. Training period will be divided into following stages.

(1) 1st stage: Training performed through engineering work: Approx. 5 months

(2) 2nd stage: Overseas study and training for local staff Approx. 3 months

(3) 3rd stage: Training through construction work, installation of machines, and test operation and adjustment: Approx. 8 months

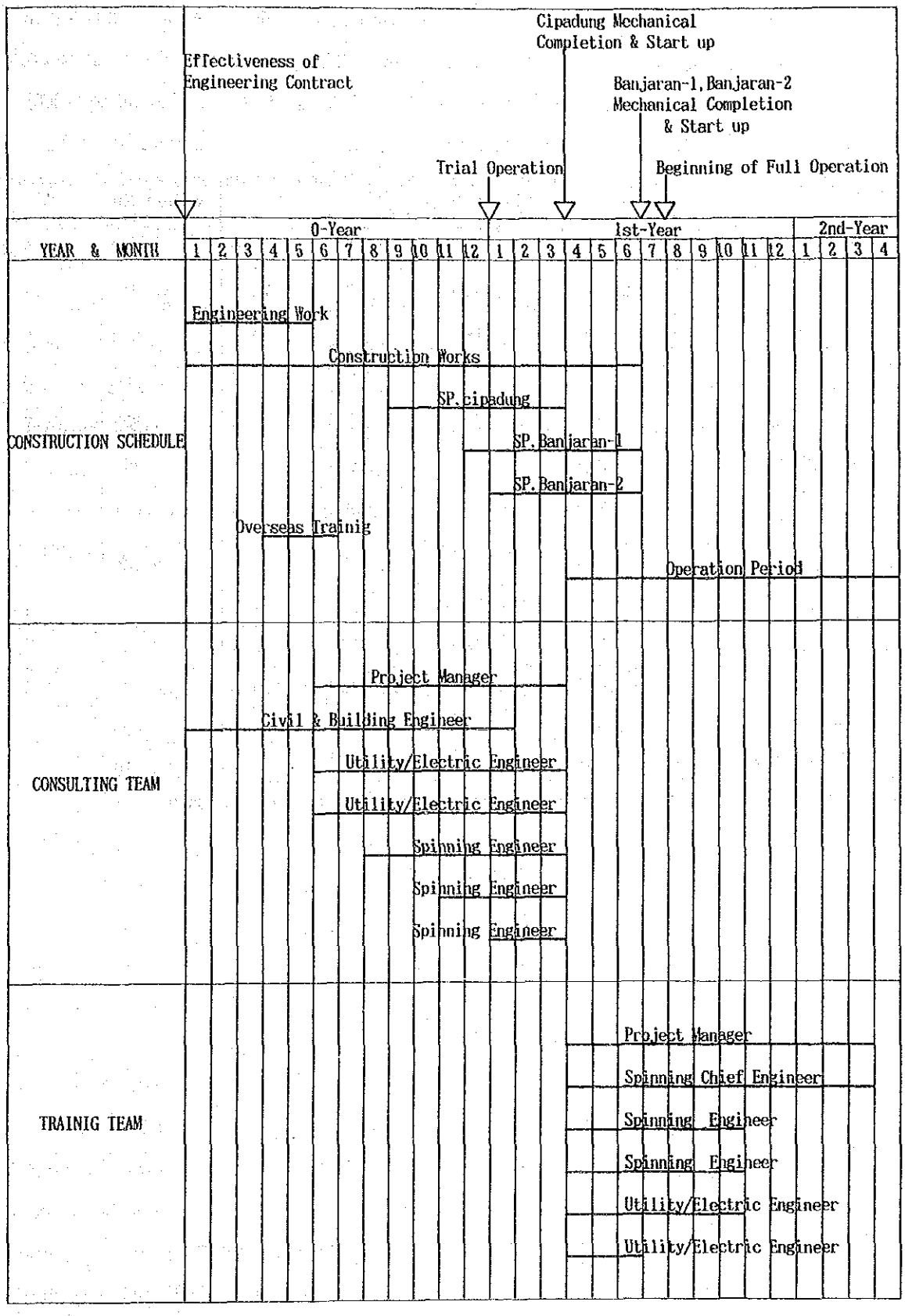
(4) 4th stage: Final training in normal operation : Approx. 12 months

The dispatch schedule of training staffs is shown in Figure 6-8.

The number of trainees and period of overseas training are planned as follows:

Type of Work	Person	Period
Overall management of the spinning mill	3	2 weeks
Overall spinning operation	3	3 months
Overall spinning maintenance	3	3 months
Total	9	19 man/month

Figure. 6-8 Dispatch Schedule of Training Staffs



6-8 Capital Requirement

The total of capital requirement for the renovation plan is shown as follows. The total capital requirement for Banjaran Mill amounts to 76.94 billion rupiahs. (or ¥ 5,364,630,000) The total for Cipadung Mill amounts to 57.352 billion rupiahs. (or ¥ 4,433,200,000)

Construction		Banjaran I Million Rp	Banjaran II Million Rp	Banjaran Mill Total Million Rp	Percentage %	Cipadung Mill Million Rp	Percentage %
Civil Works		3,571	60	3,631	5.0	1,397	2.6
Machinery Procurement (CIF)		45,346	9,431	54,777	76.3	42,250	77.9
Porthandling/Inland Transport		306	18	324	0.4	312	0.6
Insurance		96	20	116	0.2	90	0.2
Pre-oprational Expenses	Labor Costs	2,407	152	2,559	3.6	1,832	3.3
	Utility Costs	349	39	388	0.5	405	0.7
	Raw Material Costs	740	416	1,156	1.6	817	1.5
Consulting Fee		1,889	333	2,222	3.1	2,162	4.0
Training Fee		915	162	1,077	1.5	906	1.7
Contingency		4,805	771	5,576	7.8	4,055	7.5
Subtotal		60,424	11,402	71,826	100	54,226	100
Interest during Construction		3,670	598	4,268		2,490	
Total of Capital Requirment		64,094	12,000	76,094		56,716	

Note:The interest during construction in case of Loan/Equity ratio Fo/30

7 EVALUATION OF RENOVATION PLAN

7-1 Required Funds and Funding Plan

7-1-1 Required Funds

The summary of required funds of each case is as follows:

Unit: M.Rp	Case 1-A	Case 2-A	Case 3-A
Capital Requirement	92,152	67,981	160,133
Fixed Capital	77,923	57,783	135,706
Buildings	3,631	1,397	5,028
Machinery & Equipment	55,217	42,652	97,869
Preoperating Expenses	4,103	3,054	7,157
Consulting Cost	2,222	2,162	4,384
Training Cost	1,077	906	1,983
Contingency	5,576	4,055	9,631
Interest d/Construction	6,097	3,557	9,654
Working Capital	14,229	10,198	24,427
	Case 1-B	Case 2-B	Case 3-A
Capital Requirement	90,323	66,914	157,237
Fixed Capital	76,094	56,716	132,810
Buildings	3,631	1,397	5,028
Machinery & Equipment	55,217	42,652	97,869
Preoperating Expenses	4,103	3,054	7,157
Consulting Cost	2,222	2,162	4,384
Training Cost	1,077	906	1,983
Contingency	5,576	4,055	9,631
Interest d/Construction	4,268	2,490	6,758
Working Capital	14,229	10,198	24,427

7-1-2 Funds Plan

Unit: M.Rp	Case 1-A	Case 2-A	Case 3-A
Source of Fund	92,152	67,981	160,133
Paid-up Capital	0	0	0
Long Term Loan (Foreign)	62,013	48,470	110,483
Long Term Loan (Local)	30,139	19,511	49,650

	Case 1-B	Case 2-B	Case 3-B
Source of Fund	90,323	66,914	157,237
Paid-up Capital	27,097	20,174	47,171
Long Term Loan (Foreign)	34,916	27,594	62,510
Long Term Loan (Local)	28,310	19,246	47,556

Fund Raising Plan

(1) Loan interest and repayment terms

- Long-term loan in foreign currency: Interest rate 10%
  20 semi-annual equal installments with a grace period of 2.5 years
- Long-term loan in local currency: Interest rate 18%
  20 semi-annual year equal installments with a grace period of 2.5 years

Current interest rates quoted by the international organizations to state-owned companies through the Indonesian government were used as loan interests.

(2) Loan/equity ratio

Case A : 100/0

Case B : 70/30

7-2 Financial Analysis

7-2-1 Preconditions for Financial Analysis

(1) Forecast Project Period

Construction period 1.5 years starting from July 1994 and ending in December 1995

Operating period 11 years starting from 1996 and ending in 2006

(2) Calculation Standard

1) Base year: June 1991

2) Indicating currency: Indonesian Rupiah (Rp)

3) Exchange rate: Average exchange rate in June 1991

US$1 = ¥137.75 = Rp1,954

Rp1 = ¥0.0705

4) Inflation

As the inflation rate in Indonesia has been stable during the past ten years, all expenses and cost and benefits that will arise in the future are evaluated under constant prices.

Since inflation estimation will involve macro economic problems, such as currency expansion, deflation, currency demand, savings, and investments, price changes during the project period are not incorporated and future expenses and services are evaluated under constant prices

(3) Base Case for Study

As a result of the technical study of the renovation plan the following strategy has been put forward:

Banjaran I - Sales profitability is to be improved based on the change of products into higher count ones and their quality improvement by replacing almost all of outdated facilities and equipment.

Banjaran II - Product quality is to be improved through partial rehabilitation of production lines.

Cipadung Mill - Based on the strategy of promoting joint sales with Banjaran Mills, production is to be splecilized in man-made yarns and the improvement of production efficiency and sales profitability is to be attained by replacing outdated facilities and equipment almost completely.

From a technical viewpoint, the above plans are found to be optimal. In studying the financial viability of this project, the following three alternatives are assumed as renovation plans:

Case 1 - Renovation will be carried out only at Banjaran Mill.

Case 2 - Renovation will be carried out only at Cipadung Mill.

Case 3 - Renovation will be implemented at both Banjaran and Cipadung Mills.

(4) Simulation Case in the Study

Simulation Case 1 : 5% up & down in sales prices

Simulation Case 2 : 13% up & down in raw material procure ment cost

Simulation Case 3 : 2% up in the interest on loans

In judging from the various aspects such as yarn prices in the past, the change in inflation, the future's trend of facilities and equipment installation and the growth of textile consumption in Indonesia, product sales revenue is assumed to increase 5% at the mid-point of the project life. In consideration of the price fluctuation of the cotton market in the past, prices of raw materials are assumed to go up and down by 13% over the present price in the future.

(5) Basic Concept of Manufacturing Cost Analysis

1) *Method of cost calculation*

The overall cost calculation method was adopted under which actually incurred expenses for the manufacture of the products completed in a year are used in computing production cost. Because the process is a single process that manufactures yarn out of raw materials, the single process calculation method was adopted.

Manufacturing cost for each product is calculated based on the overall cost, using the standard index, ultimately to be utilized as the data for determination of the price for each product.

2) Operation ratio

A ratio of operation of 95% is assumed for the first year of operation. A full 100% is assumed for the years after the second year of operation.

3) Conditions for taxation

The tax that should be taken into account in calculating manufacturing cost is the value added tax (VAT or PPN).

The VAT to be paid by a taxable enterprise is to be calculated by deducting input tax (to be paid at the time of purchase) from output tax (to be levied at the time of sales), which is derived by multiplying sales prices by the tax rate of 10%. Both sales price and purchase price are added by this tax and its balance payable will be put in the tax column of the profit and loss statement.

4) Influences by price fluctuation

Manufacturing costs are based on the estimate made in June, 1991, without considering expected inflation on cost and profit. Especially, specific input of the project which may have a drastic price increase does not appear in this analysis.

7-2-2 Methods of Financial Analysis

Based on the preconditions stated above, financial plans are then prepared for the entire project prediction period for each base case.

The following output data for the financial plans are computed.

1) Manufacturing Cost Plan
2) Profit & Loss Plan
3) Cash Flow Plan
4) Balance Sheet Plan

The advantages/disadvantages of each case will then be judged through the financial analysis

of each case, examination of financial indicators, etc.

In the case of development projects or rehabilitation (or renovation) projects, there is a method of using IRR, calculated from the profit balance (or incremental profit) in order to assess the difference between benefits and costs in the case of implementation of the project (with case) and non-implementation of the project (without case), thereby evaluating viability of the project. In this case, however, only assessment under " without case," will be done.

7-2-3 Result of Financial Analysis

The comparison of economic efficiency for each case is shown as follows. Case-A shows less favorable figures than B, therefore, the comparison is limited only to Case A for convenience.

Assessment indictors	Case 1	Case 2	Case 3	Economic efficiency
DCFRR(IRR)				
Before tax	31,73%	24.78%	28.81%	1 > 3 > 2
After tax	28.69%	22.53%	26.11%	1 > 3 > 2
NPV (discount 10%)	M.Rp	M.Rp	M.Rp	
Before tax	101,235	49,233	150,468	3 > 1 > 2
After tax	80,637	38,417	119,054	3 > 1 > 2
Breakeven point	years	years	years	
Discount rate 0%	3.1	3.8	3.6	1 > 3 > 2
〃 〃 10%	3.8	4.8	4.5	1 > 3 > 2
EMIP	2.1 〃	2.6 〃	2.3 〃	1 > 3 > 2
CRR	%	%	%	
Before tax	130	85	111	1 > 3 > 2
After tax	103	65	88	1 > 3 > 2
Gross profit rate	34.59%	30.0%	32.34%	1 > 3 > 2
Net profit rate	%	%	%	
Before tax	16.41	13.67	15.31	1 > 3 > 2
After tax	10.67	8.89	9.95	1 > 3 > 2
Sales amount break-even point	M.Rp 51,922	M.Rp 38,032	M.Rp 89,870	
Operating ratio break-even point	77%	84%	80%	1 > 3 > 2
Cover-ratio				
(yearly)	1.48-2.92	1.13-2.40	1.38-2.70	1 > 3 > 2
(accumulated)	1.92	1.58	1.77	1 > 3 > 2

As indicated above, it can be concluded that all the three cases are financially feasible. In terms of IRR, Case 1 is the most feasible followed by Case 3 and then Case 2.

I.R.R. (R.O.I. after tax) of each sensitivity analysis is as follows:

Case of Sensitivity Analysis / Base Case	− 1	− 2	− 3	− 4	− 5	− 6
Case 1	31.72	25.73	25.26	31.64	29.19	28.76
Case 2	25.43	19.45	18.41	25.76	23.13	22.70
Case 3	29.08	23.11	22.40	29.17	26.65	26.22

Note. − Case of sensitivity analysis

1 − 5% up in sales price

2 − 5% down in sales price

3 − 13% up in raw material procurement cost

4 − 13% down in raw material procurement cost

5 − 2% up in the interest on loans

6 − Addition of spinning equipment and rehabilitation of electrical equipment (Supplement by the request of Sandang I)

7-2-4 Economic and Social Evaluation

(1) Evaluation by economic price

The following assumptions were made in order to convert market prices into economic prices.

1) Transfer item

Tax and depreciation costs are excluded from the cost.

2) In appreciating domestic assets, the value of SCF for this calculation was 0.87.

3) In converting labor expenses into international prices, SCF was applied to skilled labor and the shadow rate, of 0.8 was adopted for unskilled labor.

The calculated EIRR are as follows. All the cases are judged feasible.

Case 1 38.52%

Case 2 30.79%

Case 3 35.24%

(2) Social effects of the project

1) Creation of employment opportunity

Because the spinning is a labor-intensive industry, the implementation of this plan will contribute to the stabilization of employment opportunity in Indonesia.

2) Outward environmental effects

If other industries outside a mill are damaged or if environmental pollution is caused, such outward environmental or technological effects are considered to be negative benefits, and expenses required to mitigate them will be posted directly in cost items in the course of project evaluation. Now that environmental issues attract worldwide attention, any project that may be detrimental to environmental protection on earth will become difficult to execute no matter how much its financial feasibility is high.

Under such a situation, the spinning project, whose negative factor in terms of outward environmental effects will be virtually nil, is expected to be regarded favorably from a social viewpoint. No particular problems are conceivable if some measures are taken to muffle machinery noise and noise from in-house power generation and to treat oil discharged of negligible level.

3) Social Mission of Sandang Textile Mills

It is an important mission for Sandang I to secure yarn for use by small scale users and provide yarn in a stabilized manner to meet basic needs of the people. Therefore, the mills can be considered to be making great contributions to the society.