2) Power Distribution Facility Within the Mill:

Now, the power available at Cilacap Spinning Mill is composed of the one being purchased from PLN and the other generated privately for themselves (by Diese generation).

As indicated above, as the purchasing power from PLN is 6,000 volts, their generation by Diesel has been 6,000 volts.

The power distributed to CP-1 and CP-2 with 6,000 volts (high voltage) is dropped to 220 volts for 3-phase power and to about 127 volts for single phase power respectively by transformers installed at each Mill.

Figure 8 indicates the present skeleton connecting diagram for the distribution.

Our site survey conducted on the high voltage wiring cables revealed the following problems;

In the 1st place, the cable insulation is with a butyl rubber, of which type of cable is noted for cracks caused at ends or bent parts, and their much use of this type of cable poses problem.

Secondly, their laying of the cable through under ground pits may cause deterioration in insulating capacity due to insufficient heat radiation. Our examination into the past incidences told us that one of such reports reported that a cable pit punctured due to overheat caused by too tight laying of cables in the same cable pit, followed by inevitable widening of the distance among cables.

Of the equipments installed in the Mill, all of them, excluding a turbo refrigerator using 6,000 volts, are operated with low voltages of 220 volts for 3-phases power and 127 volts for single phase power.

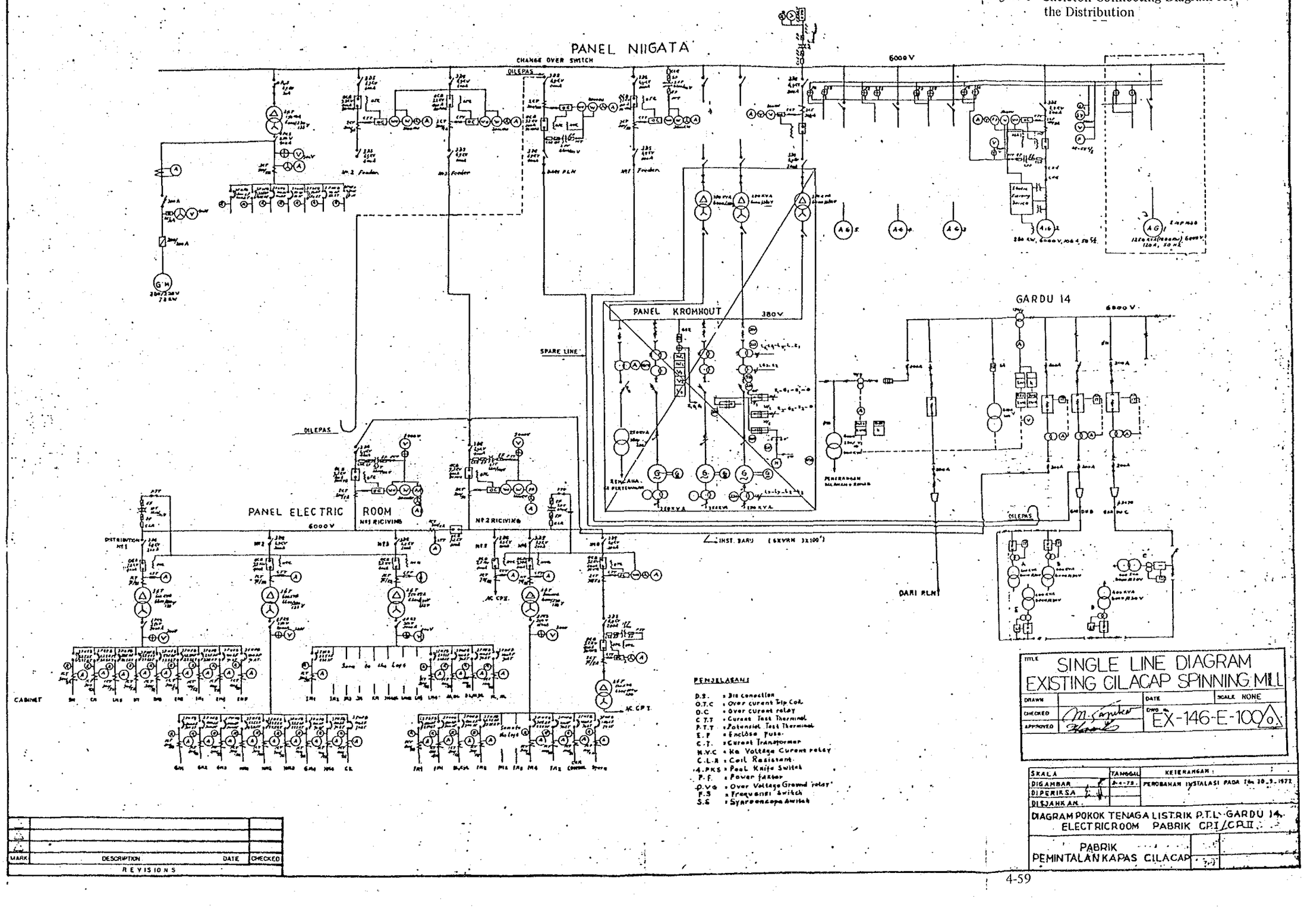
After the voltage-dropping transformer, these low voltage distribution (220V and 127V) reach within the Mill compound through the distribution panel, then go through another distribution panel installed on a wall near machines before being connected to each machines.

The problems involved in the area after the voltage-dropping transformer are as follows, for which appropriate repairs are desired;

- The voltage-dropping transformer, as well as 5 sets of power distribution equipments including the breaker are much aged as they are made in 1963. Further, these equipments are dispersedly installed around the Mill, which desirably are to be positioned at a place for strengthening their control.
- The type of power fuse used in the distribution panel is found obsolete, for which the spare parts are difficult to be found. This type of fuse is required to be replaced for safety and fire prevention as well.

In consideration of the energy-saving, the low voltage of 220V is desirably to be changed to 380V, which at the same time has a merit in saving materials for low voltage power distribution.

Figure 8 Skeleton Connecting Diagram for the Distribution



3) Private Generation Facility:

Our survey on the history of the Diesel generation facility revealed the following:

In 1962, 4 sets of the Diesel generator for 1,100 KVA were installed. For the subsequent over 10 years, the generators had been operated with high load for selling surplus power to outside users. However, in 1967 the damage to the generators due to vibration of engine caused by coming-off of the anchor bolts etc., were made known. To remedy the situation, 1 set of 1,250 KVA was additionally installed in 1972.

However, still in later years the damage to the 1,100 KVA engine due to vibration increased the extent, and in 1974, the crank shaft to one of them (No. 5) had been broken, leaving it inoperative. Additionally, in 1982, another 1 set (No. 2) of them suffered breakage of the crank case, leaving it inoperative. As the similar damage to No. 5 and No. 2 were made known for engines of the remaining 2 sets (No. 3 and No. 4), in 1982 there was no alternative but to operate them with the rated output lowered down to 50% of it. To supplement the shortage of power caused by this situation, buying power from PLN has commenced as from 1978, when the contracted power volume was 900 KVA, which as the output of the Diesel generators went down in ensuing years, was increased to 2,175 KVA in 1982.

At the present, their private generation caters power only for the production purpose in CP-2, while the required power for the production purpose and air conditioning facility in CP-1 are catered by the purchased power from PLN.

In the following, the present situation of the Diesel generation facility is described. Table 19 indicates the operating result of each Diesel generator as at June, 1984.

Table 19 Present Capacity of Diesel Generation Facility

No.	Capacity KVA	Nearest powwible maximum load KVA	Actual load KVA	Operating data		Remark
				Fuel Oil ℓ/KWH	Lubricating Oil ℓ/KWH	
1	1,250	750	375	0.32	0.006	
2	1,100	–	–	–	–	Suspended from '82
3	1,100	550	250	–	–	
4	1,100	550	300	0.36~0.34	0.017	
5	1,100	–	–	–	–	Broken in '74
		267,650 KWH/month				

Note) The data shown above are as at June, 1984. In addition, there are 3 sets of Diesel generator made in Netherlands, however, they are left broken and are inoperative.

Table 20 shows the problems involved in the existing Diesel generators. As aforesaid, it should be judged that the present troubles are caused by vibrations due to unstable foundation.

Table 20 Problems involved in Diesel Generation Facility

No.	Capacity	Descriptions
1	1,250 KVA	Defective nozzle ring of the super charger (turbo blower) and defective lubrication oil pump, causing remarkable deterioration in performances.
2	1,100 KVA	Serious damages to engine bed and crank case, cam shaft, and super charger (turbo blower), leaving the set inoperative.
3	1,100 KVA	Abrasion at crank shaft and crack at engine bed are found.
4	1,100 KVA	Same as above.
5	1,100 KVA	Inoperative due to broken crank shaft taken place in June, 1977.

We have examined the possibility of recovering the performances by conducting an overhaul for them, however, in consideration of a big amount of investment required for replacement of the larger-sized parts, as well as of the operating cost after the repairs, we consider that repair or remodelling measure will not be less costly than buying the power from PLN.

4) Comparison of actual Costs between Buying Power and Diesel Generation:

When comparing the cost of the power by the actual data from Cilacap Spinning Mill between the purchase power and Diesel generated power, the power consumption for the purchasing power is about 1,000 kwH as against the contracted 2,175 KVA at present, which means that the purchasing power is cheaper than the Diesel generation.

Table 21 shows the cost comparison using the result in April, 1984.

It is deemed that because the Diesel is with lower load and aged, the cost for the Diesel generation is expensive.

The result of our examination into the power cost with an assumption that the new Diesel generating facility is installed, revealed that the cost would be almost same with the purchasing power cost from PLN.

Therefore, at this stage we cannot yet decide that the Diesel generation is more advantageous than the purchasing power.

Table 21 Comparison of Power Cost

Result in April, 1984

Purchasing Power (PLN)		Diesel Generation	
Using Electricity Charge		Fuel Consumption	Rp.55,928,547
6:00 P.M.~10:00 P.M.(WBP)		Lubricating Oil Consumption	Rp. 8,313,750
115,200KWH x @96.5 = Rp.11,116,800		Labour Expense	Rp. 5,643,751
Time zone other than above		Repair Cost	
572,400KWH x @60.5 = Rp.34,630,200		Repair Cost for Diesel Engine	Rp. 6,310,688
		Repair Cost for Aux. Equipment	Rp. 3,477,640
Basic Charge 2,175KVA x @2,100 = Rp. 4,567,500		Other Material Cost	Rp. 3,601,072
		Depreciation Cost	Rp. 2,675,667
Share for Road Illumination Cost			
(115,200+572,400KWH) x @3			
= Rp.2,062,800			
Expense for Stamps	Rp.10		
Total Cost	Rp.52,377,310	Total Cost	Rp.85,951,115
Volume of Purchased Power			
115,200 + 572,400 = 687,600 KWH		Volume of Generated Power	1,031,494 KWH
Average Unit Cost	Rp. 76.17	Unit Cost	Rp. 83.33

Source : Cilacap Spinning Mill

4-3-3 Outline of Utility Equipment:

With the Mill situated in the tropical area, the air conditioning facility in the productive process in spinning should be indispensable.

In order to produce the high quality spun yarns acceptable for the exports, fairly precise control over temperature and humidity should be required.

We have assessed on the facilities while taking these needs after the renovation into our consideration.

1) Refrigerator in CP-1 mill:

5 sets of receprocal-type refrigerator, each with 75 US Rt, made in 1955 by Carrier Co., U.S.A are installed. Out of these, already one (No. 2) has been broken and left inoperative, with other 4 sets in the aged and inefficient condition. The recent maximum load ratio is 69% for No. 1 machine, 71% for No. 3 and No. 4 and 51% for No. 5, adding up to the total maximum output of nearly 200 US Rt, which is falling short of the required refrigerating output even compared with the currently required cooling load (about 280 US Rt), causing room temperature and humidity uncontrollable and leading to the inferior spinning condition.

There is also a report telling inability of procuring spare parts, which accompanies apprehension over operations in future.

2) Refrigerator in CP-2 mill:

2 sets of refrigerator with each capacity of 420 US Rt made by Hitachi in 1962 are installed. They are turbo refrigerators, for which cooling medium Trichloro Fluoro Methane –11 is used.

One of the 2 sets has already been made inoperative and the other 1 set has never been overhauled since the installation, causing as a result the present maximum possible output lowered to about 280 US Rt for the aged and deteriorated condition. For instance, there is a problem of the lubricating oil leaking out of the sealing part at its compressor shaft, and the type is so old that the spare parts are difficult for procurement.

Similar to CP-1, the cooling load is too large for the refrigerating output, causing the room temperature and humidity uncontrollable, which should be replaced at the time of the renovation.

3) Auxiliary Equipments to Refrigerator:

As the cooling tower is so aged and corroded that it is deemed not to be used in future. The corrosion is observed severe as the location is near the sea, a part of well water becoming salified, and iron structure used being easily corroded. This should be replaced at the time of the renovation.

The aged and inefficient condition also applies to pumps. Those pumps should also be replaced by those of with suitable design with the new refrigerator and air conditioning equipments in order to promote the efficiency and save energy, at the same time with the renovation.

4) Air Conditioning Facility in CP-1 mill:

At present, there are 14 sets of small-sized unit air conditioner hung from ceiling are equipped in CP-1 mill: Their rated capacity per set is 240 m^3/m, which made 3,360 m^3/m in total, however, the present actual capacity has decreased down to about 2,000 m^3/m.

Due to short capacity of the refrigerator as aforesaid, as well as shortage of the air volume, performance of the air conditioning facility is observed almost lost, due to which reason, they tend to open high windows to release hot air, leading to received larger variation caused by the outside air. The decrease in the air volume is considered to have been caused by the aged deterioration in the form of corrosion and blockage, as well as too small capacity, and therefore, those should be replaced at the time of the renovation.

5) Air Conditioning Facility in CP-2 mill:

The air conditioner and ducts now used are made in 1962. From out result of the visual check, the following equipments are considered to be usable in future;

- One set of supply and return ducts.
- Casings for pre-spinning and ring spinning air conditioners, and concrete water reservoir.
- One set of air conditioner for winding section and supply fan.
- A part of the return fan.

In the following a part of design values for tha air conditioning facility at the time of CP-2 construction is described:

- Air conditioner for pre-spinning and ring spinning machines.s: 5,666 m^3/m
  Cross dimension at washer part: 5.3 m(H) x 7 m(W)
- Air conditioner for winding section: 990 m^3/m
  Cross dimension at washer part: 3.5 m(H) x 1.7 m(W)

However, the supply fan for the pre-spinning and ring spinning section, water spraying equipment, eliminator and air filter thereof are observed aged and deteriorated, which should be repaired at the time of the renovation.

4-3-4 Watering Concern:

1) Water Source:

All water being used in the Mill is taken from the well. There are 14 wells provided, however, number of well usable is observed to be 10. Some of the existing wells are seen buried back and others are with inferior water quality of salified water, which cannot be operated.

All wells are shallow with depth down to 20 meters. The wells are made with the nominal diameter of 150 m/m (150A), into which suction ducts of 50A connected to the centrifugal pumps are inserted and tops of the ducts are sealed by concrete structure.

2) Water Consumption Volume:

In the Mill, water is mainly used for supply to the cooling tower and air conditioning facility, soft water for yarn dyeing and boilers and drinking water. The drinking water is catered up to the auxiliary facilities including company houses. In order to prevent salification of water, it is required to reduce water consumption volume, and therefore, saving in water use is required.

Tables 22 and 23 indicate the supplying and consuming situation of water, and Figure 9 shows the location of the wells.

Table 22 Used Condition of Wells

Result in May, 1984

Group No.	Well No.	Specification of Well		Pumping-up Volume	
		Depth (m)	Pump Capacity	m^3/Hour	m^3/Day
1	2	10	10 (HP)	18	432
	3	10	10		
	10	10	10		
2	4	20	10	30	720
	5	20	10		
	6	20	10		
	7	20	10		
	9	20	10		
3	11	15	5	4.2	403
	12	7	5	4.2	
	13	7	5	4.2	
	14	7	5	4.2	
Total			100	64.8	1,555

Table 23 Condition of Water Consumption

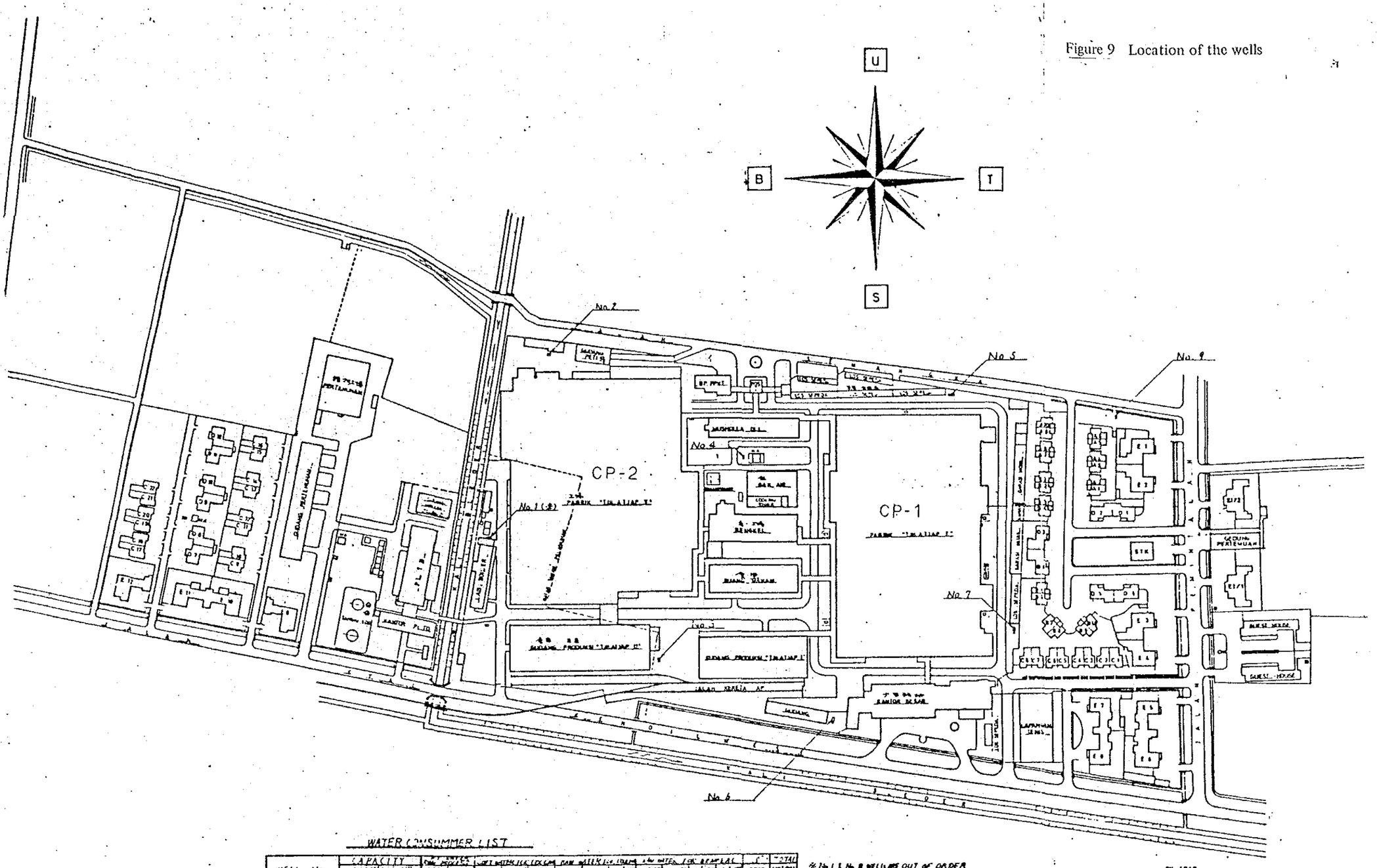
Result in May, 1984

Well Group No.	1	2	3
Soft Water for Production			
Dyeing and Bleaching	432		
Boiler	7.2		
Soft Water for Cooling			
Diesel Engine	0.5		
Steam Setter	3		
Bleaching	3		
Cooling Water			
Diesel Engine			25
Air Conditioning		24	
Drinking Water			
Administration Office		20	
Production Mill		400	
Company House		350	200
Guest House			100
Total	1,464.7 m^3/day		

Source: Cilacap Spinning Mill

The characteristic point in the water consumption situation is that too much of it is used for drinking purpose. The cause is considered to be leak from defective water taps at washing basins. Moreover, it is supposed that much volume may be leaking from the buried underground tubes due to their aged and deteriorated condition. On the other hand, the volume of water being catered to the air conditioning facility including cooling tower is observed to be less, which makes us worry over possible condensation of scale ingredient in it.

Figure 9 Location of the wells



WATER CONSUMMER LIST

WELL No.	CAPACITY		HP													TOTAL	TOTAL
2	100		10														
3	100	18	10	432	72	03	3	3								543	455.20
10	100		10			10											
4	100		10													768	
5	100		10													432	
6	100	30	10							24		20	400	350		1516	764
7	100		10													612	
9	100		10													639	
11	70	42	5						25							33.3	25
12	70	42	5											100		772.0	100
13	70	42	5											100		69.4	100
14	70	42	5												100	40.4	100
TOTAL	1080	6480	100	432	72	125	3	3	25	24		20	400	552	100		3564.7

※ No. 1 & No. 8 WELL ARE OUT OF ORDER
(a) —
(b) BOILER
(c) MACHINE 2 & DIESEL
(d) CONDENSUR AT STEAM SETTER
(e) PUMP
(f) MACHINE 2, DIESEL & OFFICE
(g) M/C & CONDENSOR FOR A/C
(h) PRODUCT MACHINE
(i) OFFICE
(j) —
(k) —
(l) GUEST HOUSE
△ OVER 100 PPM OF WELLS ARE USELESS

PABRIK PEMINTALAN KAPAS "TJILATJAP"

SKALA	1 : 1000	TANGGAL	EX-146-U-100
DIGAMBAR	SUHARTO	21-1-19	
DIPERIKSA			
DISAHKAN			

SITUASI PABRIK PEMINTALAN KAPAS "TJILATJAP"

3) Water Quality:

The water quality, as compared with anion (Cl^-, SO_4^{2-}), has very high components of hardness (Ca, Mg) and alkali (HCO_3^-) bearing strong scaling nature. Also from large amount of potassium parmanganate consumption, it is supposed that ground surface water is mixed in.

There are some wells observed where the water contains much chlorine ion due to admixture of sea water. In particular, the water in the well to the Southern side of the Mill near seashore has a tendency of containing denser saline ingredients. Moreover, as Java island is a volcanic island, the silicic acid content (SiO_2) is comparatively high.

The above is the major characteristics of the water quality, and Table 24 indicates the analysed data of water at No. 6, No. 9 and No. 13 as at March, 1981.

Table 24 Water Quality Data

	Well	Drinking Water Standard in Japan
Consumption of $KMnO_4$ ppm	4 ~ 8	10 >
PH	7.7 ~ 7.9	5.8 ~ 8.6
Electricity Conductivity $\mu s/cm$	590 ~ 985	–
Ca mg/ℓ	44 ~ 55 as $CaCO_3$ 110 ~ 137.5	Hardness 300 >
Mg mg/ℓ	50 ~ 64 as $CaCO_3$ 206 ~ 263	
SiO_2 mg/ℓ	60	–
HCO_3 mg/ℓ	302 ~ 426	–
Cl mg/ℓ	43 ~ 156	200 >
SO_4 mg/ℓ	5 ~ 42	–

Source: Cilacap Spinning Mill

4) Water Tank and Related Equipments:

Several tanks and equipments are used for collecting and supplying water, of which specification for major ones is as follows;

Well: Those pumpable: 12, including 2–3 salified.

Elevated Tank: Elevated tank for drinking water – Capacity 15 m^3
– Height 15 m
made of iron plate
Sprinkler tank for fire prevention – Capacity 50 m^3
– Height 22 m
– made of iron plate
Fire prevention tank No. II – Capacity 15 m^3
– made of iron plate

Water Tank: Central water tank – 900 m^3, made of concrete
Reserve water tank – 80 m^3, made of concrete

Water-softening Equipment – Rasin volume 180ℓ 25 m^3/h

5) Watering Expense:

According to the data provided by Cilacap Spinning Mill, the recent actual cost is as follows:

Cost of raw water: 90Rp/m^3
Cost of softened water: 150Rp/m^3

4-3-5 Fire Fighting Facilities and Equipment

Though not regulated legally, a fire fighting facility is equipped as a self-defence measure. The fact that there has been no serious fire accident occurred since the initial operation in 1952 should remind us the worthiness of the fire fighting facility having been equipped.

Table 25 indicates installed condition of the fire fighting facility.

1) Fire Hydrant:

Outdoor fire hydrants are equipped around main mill buildings, which are well maintained. However, for each hydrant, the hose is equipped for only one piece, which, considering fire combats at center of spacious mill building or on roof, would require the following improvements;

- Number of spare hoses is increased.
- Ladders and ropes are always provided.
- Sham fire combats are conducted according to examples of various kinds of actual fire accidents in order to improve in fire combatting techniques, as well as in fire prevention equipments.

Indoor fire hydrants are equipped only in C-1 Mill and not in C-2 Mill, however, rather than to plan to increase those indoor, it should be better to consider utilization of existing facilities including the outdoor fire hydrants and improvements in their use.

Material used for pipes to fire hydrants and sprinklers is the cast iron tube. Our test of pouring water out of the fire hydrant did not result in draining rust. Judging from normal life of the cast iron, we consider those tubes retain sufficient residual life. Should there be any problem occurred to those tubes, it must be leak caused by uneven sinking of them buried underground or by car traffic.

2) Sprinkler:

In the main mill buildings, there are sprinklers equipped. However, they are not equipped in the raw cotton warehouse, but it is considered that the raw cotton warehouse can be protected by outdoor fire hydrants and other fire prevention measures.

During our survey visit within the Mill, we noted many holes at ceiling (around pillars and disengaged ceiling boards).

As the sprinkler cannot extinguish a fire taken place at or above ceiling, if cotton dust get into above ceiling through the hole and is caught fire, this would cause the serious fire accident. Therefore, immediate disposition for cleaning up the area above ceiling and for blocking those holes should be required.

3) Pump for Sprinklers:

The pump itself can be well used in future as it has been used less frequently. The only problematic point is the oil switch attached to a motor for the pump, which, if a short circuit occurs at the secondary side at its starting, the oil may jump out of the switch, causing much hazard to its operator.

Therefore, the switch should be replaced by the one of other type. The pump is to be manually operated. When the fire is known by an alarm gong, the fire site is to be checked and the pump is to be operated manually as required.

Table 25 List of Fire Fighting Facility

	Equipment	Specification	Quantity
1	Fire Hydrant		
	Outdoor Fire Hydrant	CP-1 65 m/m diameter	16 pcs
		CP-2 65 m/m diameter	12 pcs
	Indoor Fire Hydrant	CP-1 40 m/m diameter	12 pcs
		CP-2 Not equipped	0
2	Sprinkler		
	Elevated Water Tank	Height 22 m, Capacity 50 m^3	1 unit
	Pressurizing Pump	51 m^3/min, 80KW x 220V x 3ϕ	1 set
	Alarm Valve	CP-1 Moisture type	2 pcs
		CP-2 Moisture type	2 pcs
	Sprinkler	CP-1 Actuating temp. 72°C	1,533
		Max. pressure 2.5 kg/cm^2 G	
		CP-2 Actuating temp. 68°C	1,473
		Max. pressure 2.5 kg/cm^2 G	
3	Water Supply	Central Water Tank	1 unit
		Concrete made 900 m^3	
4	Fire Extinguisher	CP-1 Powder type (ABC)	22 pcs
		Foam type (AB)	26 pcs
		CO_2 type (BC)	2 pcs
		Bucket	58 pcs
		CP-2 Powder type (ABC)	26 pcs
		Foam type (AB)	34 pcs
		CO_2 type (BC)	6 pcs
		Bucket	76 pcs

4-4 Area and Buildings

4-4-1 Area

The land and area related with Cilacap Spinning Mill, including warehouses located in the city, are approximately 167,000 m² as a whole, among which about 55,000 m² is the rented ground.

Table 26 Land and Area of Cilacap Spinning Mill

Land Owned:	Mill Site	73,810 m²
	Guest House Site	11,542 m²
	Warehouses in City	24,479 m²
	Land for rent	2,754 m²
	Sub-total	112,585 m²
Rented Ground:	Mill Site	52,959 m²
	Warehouses in City	1,724 m²
	Sub-total	54,683 m²
Land Owned & Rented Ground Total		167,268 m²

The Mill Site including land for company houses at the west of Pemintalan Street has the area of 126,769 m² which is considered appropriate for the spinning mill of 60,000 spindles. However, taking into consideration the vacant lot and company houses at the west of the Bleder River, the land area for production activity is rather tight and is not considered to have enough area for the future expansion.

4-4-2 Buildings

The buildings in Cilacap Spinning Mill are shown in the following table together with respective rates.

Table 27 Buildings in Cilacap Spinning Mill

Production Mill:	CP-1	10,909.44 m²	20.3%
	CP-2	12,030.11 m²	22.4%
Warehouses:	in the site	5,827.50 m²	10.8%
	in the city	5,476.00 m²	10.3%
Electricity & Utility Building		3,181.87 m²	5.9%
Administrative, Canteen, etc.		2,656.27 m²	4.9%
Company Houses & Guest House		10,093.63 m²	18.8%
Others		3,550.02 m²	6.6%
Total		53,724.84 m²	100.0%

As regards the Building-to-land ratio, i.e. the ratio of the building area against the total area of land, it is 32.1% against the total land area, and 37.3% against the mill area at the west of Pemintalan Street.

4-4-3 Corrosion and Maintenance of Buildings and Structures

Both Cilacap Spinning Mill No. 1 and No. 2 are more than 20 years old since their construction. Futhermore the location is under severe weather condition, i.e. at the sea-side where there is strong salty sea breeze. Therefore the extent of corrosion and deterioration of the buildings and structures has been considerably severe and crucial.

The structure and finishing of present buildings are outlined in the following table.

Table 28 Structure and Finishing of Buildings

	Structure	Roofing	Wall	Ceiling	Floor
Production Mills	Steel Structure	Corrugated asbestos-cement sheet	Blick with plaster finishing	Plain Asbestos Cement sheet with Vinyl paint	Cement Blicks
Auxiliary Buildings & Warehouses	Steel Structure, & partially wooden structure	Galvanized iron sheet, Corrugated asbestos-cement sheet	Blick with plaster finishing	–	Mortar
Administration Building & company houses	Blicks or Reinforced concrete structure	Tile roof	Blicks with plaster finishing	Plain asbestos-cement sheet	Terrazzo

It is observed that many places require remedial works and/or replacement woks. For instance, deterioration of corrugated asbestos-cement sheet roofing, corrosion of setting bolts, corrosion of iron sheets for valley gutters, corrosion of iron structures, breakdown and peeling-off of wall, breakdown and sinking of floor, deterioration and breakdown in water supply and sanitary equipment, etc. It is however considered that the main structures such as foundation and steel structures are still keeping the enough strength, although partial deterioration and damages are observed.

Consequently it is necessary that fundamental remedial works of respective elements except main structures shall be carried out in this renovation plan.

The maintenance of buildings and structures is easily overlooked, because it is not directly related with production. However the deterioration of working circumstances due to leaking of rain, corrosion, dirtiness, etc. would lower the productivity, and furthermore the durability of buildings would lower, as well. It is therefore necessary to pay careful attention to the maintenance and repairing of the buildings and structures.

4-5 Personnel Concerns and Training:

4-5-1 Personnel Concerns:

1) Outline:

The Mill was transfered in April, 1983 from the state-run management to the government-run management, but in the meantime to this date there are points observed where adjustment between the old and new management style is not yet well made, as well as places where control are not existent.

In the beginning of 1982, the Mill held about 2,500 employees under its employment, however, due to worsened profitability or to preparation for being transfered to the government management, the numbers of the employee decreased drastically to about 1,100 and maintained to this date.

The rule of employment applicable is almost same for the state-run and government-run conditions and they are well-arranged, however, its execution and operation are not going well. The point of strict guidance for the employee is lacked largely and their application of penal clauses against employees not observing the rule seems to be very indulgent. This status is deemed not to be the result of being changed into condition of the government management, but to have been so made through many years to this date. There seems to be not a few of them who think that their job site is where they rest and pass time leisurely, which spoils diligent mind of the working employees, resulting in total negligence mood. The wage system is shared by extremely narrow portion of the efficiency wage, where amount of the wage is determined by his schooling career at his entrance to the Mill, as well as his years of service. Therefore, this system has also to be improved in future.

As compared to the major cities of Jakarta, Bandung, Surabaya and Samarang in Java island, Cilacap is more rural and accordingly, employees working at Cilacap Mill are naive and earnest people by nature. Therefore, improvements in the employee's quality is deemed sufficiently achievable by fulfillment of labour control and depending on the way of employee training. For this renovation project, not only introduction of the new machinery and remodelling of the existing machines are required, but also technical guidance by foreign engineers is indispensable, and at the same time, the fulfillment of the labour control is desired to be made.

2) Age Composition:

Employees at the Mill has rather higher average age than other textile mills. The cause is conceivable to be a long history of 21 years of the Mill since its establishment, but also the extremely low turnover rate would be the cause (yearly average turnover rate over 1976 ~ 1981 period was about 0.7%.)

The current age composition and average age are as indicated below; (except mill manager)

Age composition:	20 ~ 30 years	136 employees
	30 ~ 39 years	484 employees
	40 ~ 49 years	439 employees
	50 ~ 55 years	31 employees
	Total:	1,090 (including 7 female employees

Average age: About 38 years (except mill manager)

3) Rate of Absenteeism:

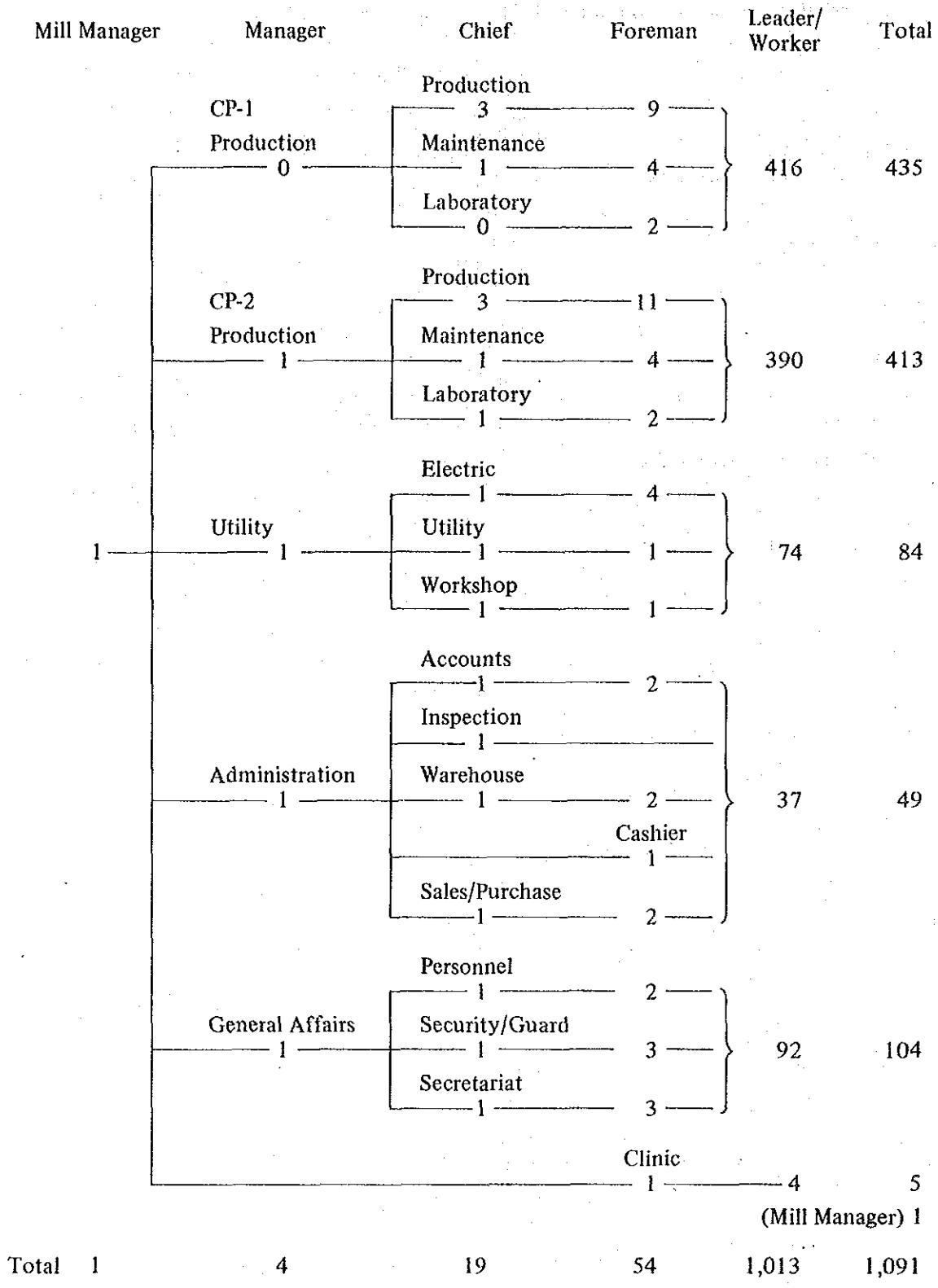
The following is the results taken from a period, Jan. ~ Jun. '84, which is observed to be relatively less then other mills in the same industry in major cities;

		Rate of Absenteeism (%)	
	No. of employees	Total rate of absenteeism	Rate of non-report absenteeism
Production Department	848	4.4	1.9
Auxiliary Department	84	2.9	0.6
Control Department	158	3.6	1.4
Total/Average	1,090	4.2	1.8

4) Personnel Organization:

The overall organization and numbers of employee for each department are shown in Table 29, and the organization and numbers of employee in the production department are indicated in Table 30.

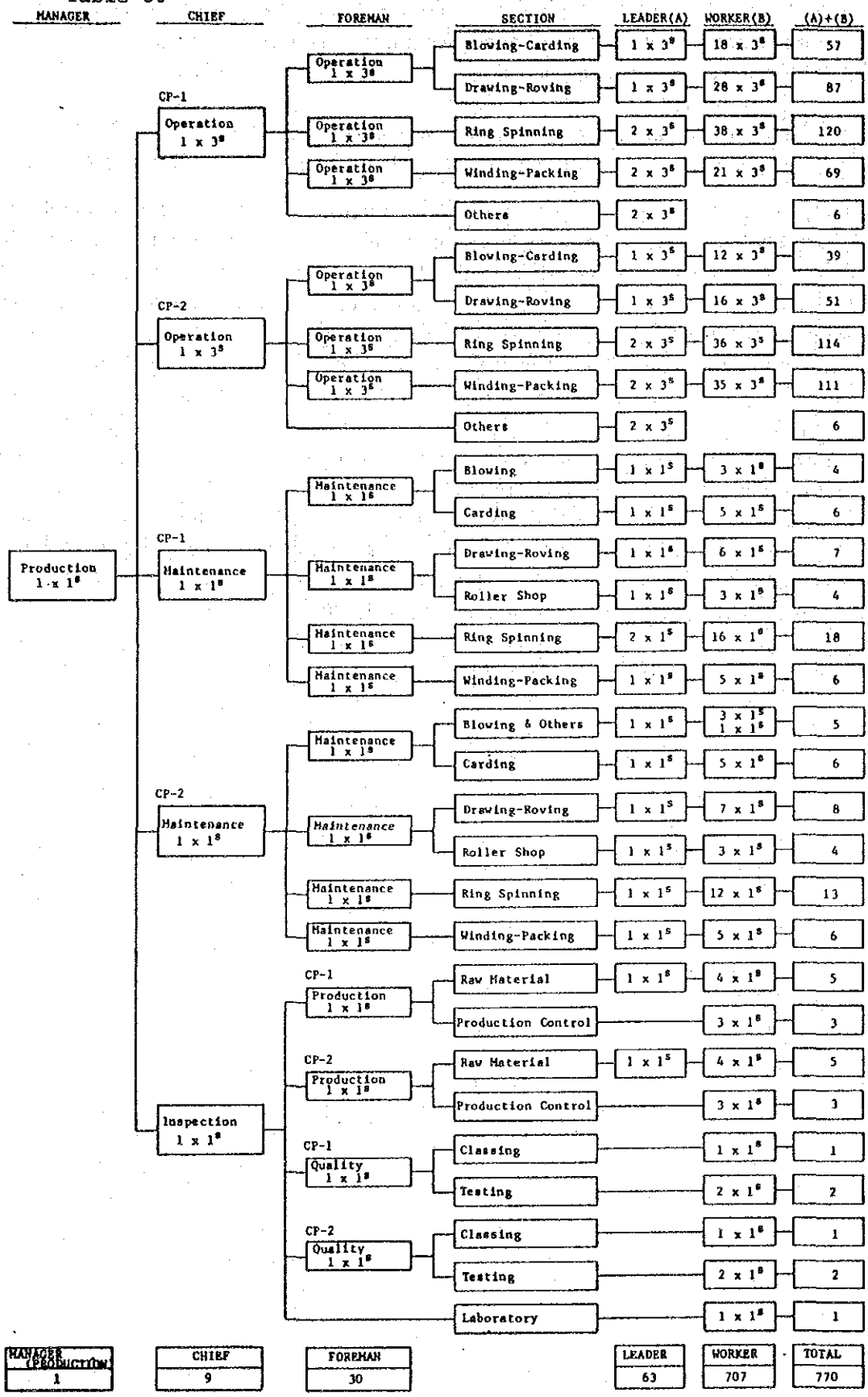
Table 29 TOTAL PERSONNEL ORGANIZATION AND COLLOCATION



MANNING SCHEDULE FOR SPINNING MILL BY CILACAP MILL'S STAFF

Table 30

Note: The mark $ means shifts.



4-5-2 Current Training Program:

The result of our survey on the current training contents are as follows:

(a) Training for new recruits of non-experience (general employees)
(b) Training for new recruits of non-experience who are promotable to the middle management.
(c) Training for new recruits with experience. (general employees)
(d) Training for new recruits with experience who are promotable to the management.

Curriculum and appraisal particulars of each above category are tabulated in Table 31. These are strictly the fundamental program, where the particular standard movements in detail have been compiled for each machine model in the Fundamental Movements Guide in 1976 and actually its effect has been shown on production, quality and safety respects (when judged from the actual result in respective part), however, they are still not to be considered as the satisfactory condition. When the new models of machine are to be introduced by the renovation project, this is deemed to be a good chance to establish the effective training program and method.

Judging from the current operating condition, output and result of the quality produced, it is considered that the effect of the training has not been shown. The fact that while keeping those stabilized employees with about 10 years of service and holding a great many educational data, the effect of the training has not been displayed, indicates that there involves problems in the fundamental purposes and implementing ways, etc. It should be necessary that once again the training program is reviewed from the very start.

Table 31 Training Program

(a) Training for New Recruits of Non-experience (General Employee)
Period: Fundamental training for 3 months Curriculum

Order	Period	Curriculum
1	1st Month ~ 1st week	General explanation: General rules of work Outline of the Mill Introduction to the job site assigned. Explanation on the machine assigned.
2	1st Month ~ 2nd week 3rd week	General technical explanation Working system Specific techniques and theories for the machine
3	1st Month ~ 4th week	Training on practical technique: Fundamental exercise
4	2nd Month ~ 1st week	Training on practical technique: Fundamental exercise
5	2nd Month ~ 2nd week 3rd week 4th week	Training on practical techniques: Working practice at machines To learn working particulars theoretically
6	3rd Month ~ 1st week ~ 2nd week ~ 3rd week ~ 4th week	Repeated practice training: At machine Ability appraisal: Faithfulness, cooperativeness order, discipline

(b) Training for New Recruits of Non-experience who are promotable to the Middle Management:
Period: Training for 6 month Curriculum

Order	Period	Curriculum
1	1st ~ 2nd Month	General explanation: General rules of works in Mill Outline of the Mill Specific techniques and theories for the machine
2	3rd Month	Training on practical technique: On-the-job training
3	4th ~ 5th Month	Training on practical technique: Repeated on-the-job training To learn specific techniques and theories
4	6th Month	Training on practical technique: Working practice To learn specific techniques Ability appraisal: Faithfulness, cooperativeness, order and leadership

(c) Training for New Recruits with Experience (general employees):
Period: No particular training period is fixed (depending on experienced level).

	Contents
General explanation:	Outline of the Mill and rules of works Explanation on job site and machines assigned.
Ability appraisal:	Faithfulness, cooperativeness, order, attitude and practice

(d) Training for New Recruits with Experience who are promotable to the Management:
Period: No particular training period is fixed (depending on experienced level).

	Contents
General explanation:	Outline of the Mill and rules of service. Improvement in ability, Specific Techniques and Theories.
Ability appraisal:	Faithfulness, cooperativeness, Leadership and attitude.

4-6 Production Cost, Revenue and Profitability:

4-6-1 Production Cost:

Table 32 indicates the comparison chart of production cost plan and its results over a period from January to June, 1984.

More study is desired for combination and orders of the cost items indicated on the production cost table. Cost for the raw cotton to be decided solely by discretion of Sandand II head office as well as distributing amount of head office cost such as sales and administration costs are desirably indicated separately from those cost items which are determined by endeavour and discretion of the Mill's side.

Further, even within the cost items at the Mill side, if they are divided into 3 categories of auxiliary, administrative and productive departments, the responsibility for the working cost will be made more clear for each department. It is needless to say that in order to make the control over the working cost more easy and effective, preparing of books and chits, and accounts tables concerning the working costs in order should be important as well.

Now, as will be noted from Table 32, the discrepancy between the plan and the result is so much that it could not be said that any budget control is being carried out there. It is observed that since transfer of the management from the state-run condition to the government-run condition in April, 1983, the control systems of the both conditions are still co-existing without clear-cut smooth transfer of the business, resulting in that the Mill is not yet consolidated into one entity. It further seems that expecting execution of the renovation project in near future, there may be conscious noninterference on the part of the higher management.

The cause for such a big discrepancy between the production cost plan and its result is drastic change in the output. As against the planned output, 8,328 bales for January ~ June period, the result was 5,200 bales or 62.4%, due to which the result for the raw material cost was 68% of the plan, while the production cost attained 63.5% of the plan. Share of raw material cost in the production cost is 73% in terms of the result for January ~ June period, followed by power cost (11%) and labour cost (9%).

Result of the power cost is 47.8% of the budget, which as compared with attainment rate of 63.5% of the output, decrement in the power cost is too remarkable, giving it an inexplicable impression. Further, the labour cost shares 82% of the budget, which is considered as the result of decreasing in numbers of employee and of drastic reduction in insurance premiums, lump sum, as well as in expenditures for uniforms, meals, medicals and buying-up cost of annual leaves.

Further, in the production cost table indicated in Table 32, no distribution cost of sales and administration costs at Sandang II head office is included.

Table 32 MANUFACTURING COST PLAN AND ACTUAL RESULTS (Jan. ~ Jun. 1984)

(Unit : Rp.1,000)

Item	Jan. '84		Feb. '84		Mar. '84		Apr. '84		May '84		Jun. '84		Total		A/B
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan(A)	Actual(B)	(%)
I. Variable Costs															
1. Raw Materials	739,015	404,973	710,591	419,268	710,591	555,872	682,168	520,489	710,591	477,870	653,744	482,491	4,206,700	2,860,963	68.0
2. Sub Materials	75,206	7,542	72,314	7,242	72,314	8,334	69,421	12,247	72,314	11,121	66,528	5,742	428,097	52,228	12.2
I. Total	814,221	412,515	782,905	426,510	782,905	564,206	751,589	532,736	782,905	488,991	720,272	488,233	4,634,797	2,913,191	62.9
II. Fixed Costs															
1. Power Charge	125,845	44,085	121,005	43,293	121,005	49,563	116,165	75,776	121,005	66,703	111,325	62,896	716,350	342,316	47.8
2. Labour Expenses	90,238	67,923	90,238	56,201	90,238	74,496	90,238	70,934	90,238	100,146	90,238	74,515	541,428	444,215	82.0
3. Preparatory Expenses	1,385	759	1,332	625	1,332	1,083	1,278	1,078	1,332	667	1,225	265	7,884	4,477	56.8
4. General Expenses	7,016	5,170	7,016	12,580	7,016	6,445	7,016	7,721	7,016	3,890	7,016	9,852	42,096	45,658	108.5
5. Depreciation	6,918	6,501	6,918	6,501	6,918	6,501	6,918	6,501	6,918	6,501	6,918	6,502	41,508	39,007	94.0
6. Maintenance Expenses	33,473	41,692	33,473	12,607	33,473	22,179	33,473	14,591	33,473	11,409	24,473	28,590	191,838	130,708	68.1
7. Fire Insurance	979	-	979	-	979	5,724	979	-	979	-	979	-	5,874	5,724	102.6
8. Selling Expenses	129	277	124	63	124	-	119	14	124	1,200	114	-	734	1,554	211.7
II. Total	265,983	166,407	261,085	131,870	261,085	165,991	256,186	176,615	261,085	190,156	242,288	182,620	1,547,712	1,013,659	65.5
I + II. Total	1,080,204	578,922	1,043,990	558,380	1,043,990	730,197	1,007,775	709,351	1,043,990	679,147	962,560	670,853	6,182,509	3,926,850	63.5

[Note] I-2. Dyestuff and Chemical for Yarn-dyeing
II-8. not including Head-office Expenditures

4-6-2 Revenue:

Table 33 indicates the turnover quantity per kind of product and result of the turnover amount over January ~ June, 1984 period. In the total turnout quantity, the quantity sold of polyester/cotton blended yarn and other blended yarns (of various mixed yarn, which cannot be assorted) shares as much as 5.3% of the total, which were sold with low prices, increasing in loss amount. These inferior yarns are the result of the insufficient maintenance of machines and absence of operation control, still there is extremely high occurrence of wastage, which makes us to suppose that the yield for the raw cotton would remarkably be low.

Marketing of the general yarns are in extremely bad condition, which has no alternative but to be sold at lower price than that in the general market. This price is the lowest one in the group of P.T. Sandung II.

Bad quality yarns, which cannot be sold in the general market, are dispatched to the weaving mills in the group of P.T. Sandung II. We hear that in this case the selling price is just to cover the raw material costs, which is increasing the amount of loss more and more.

The average selling price per bale is 505,131Rp according to the result over the Jan. ~ June period, and the total turnover for the period was 2,626,732,000 Rp. The actual raw material cost was 2,860,963,000 Rp, which was astonishingly higher than the amount of turnover. Currently, the perfect production stoppage produces less loss amount than operation, and the more the production increases, the more the deficit gets bigger.

Table 33 SALES VOLUME AND PRICE (Jan. ~ June, 1984)

Item / Yarn	Sales Volume (Bales)							Selling Price	
	Jan '84	Feb.	Mar.	Apr.	May	Jun.	Total	Amount (Rp. 1,000)	Average (Rp./Bale)
Polyester/Cotton Nel	27	–	–	90	65	20	202	48,968	242,416
Polyester/Cotton Ne20	239	–	30	65	142	–	476	215,061	451,809
Polyester/Cotton Ne30	579	325	475	375	430	275	2,459	1,332,310	541,810
Polyester/Rayon Ne16	41.3	–	–	–	–	–	41.3	16,520	400,000
Polyester/Rayon Ne20	–	–	100	100	200	63	463	216,980	468,639
Polyester/Rayon Ne45	23	–	–	8	–	–	31	18,724	604,000
Cotton/Rayon Ne30	–	14	355	175	480	410	1,434	747,412	521,208
Polyester/Rayon Ne40	–	–	–	–	–	10	10	5,200	520,000
Polyester/Rayon Ne40/2	–	–	–	–	–	9	9	5,265	585,000
Polyester/Rayon Ne21	–	–	–	–	–	1	1	478	478,141
Mixed Yarn	–	–	–	–	39.3	34.5	73.8	19,815	268,496
Total	909.3	339	960	813	1,356.3	822.5	5,200.1	2,626,733	505,131

4-6-3 Profitability:

From Tables 32 and 33, the gross profit from the actual turnover for the period, January ~ June, 1984 is deducted as follows:

Turnover from the yarn	2,626,733,000 Rp
Miscellaneous revenue (Revenues from yarn dyeing and sales of wastes)	108,541,000 Rp
Turnover total	2,735,274,000 Rp
Production cost	3,926,850,000 Rp
Gross sales profit:	−1,191,576,000 Rp

Table 34 shows monthly net sales profit over the period, January ~ June, 1984. This is the data from PT. Sandang II, where the calculating data 2 items (cost for sold weaving yarns and adjustment amount) is not clear, however, the profit was produced only in February and March, while in the other months the account got into red figures. The gross sales profit for the January ~ June period is in the red figures of 111,169,000 Rp., which is much different from the aforesaid amount of loss, however, anyway, the Mill holds too many problems in the profitability.

By the earlier execution of the renovation project, the chain of loss which is now still keeping should be cut as soon as possible.

Table 34 GROSS PROFIT ON SALES (Jan. ~ June, 1984) (Unit: Rp. 1,000)

Item \ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Total
Net Sales & Other							
Market Sale	235,500	185,002	506,326	396,937	620,343	419,049	2,363,157
Sandang II Self-use	207,652	–	–	4,832	50,613	478	263,575
Other Income	7,915	16,073	15,564	38,712	23,814	6,464	108,542
Total	451,067	201,075	521,890	440,481	694,770	425,991	2,735,274
Manufacturing Cost							
Cost of Goods sold	455,083	178,787	492,316	387,178	650,774	396,757	2,560,865
Adjustment	115,479	–14,065	5,290	55,408	72,276	51,190	285,578
Total	570,562	164,722	497,606	442,586	723,020	447,947	2,846,443
Gross Profit on Sales	–119,495	36,353	24,284	–2,105	–28,250	–21,956	–111,169

5 SCOPE OF RENOVATION PROJECT AND ENGINEERING

5 SCOPE OF RENOVATION PROJECT AND ENGINEERING

5-1 Raw Materials and Production Plan

5-1-1 Consumption of Raw Materials

Both raw cotton and polyester fiber shall be used as raw materials. Table 1 shows the consumption figures at the normal operation of full capacity.

Table 1 Annual Consumption of Raw Materials

Mill	Kind of Products	Annual Consumption in tonnes	
		cotton	Polyester
No. 1	Combed Cotton Yarn Ne 30's	1,514,279	–
	Combed Cotton Yarn Ne 40's	2,238,749	–
	Combed Cotton Yarn Ne 60's	302,771	–
	Sub-total of Mill No. 1	4,055,800	–
No. 2	Polyester 65%, Cotton 35% Blended Yarn Ne 45's	595,796	924,692
	Polyester 48%, Cotton 52% Blended Yarn Ne 45's	838,688	646,983
	Sub-total of Mill No. 2	1,434,484	1,571,675
Total	Grand Total	5,490,284	1,571,675

Remarks: The reworkable fibers to be generated at various spinning processes shall be re-used. The figures in the table above do not include the quantity of such reworkable fibers, instead are consisted of only virgin fibers/cotton.

It is assumed that the raw cotton shall be imported from the U.S.A. and the Polyester fiber shall be procured from the Manufacturer(s) in the Republic of Indonesia. Major specifications of the raw materials for respective products are shown in Table 2 below.

Table 2 Major Specifications of Raw Materials

Mill	Kind of Products	Grade and Specifications	Blending Ratio
No. 1	Combed Cotton Yarn Ne 30's and Combed Cotton Yarn Ne 40's	SM 1-1/16" (26.96 mm)	50%
		SM 1-2/32" (27.78 mm)	50%
		Average 27.385 mm	100%
	Combed Cotton Yarn Ne 60's	SM 1-1/4" (31.75 mm)	40%
		SM 1-3/8" (34.925 mm)	60%
		Average 33.655 mm	100%
No. 2	Polyester 65%, Cotton 35% Blended Yarn Ne 45's	SM 1-1/16" (26.99 mm)	35%
		Polyester Fiber 1.4d x 38 mm	56%
		Average 34.146 mm	100%
	Polyester 48%, cotton 52% Blended Yarn Ne 45's	SM 1-1/16" (26.99 mm)	52%
		Polyester Fiber 1.4d x 38 mm	48%
		Average 32.275 mm	100%

Table 3 Raw material consumption during 1st year after operation

Mill / Yarn / Material / Months after operation	CP-1 Mill			CP-2 Mill				Total (Unit: Kg)
	Cotton combed yarn			Polyester cotton blended yarn				
	30'S	40'S	60'S	(65/35) 45'S		(48/52) 45'S		
	Cotton	Cotton	Cotton	Cotton	Polyester	Cotton	Polyester	
1	–	–	–	24,830	38,528	34,945	26,961	125,264
2	–	–	–	49,652	77,062	69,892	53,916	250,522
3	62,918	93,004	12,614	49,652	77,062	69,892	53,916	419.058
4	125,829	186,013	25,229	49,652	77,062	69,892	53,916	587,593
5	125,829	186,013	25,229	49,652	77,062	69,892	53,916	587,593
6	125,829	186013	25,229	49,652	77,062	69,892	53,916	587,593
7	125,829	186,013	25,229	49,652	77,062	69,892	53,916	587,593
8	125,829	186,013	25,229	49,652	77,062	69,892	53,916	587,593
9	125,829	186,013	25,229	49,652	77,062	69,892	53,916	587,593
10	125,829	186013	25,229	49,652	77,062	69,892	53,916	587,593
11	125,829	186,013	25,229	49,652	77,062	69,892	53,916	587,593
12	125,829	186,013	25,229	49,652	77,062	69,892	53,916	587,593
Total	1,195,379	1,767,121	239,675	571,002	886,210	803,757	620,037	6,083,181

[Note] Cotton: 4,576,934Kgs Polyester: 1,506,247Kgs

Table 3 shows the raw material consumption during the first year from the commencement of normal operation.

Table 4 shows the quantity of raw materials which shall be required to commence the operation at the outset.

Table 4 Quantity of raw cotton required for commencing the operation

Item / Mill	Kinds	Raw material	Required quantity (unit: Kg)
CP–1	Cotton combed yarn 30'S	Cotton	43,667
	Cotton combed yarn 40'S	Cotton	64,446
	Cotton combed yarn 60'S	Cotton	8,744
	Sub-total		116,857
CP–2	Polyester/cotton 65/35 Blended yarn 45's	Cotton	16,315
		Polyester	27,808
	Polyester/cotton 48/52 blended yarn 45's	Cotton	23,630
		Polyester	20,076
	Sub-total		87,829
Total			204,686

5-1-2 Production Plan

It is intended that the Cilacap Spinning Mill shall produce the excellent quality yarn which can be exported. Table 5 shows the production plan of normal operation at the full capacity.

It is assumed that annual operation hours are 8,352 hours, which is based on 24 hours a day, 348 days a year, and 3 shifts a day by 4 groups of workers.

Table 6 shows the progressive production increases schedule during the first year of operation.

Table 5 ANNUAL PRODUCTION PLAN BY FULL-OPERATION

Item / Mill	Kinds of Products	Production (Bales/Year)
CP-1	Cotton Combed Yarn 30's	6,605
	Cotton Combed Yarn 40's	9,765
	Cotton Combed Yarn 60's	1,310
	Sub Total	17,680
CP-2	Polyester Cotton 65/35 Blended Yarn 45's	7,425
	Polyester Cotton 48/52 Blended Yarn 45's	7,035
	Sub Total	14,460
Total		32,140

Table 6. PRODUCTION PLAN FOR 1ST-YEAR AFTER START-UP

(Unit: Bales/Month)

Mill / Kinds / Month after Start-up	CP-1			CP-2		Total
	Cotton Combed Yarn 30's	Cotton Combed Yarn 40's	Cotton Combed Yarn 60's	Polyester Cotton 65/35 Blended Yarn 45's	Polyester Cotton 48/52 Blended Yarn 45's	
1	-	-	-	309.38	293.13	602.51
2	-	-	-	618.75	586.25	1,205.00
3	275.17	406.88	54.55	618.75	586.25	1,941.60
4	550.42	813.75	109.17	618.75	586.25	2,678.34
5	550.42	813.75	109.17	618.75	586.25	2,678.34
6	550.42	813.75	109.17	618.75	586.25	2,678.34
7	550.42	813.75	109.17	618.75	586.25	2,678.34
8	550.42	813.75	109.17	618.75	586.25	2,678.34
9	550.42	813.75	109.17	618.75	586.25	2,678.34
10	550.42	813.75	109.17	618.75	586.25	2,678.34
11	550.42	813.75	109.17	618.75	586.25	2,678.34
12	550.42	813.75	109.17	618.75	586.25	2,678.34
Total	5,228.95	7,730.63	1,037.08	7.115.63	6,741.88	27,854.17

5-1-3 Quality:

The quality of yarns to be produced after completion of the renovation project shall be with higher evaluation in the Republic of Indonesia, and at the same time be of high standard which is good for the international markets. Generally, to express the quality level in numerical terms, using data of Uster Statistics is convenient. Quality to be set as a target after completion of the renovation is indicated in table 7, data of which is shown in figure 1 to 7. Setting up conditions of Uster Statistic data are shown in table 8.

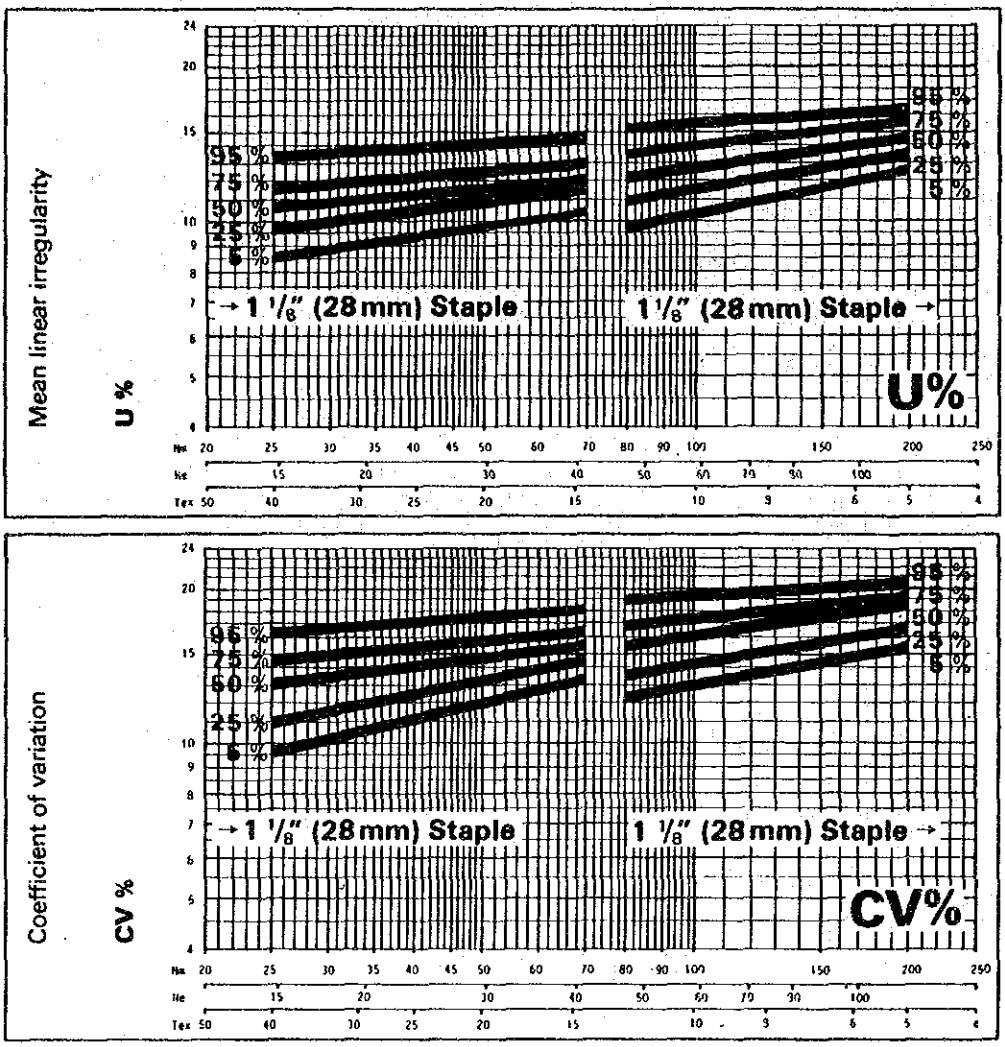
Table 7 Target Values of Yarn Quality

Characteristic Values	Target Lines (Range)
Simple Yarn Strength (Breaking length R Km)	50–25% line
Uster % (Mean linear irregularity %)	50–25% line
Thick Yarn	50–25% line
Thin Yarn	50–25% line
Neps	50–25% line

Figure 1 Unevenness

USTER® Statistics

Combed cotton yarns (ring-spun)



Irreg.
CO COMBED
RING
CO-Type

Figure 2 Thin, thick and neps

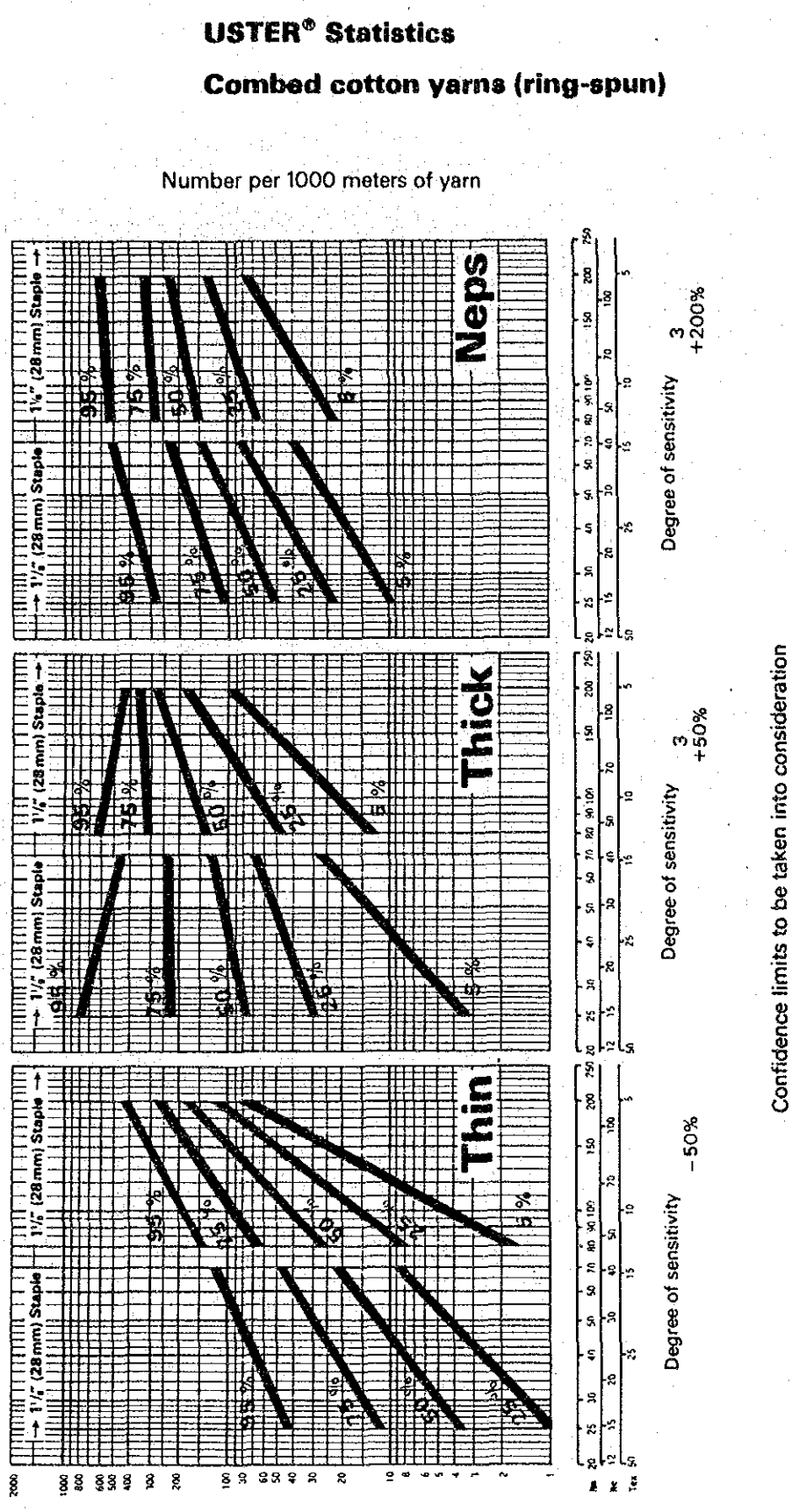
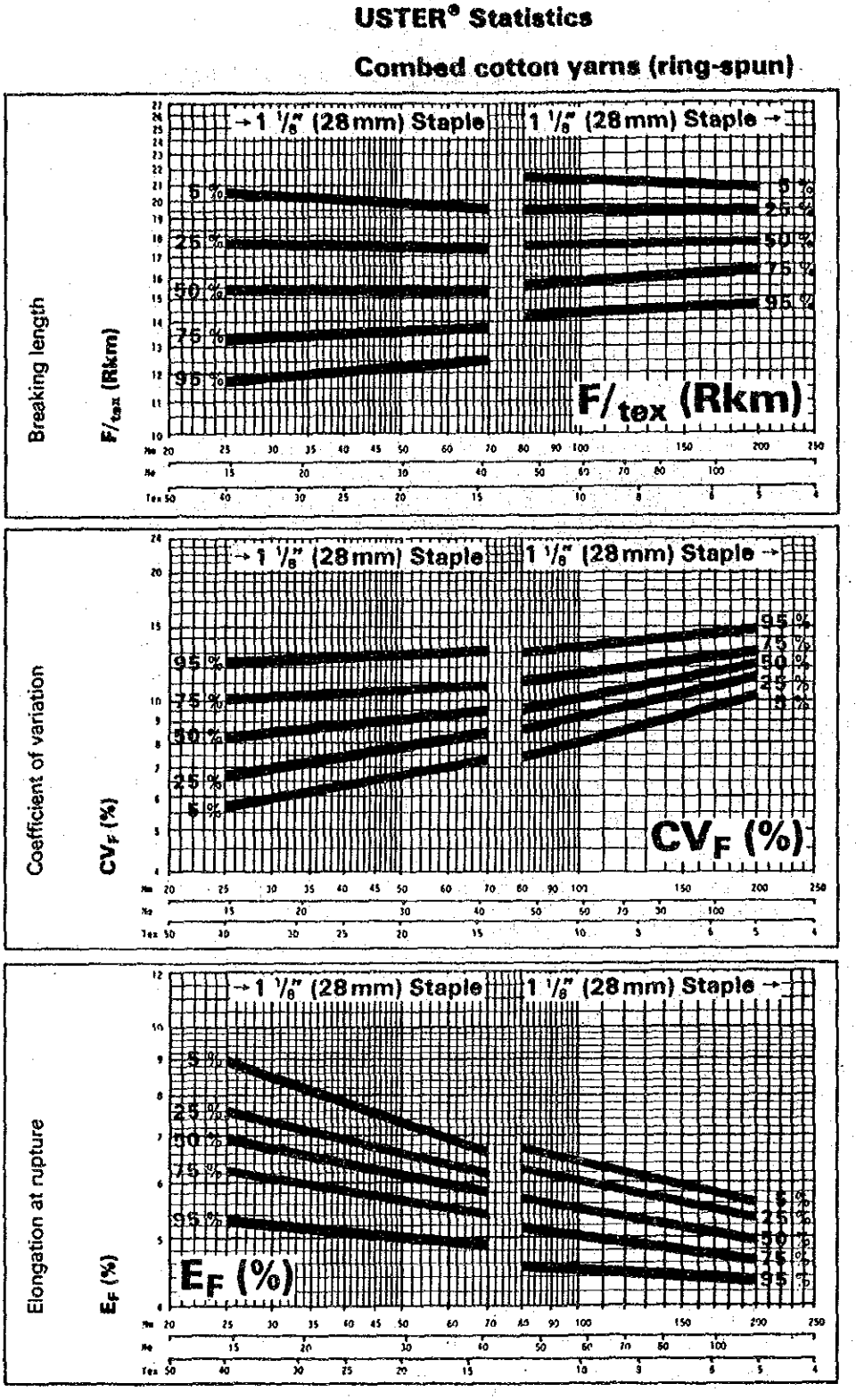


Figure 3 Unevenness

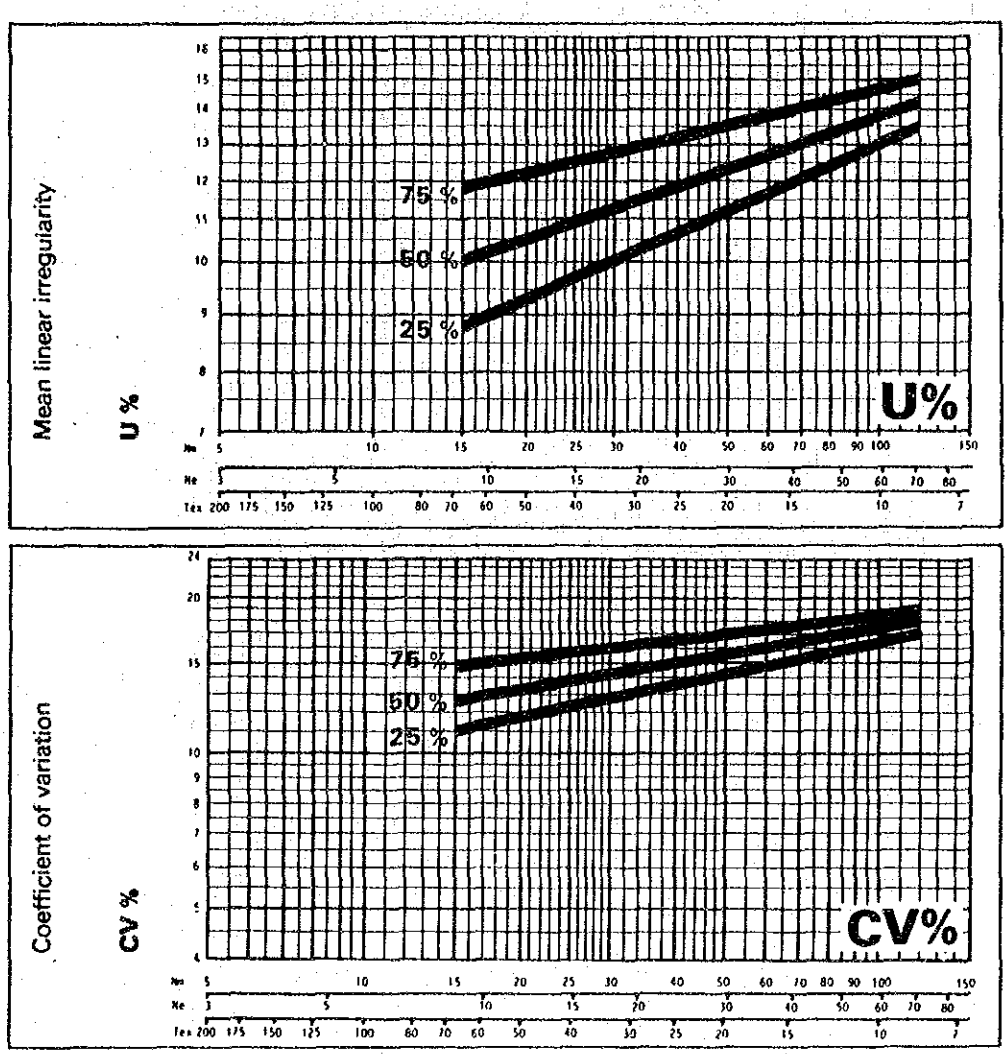


USTER® DYNAMAT =

– USTER® Single End Automatic Strength Tester, Type AD

CRL
CO COMBED
RING
CO-Type

Figure 4 Unevenness



Irreg.
PES/CO, RING
67 % / 33 %,
50 % / 50 %
CO-Type

Figure 5 Thin, thick and neps

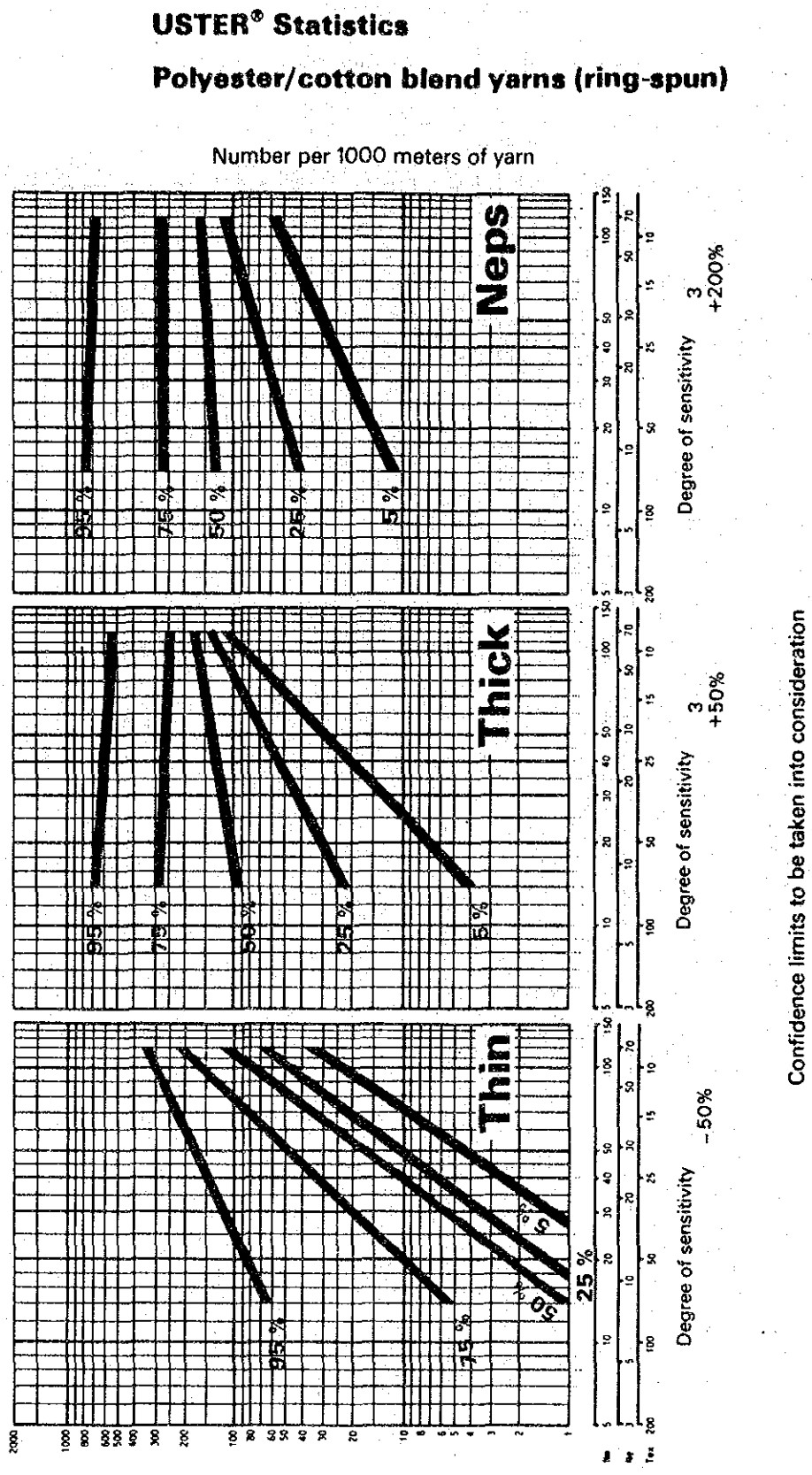


Figure 6 Strength and elongation

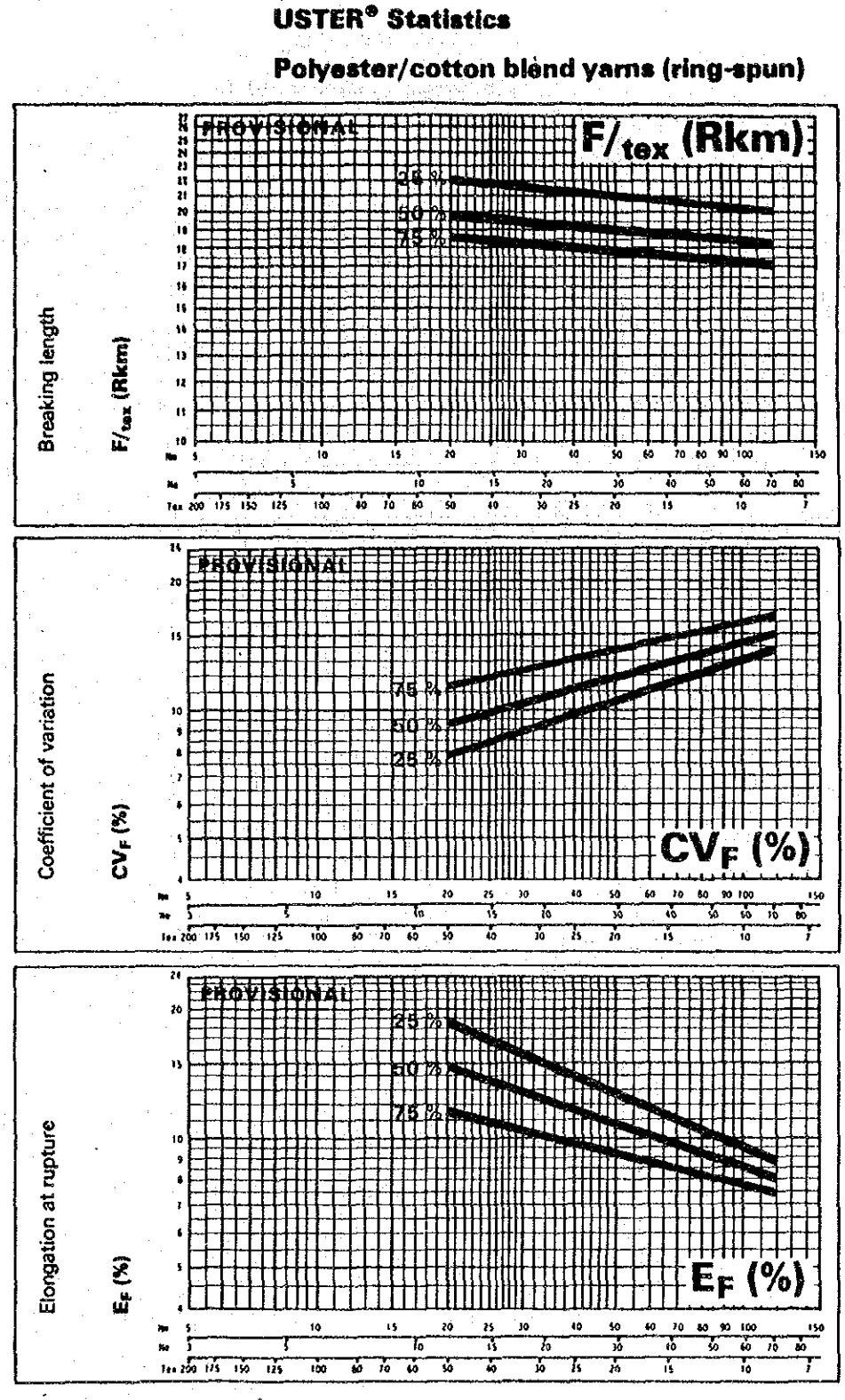


Figure 7 Strength and elongation

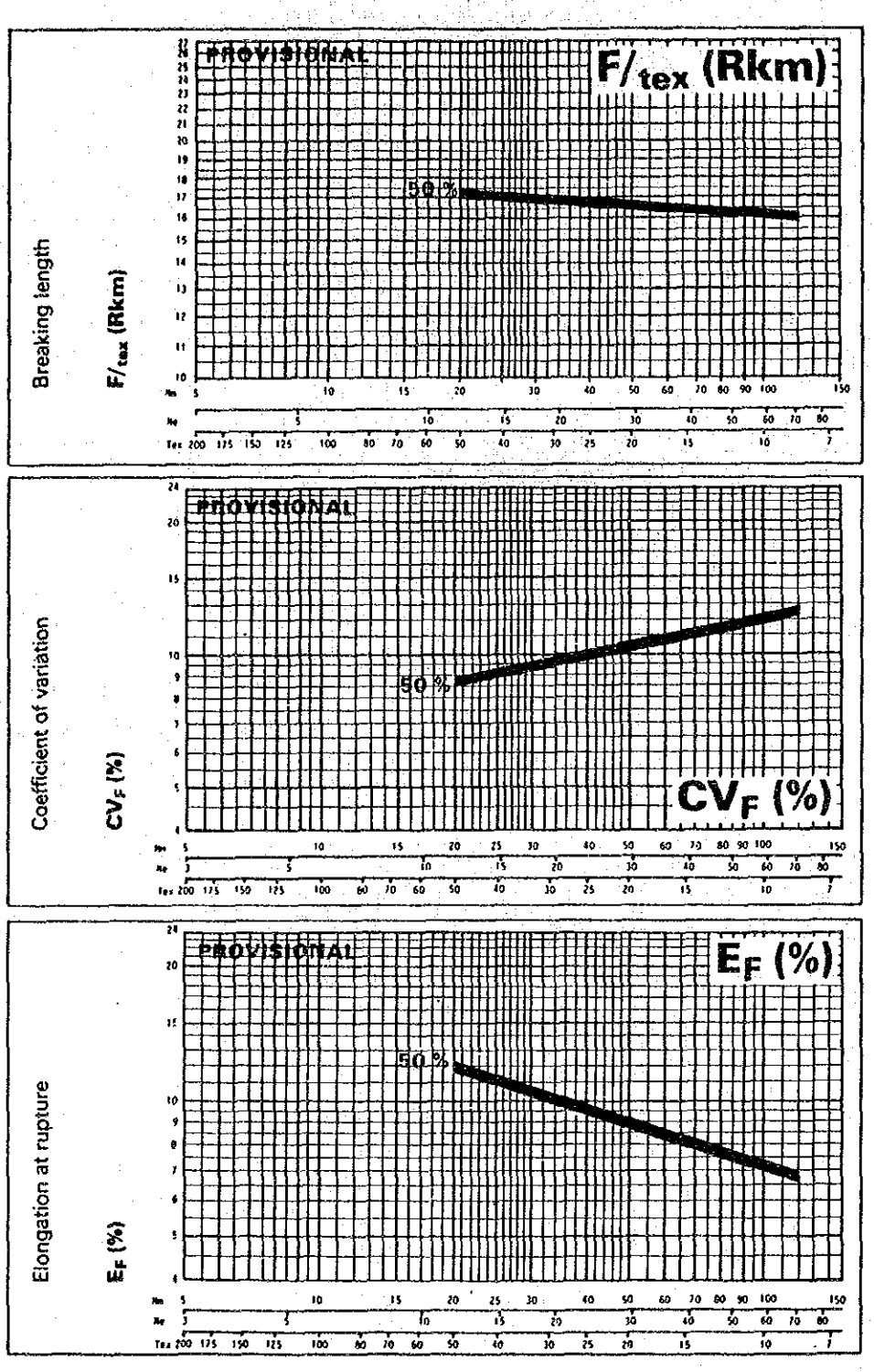


Table 8 USTER STATISTICS DIAGRAM

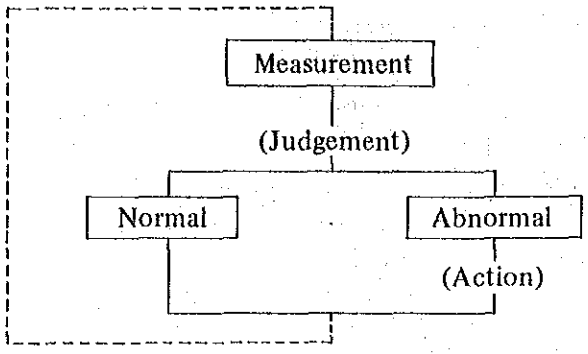
Item	Points to note/Setting and Testing Conditions
Mean linear irregularity U% Coefficient of variation CV% Number per 1,000 meters of yarn Thin Thick Neps	Besides being dependent on the yarn count, the irregularity and imperfections are influenced by the raw material and also by the type, condition and setting of the machines.
Breaking length F/tex (Rkm) Coefficient of variation CVF(%) Elongation at rupture EF(%)	Experience values from tests with the USTER DYNAMAT Automatic Tensile Testing Installation (principle of constant-rate-of-load). Testing Conditions Between 100 and 400 tests of as large a number of packages as possible should be made on the USTER DYNAMAT Automatic Yarn Tensile Tester under the following conditions: Standard atmosphere: Temperature 20±2°C (68+4°F) Relative humidity 65±2% The material should be adequately conditioned before testing (cf. the relevant test specifications of the national standards organizations). Average time-to-break: 20±3 seconds pre-tension: 0,5 cN/tex (corresponding to a weight of 500 m of yarn).

5-1-4 Method of Process (Quality) Control:

1) Summary:

The purpose of the process control (in particular, quality) in a spinning mill is to select the proper quality characteristics for each process, to measure the result and to judge whether the process as the whole is in normal condition as the operating condition by the objective criteria based on the measured data, and in case it is in an abnormal condition, to take accordingly appropriate measures, maintaining a stable operating condition to attain the stable quality and maintain it. Therefore, it should be meaningless to measure such quality characteristics as that for which no measure cannot be taken, and in the first place, the following points should be standardized and the line of command should be clarified in order to heighten the consciousness of the whole mill for the quality;

- Who will, in what order, take samples and measure them.
- Who will judge the results of the measurement.
- To whom should the judged result be relayed.
- When in an abnormal case, who, in what order, will act the case.



The items of the process (quality) control for the Mill studied this time are classified into;

- Raw Cotton Control.
- Operations Control (Mainly, control by operators)
- Quantity Control (Grain control)
- Fall, Waste and Neps Control.

The results of analysis of current conditions for each of these items are as follows;

2) Raw Cotton Control:

As seen in many data, the influence of the fiber properties of the raw cotton to the quality properties of the yarn is enormous, and the yarn quality depends on the raw cotton. Therefore, the proper control over the raw cotton should be required according to where yarns are used. At present, the checking system for the raw cotton characteristics has been set up, however, it is not observed that the system is made use of to its full capacity. An example of how fiber characteristics of the raw cotton influences the quality characteristics of the yarn is indicated in Table 9.

Table 9 Example in Shares of How Fiber Characteristics influences Quality Characteristics of the Yarn

(Unit: %)

Fiber Characteristics	Strength		Appearance (evenness)		Neps in card web	Waste
	Coarse Yarn	Fine Yarn	Coarse Yarn	Fine Yarn		
Fiber strength	34	35	1	1	–	3
Staple length	27	31	39	41	1	2
Fineness	24	19	1	14	–	3
Uniformity	4	4	3	1	3	4
Grade Index	2	3	14	6	–	52
Maturity	1	1	6	6	59	4
Mechanical factor	8	7	36	31	37	32

On the other hand, the raw cotton control is difficult to be unified into a standard, however, the target value for the major fiber characteristics, control limit and controlling method of the testing machine are as per indicated in Table 10.

Table 10 Target values for Major Fiber Characteristics and Control Limit

Fiber Characteristics		Target		Testing Machine
		Target value	Control Limit	
Cotton	Grade	SM	±half rated	By sight
	Staple Length	1-1/6 in.	±1/32 in.	Fibrograph Sorter
	Fineness	4.5–5.0	±0.5	Micronaire
	Strength	85	More than 80	Pressley

Polyester: To be compared with the presented quality by the maker

The target and control limit must be established in reference of the Table 9 and 10 to use the raw cotton properly.

3) Operations Control (Mainly by visual control of the operator):

Only by measuring the quality characteristics of the semiproduct, the abnormality involved in a working process cannot be found out earlier.

In order to establish a system whereby the operating conditions are always observed to have the abnormality found out earlier while the quality control is measured at the same time, the check-points including those now applied at various working processes are shown in Table 11. Those check-points should be incorporated in the training program for the operators to improve their quality.

Table 11 Examples of Operations Control (Mainly by visual check of operators):

Blow Room Machinery:

- Opening Condition of Cotton ..... No closed taft or twist shall be observed.
- Blowing to Cage Surface ..... No insufficient blowing (unevenness, eddy or hole) shall be observed.
- Shape of Lap ..... No defective shapes shall be observed for outer diameter, selvage, taper and hardness.

Carding Engine:

- Lap Licking ..... No lap licking shall be observed.
- Uneven Web ..... With no horizontal and vertical striped, cloud and waste and neps shall be few.
- Waste and How fall ..... No good fibers shall fall and short fibers and leaf (under taker-in roller and flat strip) dusts shall be removed (for cotton only)

Pre-Drawing Frame:

- Condition of Fleece ..... No stepped unevenness, cloud or broken selvage is observed.

Lap Former:

- Condition of Fleece ..... No sliver is overlapped, nor unevenness of fleece is observed.
- Shape of Lap ..... No defective selvage, side, hardness and shape shall be observed.

Comber:

- Lap Licking ..... No lap licking shall be observed.
- Condition of Fleece ..... No stepped unevenness, cloud, selvage breakage or bending shall be observed.
- Waste and How fall ..... No unevenness, thick/thin, cloud or blocking shall be observed.

Drawing Frame:

- No. of Sliver supplied ..... No. of pieces shall be checked when the sliver is used up or to be replaced (Mixed Drawing Frame)
- Condition of Fleece ..... No stepped enevenness, cloud or selvage breakage shall be observed.

Roving Frame:

- Shape of Roving ..... No overlapping of roving or deform shall be observed.

Ring Spinning Frame:

- Check of End Breakage ..... End breakage during a doffing, or end breakage during a certain time.
- End breakage after doffing ..... According to the need

Winder:

- Defective Cheese ..... No defective shape such as cob-webbing, different color or poor make-up shall be observed.
- Rate of Yarn Breakage per Cop ... By counter attached to machine Applicable to automatic winders
- Mis-knot Ratio ..... By counter attached to machine Applicable to automatic winders

4) Unit Weight Control:

The weight control composes the major part of the process control, which has been incorporated into the existing control items (Table 12) and executed. However, it is required to clarify and strengthen a system whereby the surveyed results are fed back and applied. For this purpose too, the survey form should not only be the line-up of the measured results, but also it should be improved so that it could be used as the survey table where standard values and control limit line (value) are filled in to judge the quality

trend immediately and measures for the abnormality can be taken and the measures can be written therein.
Table 12 shows the unit weight control items including those now being executed.

Table 12 Unit Weight Control Items

Blow Room Machinery:

- Variation between laps (Lap control: x control chart is prepared) (pass rate: Defective lap shall be reused)
- Variation within lap: A piece of lap is cut at every yard and weighed.

Carding Engine:

- Unit weight of Sliver: To be cut at every 6 yard and weighed.
- U% of sliver:

Predrawing Frame:

- Unit weight of Sliver: To be cut at every 6 yard and weighed.

Lap Former:

- Unit weight of lap: To be cut at every 1 yard and weighed.
- Variation between laps: To be weighed for every lap.
- Variation within lap: A piece of lap is cut at every 1 yard and weighed.

Comber:

- Unit weight of sliver: To be cut at every 6 yard and weighed.
- U% of sliver:

Drawing Frame:

- Unit weight of sliver (Grain control: $\bar{x} - R$ control chart)
- U% of sliver:

Ring Spinning Frame:

- Unit weight of yarn: To be cut at 120 yeards and weighed.
- U% of Yarn:
- Strength and elongation of single yarn

Winder:

- Unit weight per cheese: To be weighed for each cheese.

5) Waste, Leaf and Neps Control:

The quantity of waste (waste ratio) depends on rate of impurities in the supplied raw cotton and also is related to yield and the quality of the yarn (in particular, leaf dust and

neps), which is one of the important control items. The waste control must be effected from both sides of the quantity and quality.

The measuring results thereof shall be fed back to the next maintenance plan and be maintained under good control condition at all times.

Although they are nominally incorporated into the existing control items for practice, the feeding-back system shall be firmly established.

Table 13 indicates the control items for waste, leaf dust and neps including those now being executed.

Table 13 Waste, Leaf Dust and Neps Control Items

Blow Room Machinery:

- Waste – Waste Ratio (Cotton): Waste ratio for 10 pieces of lap
- Waste – Contents of Waste (Cotton): Analysis by Shirlay Analyser at change of spinning condition for the raw cotton.

Carding Engine:

- Waste – Waste Ratio (Cotton): Waste ratio for 1 piece of lap (under take-in roller and flat strip)
- Waste – Contents of Waste (Cotton): Analysis by Shirlay Analyser (under taker-in roller and flat strip)
- Leaf Dust and Neps in Web: Numbers per 100 in^2 of black board. (However, there may be a case where sliver is cut for a certain length. In addition, the leaf dust and neps in the web must be visually checked every day)

Predrawing Frame/Lap Former/Comber

- Waste – Waste Ratio: To weigh waste per about 150 nips/minute;
  - Per machine: When the raw cottons or spinning codition changed, or after maintenance.
  - Per delivery: When the raw cottons or spinning condition changed, or after maintenance.

  (However, waste and how they fell shall be checked visually daily).

Drawing/Roving Frame/Ring Spinning Frame

- Judgement by appearance: 5 black sheets (Yarn irregularity, leaf dust and neps)
- IPI: Sensitivity thin – 50%, thick + 50% and nep + 200%

Winder:

- Judgement by appearance: 5 black sheets (yarn irregularity, leaf dust and neps)

- Remaining defects: More than A4, B4, C3 and D2, Sensitivity M4.9 x C45 (numbers per 100,000 m)

5-2 Production Machinery and Equipment

5-2-1 Required Numbers of Production Machines

1) Calculation Tables

The required numbers of production machines have been carefully calculated taking into consideration various factors. Various Factors have been set up at the proper level respectively by means of judging comprehensively the skill level of operatives, designed product quality, experiences of workers, quality of raw materials, etc.

Calculation results for each process on the basic of rather high quality level set up to cope with export purpose in the Renovation Project are shown in table 14.

(a) Table 14-1: Calculation Table for CP-1 Mill

This calculation is carried out on the basis of the average yarn count of Ne36's, which is considered to deal best with the future various market requirements, especially coarse count yarns. The numbers of machines obtained from this calculation are taken as the basic numbers of machines in the CP-1 Mill.

(b) Table 14-2: Calculation table for CP-1 Mill

It is assumed that the product mix after this renovation of the CP-1 Mill shall be Combed cotton Yarn of Ne30's, 40's, and 60's, and also assumed that the number of machines obtained by the Table 14-1 shall be effectively utilized.

(c) Table 14-3: Calculation table for CP-2 Mill

It is assumed that the product mix of the CP-2 Mill shall be Polyester/Cotton blended Yarn of Ne45's. And the blending ratios, namely Polyester 65% and Cotton 35%, and Polyester 48% and Cotton 52%, are also assumed.

Table 14-1 CALCULATION TABLE FOR CP-1 (COMBED YARN $\bar{X}$ Ne36)

No. 1

Item / Process	1 Supply thickness (Grain/yard)	2 No. of doubling	3 Draft	4 Produced thickness (Grain/yard)	5 Twist multiplier (α e)	6 Twist per/inch (TPI)	7 Waste percent (%)	8 Delivery speed or Revolution (per min.)	9 Package	10 100% Production (LBS) (per hour and unit)	11 Working hour	12 Working efficiency (%)	13 No. of spindle (per machine)	14 Actual Production (per machine) (LBS/8Hours)	15 Required Production (LBS/8Hours)	16 Calculated No. of machine	17 No. of machine
1. Blowing Section																	
-1 Blow Room Machinery	-	-	-	14 oz/1	-	-	3.0	11.5rpm 9.483yds	960mm x 50mL	497.86	7.5	90	1 P	3360.5	9361.7	2.8	3 P
2. Carding Section																	
-1 Card	14 oz/1	1	101.33	350/6	-	-	3.5 +0.5	50.0 yds	36"ϕ x 42"H	25.00	8	85	1	170.0	8987.2	52.9	54
3. Combing Section																	
-1 Pre-Drawing Frame	350/6	8	8.0	350/6	-	-	0.5	300 yds	20"ϕ x 42"H	150.00	7.5	80	2	1800.0	8942.3	5.0	5
-2 Sliver Lap Former	350/6	36	2.58	815/1	-	-	0.5	72 yds	267 mmW	502.97	7.5	80	1	3017.8	8897.6	3.0	3
-3 Comber	815/1	4	50.38	330/6	-	-	15.0 +1.0	200NIP x 5.23mm	20"ϕ x 42"H	27.17	7.5	85	2	346.4	7474.0	21.6	22
4. Drawing Section																	
-1 1st Drawing Frame	330/6	8	7.333	360/6	-	-	0.5	245 yds	20"ϕ x 42"H	126.00	7.5	80	2	1512.0	7436.6	4.9	5
-2 2nd Drawing Frame	360/6	8	8.0	360/6	-	-	0.5	245 yds	20"ϕ x 42"H	126.00	7.5	80	2	1512.0	7399.4	4.9	5
5. Roving Section																	
-1 Simplex Fly Frame	360/6	1	7.828	230/30	1.26	1.314	1.0	950 rpm	6"ϕ x 16"L	1.320	7.5	77	108	823.3	7325.4	8.9	9
6. Spinning Section																	
-1 Ring Spinning Frame	230/30	1	33.12	Ne 36	3.75	22.5	1.4	13,000 rpm	47mmϕ x 8"L	0.0318	8	91	400	92.7	7222.8	77.9	78
7. Winding Section																	
-1 Automatic Winder	Ne 36	1	-	Ne 36	-	-	0.5	1,094 yds	6" x 5°57'	2.1706	7.5	85	60	830.0	6642.4	8.0	8
-2 R.T. Winder	Ne 36	1	-	Ne 36	-	-	0.5	550 yds	6" x 5°57'	1.0913	7.5	60	100	491.1	544.3	1.1	2

Table 14-2 CALCULATION TABLE FOR CP-1 (COMBED YARN Ne30, 40, 60)

No. 2

Item / Process	1 Supply thickness (Grain/yard)	2 No. of doubling	3 Draft	4 Produced thickness (Grain/yard)	5 Twist multiplier (α e)	6 Twist per/inch (TPI)	7 Waste percent (%)	8 Delivery speed or Revolution (per min.)	9 Package	10 100% Production (LBS) (per hour and unit)	11 Working hour	12 Working efficiency (%)	13 No. of spindle (per machine)	14 Actual Production (per machine) (LBS/8Hours)	15 Required Production (LBS/8Hours)	16 Calculated No. of machine	17 No. of machine
1. Blowing Section																	
-1 Blow Room Machinery for Ne30&40	-	-	-	14 oz/1	-	-	3.0	11.5rpm 9.483yds	960mm x 50mL	497.86	7.5	90	1 P	3584.6	8170.9	2.4	3P
for Ne60	-	-	-	13 oz/1	-	-	3.0	11.0rpm 9.071yds	960mm x 50mL	442.21	7.5	90	1 P	2984.9	661.9	0.2	
2. Carding Section																	
-1 Card for Ne30&40	14 oz/1	1	101.33	350/6	-	-	3.5 +0.5	50 yds	36"ϕ x 42"H	25.00	8	85	1	170.0	7844.1	46.1	52
for Ne60	13 oz/1	1	109.77	300/6	-	-	3.5 +0.5	50 yds	36"ϕ x 42"H	21.43	8	85	1	145.7	635.4	4.4	
3. Combing Section																	
-1 Pre-Drawing Frame for Ne30&40	350/6	8	8.0	350/6	-	-	0.5	300 yds	20"ϕ x 42"H	150.00	7.5	80	2	1800.0	7804.9	4.3	5
for Ne60	300/6	8	8.0	300/6	-	-	0.5	270 yds	20"ϕ x 42"H	115.71	7.5	80	2	1388.5	632.2	0.5	
-2 Lap Former for Ne30&40	350/6	36	2.58	815/1	-	-	0.5	72 yds	267 mmW	502.97	7.5	80	1	3017.8	7765.8	2.6	3
for Ne60	300/6	36	2.77	650/1	-	-	0.5	66 yds	267 mmW	367.71	7.5	80	1	2206.3	629.0	0.3	
-3 Comber for Ne30&40	815/1	4	50.38	330/6	-	-	15.0 +1.0	200NIP x 5.23mm	20"ϕ x 42"H	27.17	7.5	85	2	346.4	6523.3	18.8	22
for Ne60	650/1	4	43.68	300/6	-	-	16.0 +1.0	180NIP x 5.23mm	20"ϕ x 42"H	19.27	7.5	85	2	245.7	522.1	2.1	
4. Drawing Section																	
-1 1st Drawing Frame for Ne30&40	330/6	8	7.333	360/6	-	-	0.5	245 yds	20"ϕ x 42"H	126.00	7.5	80	2	1512.0	6490.7	4.3	5
for Ne60	300/6	8	8.00	300/6	-	-	0.5	220 yds	20"ϕ x 42"H	94.29	7.5	80	2	1131.5	519.5	0.5	

No. 3

Item / Process	1 Supply thickness (Grain/yard)	2 No. of doubling	3 Draft	4 Produced thickness (Grain/yard)	5 Twist multiplier (α e)	6 Twist per/inch (TPI)	7 Waste percent (%)	8 Delivery speed or Revolution (per min.)	9 Package	10 100% Production (LBS) (per hour and unit)	11 Working hour	12 Working efficiency (%)	13 No. of spindle (per machine)	14 Actual Production (per machine) (LBS/8Hours)	15 Required Production (LBS/8Hours)	16 Calculated No. of machine	17 No. of machine
-2 2nd Drawing Frame																	
for Ne30&40	360/6	8	8.0	360/6	-	-	0.5	245 yds	20"ϕ x 42"H	126.00	7.5	80	2	1512.0	6458.3	4.3	5
for Ne60	300/6	8	8.0	300/6	-	-	0.5	220 yds	20"ϕ x 42"H	94.29	7.5	80	2	1131.5	516.9	0.5	
5. Roving Section																	
-1 Simplex Fly Frame																	
for Ne30	360/6	1	7.200	250/30	1.26	1.260	1.0	900 rpm	6"ϕ x 16"L	1.4172	7.5	77	108	883.9	2582.7	2.9	3
for Ne40	360/6	1	8.182	220/30	1.24	1.322	1.0	950 rpm	6"ϕ x 16"L	1.2549	7.5	77	108	782.7	3811.0	4.9	5
for Ne60	300/6	1	9.091	165/30	1.20	1.477	1.0	950 rpm	6"ϕ x 16"L	0.8422	7.5	78	108	532.0	511.7	1.0	1
																	9
6. Spinning Section																	
-1 Ring Spinning Frame																	
for Ne30	250/30	1	30.0	Ne 30	3.80	20.81	1.5	13,000 rpm	47mmϕ x 8"L	0.0413	8	90	400	118.9	2544.0	21.4	22
for Ne40	220/30	1	35.2	Ne 40	3.70	23.40	1.3	13,800 rpm	47mmϕ x 8"L	0.0293	8	92	400	86.3	3761.5	43.6	44
for Ne60	165/30	1	39.2	Ne 60	3.60	27.89	1.1	12,500 rpm	45mmϕ x 8"L	0.0148	8	94	400	44.5	506.1	11.4	12
																	78
7. Winding Section																	
-1 Automatic Winder																	
for Ne30	Ne 30	1	-	Ne 30	-	-	0.5	1,040 yds	6" x 5°57'	2.4762	7.5	83	60	924.9	2531.3	2.7	3
for Ne40	Ne 40	1	-	Ne 40	-	-	0.5	1,094 yds	6" x 5°57'	1.9536	7.5	86	60	756.0	3742.7	5.0	5
-2 R.T. Winder																	
for Ne60	Ne 60	1	-	Ne 60	-	-	0.5	440 yds	6" x 5°57'	0.5238	7.5	65	100	255.4	503.6	2.0	2

Table 14-3 CALCULATION TABLE CP-2 (BLENDED YARN Ne45-P/C65:35 & 48:52)

No. 4

Process \ Item	1 Supply thickness (Grain/yard)	2 No. of doubling	3 Draft	4 Produced thickness (Grain/yard)	5 Twist multiplier (α e)	6 Twist per/inch (TPI)	7 Waste percent (%)	8 Delivery speed or Revolution (per min.)	9 Package	10 100% Production (LBS) (per hour and unit)	11 Working hour	12 Working efficiency (%)	13 No. of spindle (per machine)	14 Actual Production (per machine) (LBS/8Hours)	15 Required Production (LBS/8Hours)	16 Calculated No. of machine	17 No. of machine
1. Blowing Section																	
-1 Blow Room Machinery for Cotton	-	-	-	13 oz/1	-	-	3.0	9.48 yds	960mm x 50mL	462.15	7.5	90	1 P	3119.5	3041.8	1.0	1 P
-2 Blow Room Machinery for Polyester	-	-	-	14 oz/1	-	-	1.0	10.73 yds	960mm x 45mL	563.33	7.5	90	1 P	3802.5	3338.8	0.9	1 P
2. Carding Section																	
-1 Card for Cotton	13 oz/1	1	94.09	350/6	-	-	3.5 +0.5	46.0 yds	36"φ x 42"H	23.00	8	85	1	156.4	2920.1	18.7	19
-2 Card for Polyester	14 oz/1	1	95.74	380/6	-	-	1.0 +0.5	51.58 yds	36"φ x 42"H	28.00	8	85	1	190.4	3288.7	17.3	18
3. Combing Section																	
-1 Pre-Drawing	350/6	8	8.0	350/6	-	-	0.5	300 yds	20"φ x 42"H	150.00	7.5	80	2	1800.0	2905.5	1.6	2
-2 Sliver Lap Former	350/6	36	2.63	800/1	-	-	0.5	72 yds	267 mmW	493.71	7.5	82	1	3036.3	2891.0	1.0	1
-3 Comber	800/1	4	50.62	330/6	-	-	13.0 +1.0	200NIP x 5.23mm	20"φ x 42"H	27.30	7.5	85	2	348.1	2486.3	7.1	8
4. Drawing Section																	
-1 Pre-Drawing Frame for Polyester	380/6	8	8.26	368/6	-	-	0.5	310 yds	20"φ x 42"H	162.97	7.5	80	2	1955.6	3272.3	1.7	2
-2 1st Drawing Frame for P65%:C35%	330/6 368/6	9 15	24.26	350/6	-	-	0.5	275 yds	20"φ x 42"H	137.50	7.5	80	2	1650.0	2941.7	1.8	2
-3 1st Drawing Frame for P48%:C52%	330/6 368/6	12 10	21.83	350/6	-	-	0.5	275 yds	20"φ x 42"H	137.50	7.5	80	2	1650.0	2788.1	1.7	2
-4 2nd Drawing Frame for P65%:C35%	350/6	8	8.0	350/6	-	-	0.5	275 yds	20"φ x 42"H	137.50	7.5	80	2	1650.0	2927.0	1.8	2
-5 2nd Drawing Frame for P48%:C52%	350/6	8	8.0	350/6	-	-	0.5	275 yds	20"φ x 42"H	137.50	7.5	80	2	1650.0	2774.2	1.7	2

No. 5

CALCULATION TABLE FOR CP-2 (BLENDED YARN Ne45-P/C65:35 & 48:52)

Item / Process	1 Supply thickness (Grain/Yard)	2 No. of doubling	3 Draft	4 Produced thickness (Grain/Yard)	5 Twist multiplier (α e)	6 Twist per/inch (TPI)	7 Waste percent (%)	8 Delivery speed or Revolution (per min.)	9 Package	10 100% Production (LBS) (per hour and unit)	11 Working hour	12 Working efficiency (%)	13 No. of spindle (per machine)	14 Actual Production (per machine) (LBS/8Hours)	15 Required Production (LBS/8Hours)	16 Calculated No. of machine	17 No. of machine
5. Roving Section																	
-1 Simplex Fly Frame for P65%:C35%	350/6	1	7.95	220/30	0.66	0.704	1.0	900 rpm	6"φ x 16"L	2.2335	7.5	75	108	1356.9	2897.7	2.1	3
-2 Simplex Fly Frame for P48%:C52%	350/6	1	7.95	220/30	0.66	0.704	1.0	900 rpm	6"φ x 16"L	2.2335	7.5	75	108	1356.9	2746.5	2.0	2
6. Spinning Section																	
-1 Ring Spinning Frame for P65%:C35%	220/30	1	39.6	Ne 45	3.6	24.15	1.3	14,000 rpm	47φ x 205mmL	0.0256	8	92	400	75.4	2860.0	37.9	38
-2 Ring Spinning Frame for P48%:C52%	220/30	1	39.6	Ne 45	3.6	24.15	1.3	14,000 rpm	47φ x 205mmL	0.0256	8	92	400	75.4	2710.8	36.0	36
7. Setting Section																	
-1 Steam Setter (SBR-4)	-	-	-	-	-	-	-	-	-	400.0	8	70	1	2240.0	5570.8	1.0	1
(SBR-6)	-	-	-	-	-	-	-	-	-	600.0	8	70	1	3360.0		1.0	1
8. Winding Section																	
-1 Automatic Winder for P65%:C35%	Ne 45	1	-	Ne 45	-	-	0.5	1,094 yds	6" x 5°57'	1.7365	7.5	88	60	687.7	2685.7	3.9	4
-2 Automatic Winder for P48%:C52%	Ne 45	1	-	Ne 45	-	-	0.5	1,094 yds	6" x 5°57'	1.7365	7.5	88	60	687.7	2697.2	3.9	4
-3 R. T. Winder for P65%:C35%	Ne 45	1	-	Ne 45	-	-	0.5	500 yds	6" x 5°57'	0.7937	7.5	50	100	297.6	160.0	0.5	1

2) List of Production Machines.

In compliance with the calculation tables, the following tables shows the required numbers of production machines in respective processes.

a) Table 15-1: List of Production Machines for CP-1 Mill

b) Table 15-2: List of Production Machines for CP-2 Mill

Table 15-1 MAIN PRODUCTION MACHINE LIST FOR CP-1 MILL

Item No.	Machine/Equipment	Quantity
RS-1	Blowing Section	
RS-1-1	Blow Room Machinery	2 lines
RS-2	Carding Section	
RD-2-1*	Semi High Production Card	54 sets
RS-3	Combing Section	
RS-3-1	High Speed Drawing Frame (Pre-Drawing)	5 sets
RS-3-2	Sliver Lap Former	3 sets
RS-3-3	High Production Comber	22 sets
RS-4	Drawing Section	
RS-4-1	High Speed Drawing Frame (1st Drawing)	5 sets
RS-4-2	High Speed Drawing Frame (2nd Drawing)	5 sets
RS-5	Roving Section	
RS-5-1	High Speed Simplex Fly Frame	9 sets
RS-6	Spinning Section	
RS-6-1	Ring Spinning Frame	78 sets
RS-7	Winding Section	
RS-7-1	Automatic Cone Winder	8 sets
RS-7-2*	R.T. Cone Winder	2 sets

* shows the machines to be improved.

Table 15-2 MAIN PRODUCTION MACHINE LIST FOR CP-2 MILL

Item No.	Machine/Equipment	Quantity
RS-1	Blowing Section	
RS-1-1	Blow Room Machinery for Cotton	1 line

Item No.	Machine/Equipment	Quantity
RS-1-2*	Blow Room Machinery for Polyester	1 line
RS-2	Carding Section	
RS-2-1*	Semi High Production Card for Cotton	19 sets
RS-2-2*	Semi High Production Card for Polyester	18 sets
RS-3	Combing Section	
RS-3-1	High Speed Drawing Frame (Pre-Drawing)	2 sets
RS-3-2	Sliver Lap Former	1 set
RS-3-3	High Production Comber	8 sets
RS-4	Drawing Section	
RS-4-1	High Speed Drawing Frame (Grain Adjust Drawing for Polyester)	2 sets
RS-4-2	High Speed Drawing Frame (1st Drawing for P. 65%: C. 35%)	2 sets
RS-4-3	High Speed Drawing Frame (1st Drawing for P. 48%: C. 52%)	2 sets
RS-4-4	High Speed Drawing Frame (2nd Drawing for P. 65%: C. 35%)	2 sets
RS-4-5	High Speed Drawing Frame (2nd Drawing for P. 48%: C. 52%)	2 sets
RS-5	Roving Section	
RS-5-1	High Speed Simplex Fly Frame (P. 65%: C. 35%)	3 sets
RS-5-2	High Speed Simplex Fly Frame (P. 48%: C. 52%)	2 sets
RS-6	Spinning Section	
RS-6-1*	Ring Spinning Frame (P. 65%: C. 35%)	38 sets
RS-6-2*	Ring Spinning Frame (P. 48%: C. 52%)	36 sets
RS-7	Setting Section	
RS-7-1	Full Automatic Vacuum Steam Setter (1 set to be improved)	2 sets
RS-8	Winding Section	
RS-8-1	Automatic Cone Winder (P. 65%: C. 35%)	4 sets
RS-8-2	Automatic Cone Winder (P. 48%: C. 52%)	4 sets
RS-8-3*	R.T. Cone Winder (Re-Winding)	1 set

* shows the machines to be improved.

3) List of Auxiliary Equipment, Accessories, and Laboratory Equipment

It is essential to equip with proper auxiliary equipment, accessories, and laboratory equipment of appropriate quantity, so that the production machines shall be effectively utilized, their performance shall be maintained, and the product quality shall be properly controlled and upgraded. Therefore, in addition to the effective utilization of existing auxiliary and laboratory equipments, accessories and consumables, various kinds of new equipment shall be required to be procured, which are shown in table 16-1 and 16-2, being classified into items to be imported and to be procured locally.

Table 16-1 AUXILIARY EQUIPMENT AND ACCESSORIES LIST

Item No.	Equipment/Accessories	Quantity	
		Import	Local
AUX-1	Blowing Section		
-1	Cart for Lap Transport		7
-2	Carrier for Waste and Reusable Fiber		20
-3	Hand Lift Truck	4	
-4	Lap Sheet	370	
AUX-2	Carding Section		
-1	Metallic Wire Mounting Machine Complete Set	2	
-2	Bare Surface Grinder	1	
-3	Licker-in Roller Mounting Machine	1	
-4	Flat Clipping Machine	1	
-5	Flat Grinding Machine	1	
-6	Flat Tester	1	
-7	Traverse Hose Roller Grinder for MCC	4	
-8	Traverse Hose Roller Grinder for Top	4	
-9	Stripping Roller	2	
-10	Burnishing Roller	2	
-11	Long Grinding Roller	2	
-12	Movable Motor Device for Stripping & Burnishing Roller	2	
-13	Chain Washing Machine	1	
-14	Truck for Flat Bar		4
-15	Truck for Traverse Hose Roller		2
-16	36″ϕ Can with Spring & Caster	440	
-17	Side Scope	2	
-18	Cylinder & Doffer Jack Set	2	
-19	Cylinder Balance Tester Set	1	
AUX-3	Combing Section		
-1	Bobbion for Comber	550	
-2	20″ϕ Can with Spring & Caster	200	

Item No.	Equipment/Accessories	Quantity	
		Import	Local
AUX-4	Drawing Section		
-1	20"ϕ Can with Spring & Caster	3,000	
AUX-5	Roving Section		
-1	Cart for Roving		25
-2	Cart for Roving Bobbin		20
-3	Bobbin for Simplex Fly Frame	94,000	
-4	Polivel Picker	25	
AUX-6	Spinning Section		
-1	Cop Box with Separator	570	
-2	Hanger for Doffing	36	
-3	Cart for Cop Transportation		10
-4	Spira Clean for Spindle Oil	2	
-5	Clearer Cleaning Machine	4	
-6	Heating Press for Spindle Tape	2	
-7	Roller Picker with Hose	16	
-8	Can Containing Travellers	800	
-9	Traveller Magazine	310	
-10	Bobbin for Ring Spinning Frame	260,000	
-11	Blow Cleaner for Ring Spinning Frame	152	
-12	T.T. Collector	31,000	
AUX-7	Winding Section		
-1	Cart for Cone		40
-2	Scale for Auto Winder	10	
AUX-8	Maintenance Section		
-1	Movable Tool Box with Vise	4	
-2	Movable Tool Box	3	
-3	Handling Carrier	7	
-4	General Tool	1 lot	
-5	Spare Parts for Existent Auxiliary Equipment	1 lot	1 lot
-6	Portable Crane with Chain Block	1	
AUX-9	Roller Shop		
-1	Gum Cot Grinding Machine with Attachment	1	
-2	Roller Eccentricity Tester	2	
-3	Heavy Type Roller Assembling Machine	2	
-4	Roller Tester	2	
-5	Automatic Ultraviolet Rays Rubber Roller Treatment Machine	1	
-6	Miscellaneous Accessories		1 lot

Table 16-2 LABORATORY EQUIPMENT

Item No.	Equipment/Accessories	Quantity Import	Quantity Local
LAB-1	Digital Fibrograph	1	
-2	Micronaire with Balance	1	
-3	Stelometer (Fineness/Maturity Tester)	1	
-4	Microscope with Photographing Device	1	
-5	Cotton Standard Box	3	
-6	Irregularity Sample	14	
-7	Evenness Testing Installation	1	
-8	Compressor with Sub Tank	1	
-9	Wrap Reel	3	
-10	Wrap Block	1	
-11	Grain Balance	3	
-12	Yarn Fault Classifying Installation to be fit to modified existing R.T. Winder	1	
-13	Comber Waste Percentage Balance	1	
-14	Mini Evenness Tester	1	
-15	Single Yarn Tension Strength Tester	3	
-16	Lap Yard Testing Machine	1	
-17	Miscellaneous Equipment & Accessories		1 lot

4) Flow Chart

In accordance with the results of calculation tables and the list of production machines, the process flow is shown on the table 17 Flow Chart. The double circle mark, ◎ indicates existing machines to be remodeled. The single circle mark ○ indicates new machines to be procured.

Table 17 **FLOW CHART**

Note : Figure shows number of Production machine

Item \ Main Production Machine	Blow Room Machinery	Carding Machine	Pre -Drawing Frame	Lap Former	Comber	—	1st Drawing Frame	2nd Drawing Frame	Simplex Fly Frame	Ring Spinning Frame	Steam Setter	Auto Winder	R.T. Re-Winder
Total Number of Existing Machines	1	91								74	1		3
Total Number of New Machines	3		9	4	30		9	9	14	78	1	16	
CP-1 Cotton Combed Yarn for Ne30, 40 & 60	2	54	5	3	22		5	5	9	78		8	Ne60: 2
CP-2 Polyester65/Cotton35 Blended Yarn for Ne45 (Cotton Line)	1	19	2	1	8		2	2	3	38	1	4	1
Polyester48/Cotton52 Blended Yarn for Ne45 (Polyester Line)	1	18	2				2	2	2	36	1	4	

5-2-2 Ways of Thinking for Equipment Selection

1) Production Machines

The Spinning Machines have been selected among those modernized type machines which ensure the high product quality through high speed operation, i.e. high productivity, and also energy saving and lower noise level. Such ways of thinking have been also applied for selection of remodeling of existing machines.

The operating conditions are set at reasonable and appropriate level for the smooth and stable operation for all processes, in other words, they are set at the mechanically achievable levels. In addition, in order to ensure both high productivity and high quality, larger packages are applied as far as possible.

(a) Blowroom Machinery

The Blow room machines shall be those of less breakdown through utilization of high quality bearings of enough strength, and less numbers of parts through simplifying the mechanism. Each section of the blowroom machines shall be driven separately by respective electrical motors.

The Bale Opener shall have powerful opening capability through spiked lattice and spiked cylinder, and also effective mixing capability with large hopper.

The machines shall have effective cleaning and opening capability.

The scutcher shall have the capability of producing high quality laps in terms of both CV% and lap licking through the stable loading by the pneumatic control feeder of air pressure system.

The Blowroom Machinery for Polyester Line shall utilize the existing blowroom machinery of synthetic fibers, and shall be improved through the replacement of the scutcher part.

(b) Semi-High Production Cards

All 91 Carding Engines manufactured by Howa Machinery Ltd. of Japan in 1961 and existing in the Mill No. 2 shall be remodeled in order to obtain higher productivity and higher quality. Among them, 54 cards shall be used for Combed Cotton Yarn Line, 19 for cotton of Polyester/Cotton blended yarn, and 18 for Polyester of Polyester/Cotton blended Yarn Line.

Remodeling shall include the following.

- Replacement of metallic wire and garnet wire,
- Remodeling of driving mechanism,
- Remodeling of coiler and can so as to be 36" ϕ x 42"H
- Remodeling of waste collecting devices to the form of combination of suction and wrapping device,
- Furnishing of automatic stopping device
- Other necessary remodeling.

(c) Lap Former

The Lap Former should be capable to produce uniform laps at high speed, and to feed up to 48 slivers, since laps of high degree of fiber parallelism and uniformity can reduce comber noil to a considerable extent.

The Lap Former should be equipped with Full Automatic Lap Doffing Device,

including lap carriers to take automatically up to 4 laps, in order to realize continuous operation and consequent higher operating efficiency.

In addition, the lap former should be equipped with electrical stop motion devices for stopping machines instantaneously in the case of trouble so that waste shall be minimized and operation efficiency shall be improved.

(d) Comber

This is the comber with 8 combing heads enabling spinning of heavy grain lap as well as high speed and stable running without stopping for a long time, thanks to the reasonable design. Driving mechanism with camless motion, strong nipper knife, separate driving motor of brushes. uni-comb on cylinder, safety devices at various places within comber, etc. make the machine of less wear, of safety, of high productivity, and of high quality product.

(e) Drawing Frame

The Drawing Frames shall be of high speed, of high quality product, of less power consumption, of easy operation, and of easy maintenance.

The draft part shall be 5-over-4 with pressure bar type which gives optimum loading to fleece and hence controls fibers well, in order to contribute to produce slivers of better quality.

The Drawing Frames shall be equipped with both pneumatic suction clearer and electrical stop motion device.

The drawing frames shall be also equipped with automatic can changing device, in order to improve operating efficiency.

On the other hand, as regards the first drawing in the Mill No. 2 for the production line of Polyester/Cotton blended yarns, the drawing frames for blending shall be utilized in order to get more precise blending ratio. The drawing frame for blending shall be of sandwich blending type, from which better blending effect can be expected, and in which the fleece drawn in the pre-drafting zone shall be conveyed to the finishing draft zone by belt conveyor.

(f) Simplex Fly Frames

The Roving Frames shall be of high speed and high product quality. That is to say, the roving frames shall be capable to produce large roving bobbins of 152 mmϕ x 406 mm lift, in order to offset the increase in work load due to high speed and also in order to lengthen the doffing cycle time. The flyers supported at the top are offering such advantages as easier doffing works for large bobbins, shorter doffing hours, almost no vibration of flyer-top even at high speed operation, and less vibration of the frame itself. Furthermore since the flyer rail is located at the top of spindle and drives flyers from the top, the following advantages in terms of product quality and productivity are expected:–

– In the case that the roving is broken between the front roller and the flyer top, the photo-electric stop motion works surely and stops the machine, and hence prevents fly mixture and roving breakage.
– The roving is passing steadily and smoothly, especially from front rollers to flyer

tops, because the rotation of flyers generatesair turbulence very little.
Consequently less fluff and less fly shall be generated, and higher production can be expected than conventional roving frames due to less twist number to be required.

– The doffing operation requires less hours, because the easy doffing mechanism is equipped and hence it is not necessary to take off the flyers during doffing as the case of conventional roving frames.

The draft mechanism shall be 4-line with double apron system, which generates less fly, produces good roving of less fluff.

In addition, the following auxiliary devices shall be equipped, in order to ensure high productivity and quality.

– Fine adjusting device for roving tension,
– Cone belt automatic return motion,
– Full bobbin proper position stop motion,
– Package shoulder collapse preventing device,
– Cushion starter, i.e. Uneven roving preventing device,
– Line blow and pneumafil apparatus,
– Disconnecting device for irregular bobbin,
– Stop motion devices for both sliver and roving breakage,
– Safety devices for gear-end and side doors.

(g) Ring Spinning Frames.

The Ring Spinning Frames of 45/47 mmϕ ring and 205 mm (8") lift shall be utilized in order to reduce the work load as much as possible through making doffing cycle time as longer as possible. The Headstock shall be totally enclosed because of out-end driving system, and shall be prevented from exposure to fly due to no air flow to be caused by the heat generated by a motor and by the motor cooling purpose.

In addition, the change gears such as draft, twist, and lifter change gears shall be interchangable and neatly arranged at the end face of the headstock, in order to make the maintenance works convenient.

The draft mechanism shall be 3-line double apron system.

The following abtomatic devices shall be equipped in order to ensure the stable operation:–

– Automatic full bobbing stop motion,
– Automatic lefting and optimum position stop motion of ring rail,
– Push button switch for emergency stop,
– Automatic lappet tilting and reversing device.
– Cushion starter and snirl preventing device.
– Automatic speed changer of spindle

(h) Automatic Cone Winder

The Automatic Cone Winders shall be equipped with knotters of 1-drum 1-knotter type which allows excellent operating efficiency because of almost no waiting time for knotting. The knotters shall be of epock-making air-splicer type which joins yarn ends without a knot, and which prevents troubles due to knots in the subsequent weaving or knitting process.

The following devices shall be equipped in order to ensure the better product quality:–

- Electric slub catcher shall be mounted in order to remove thoroughly faults.
- When knotting, the electric clearer shall check both yarn tips from package and bobbin. If double or triple ends are detected, it is cut away for sure.
- Ribbon breaker of intermittent and variable speed mechanism driven by independent motor does not generate ribboning.
- Fly and yarn waste is removed by air blow at every yarn knot.

In order to make the maintenence works convenient, the following characteristics shall be preferably included:–

- Easy access to yarn path including splicer knotters, electrical slub catchers, and pegs for easy checking.
- Each winding unit can be swung down individually without stopping other units for the purpose of most maintenance works.
- Each winding unit can be easily taken off.
- Knotters and tension devices shall be of cassette type for easier maintenance.

The centralized compressed air station shall be established for the purpose of energy saving.

(i) RT (Rotary Traverse) Cone Winders

Three (3) sets of RT Cone Winders, which were manufactured by Kamitsu Seisakusho of Japan in 1970, shall be remodeled and utilized. The major points to be remodeled are as follows:–

- Remodeling of tension devices.
- Unifying the dimensions of the bobbin into 6" traverse x 5°57'.
- Mounting of electronic slub catchers.
- Mounting of Yarn Length Counters.
- Other remodeling to be required.

(j) Steam Setter

The existing Steam Setter, which is SBR-4 manufactured by Nikku Kogyo of Japan in 1971, shall be remodeled and utilized. In addition, one set of Fully Automated Steam Setter shall be procured. Consequently two (2) sets of Steam Setters shall be utilized for twist setting of Polyester/Cotton blended yarns.

The Major points of remodeling are as follows:–

- Replacement of packings.
- Remodeling of Carriers due to change in setting packages from cheeses to spinning bobbins.
- Other remodeling to be required.

The Steam Setter to be procured shall be of steam heated jacket type and fully automated type from commencement of setting after loading of bobbin carriers to completion of setting, in order to reduce setting work load and carry out uniform steam setting.

In addition, one set of small boiler shall be installed in order to supply steam to the two steam setters.

2) Auxiliary Equipment and Accessories

(a) Auxiliary Equipment and Accessories

After examining the performance of the existing auxiliary equipment, those which are suitable for the production machines to be newly installed shall be effectively utilized as many as possible. On the other hand, those to be procured shall be the equipment of high performance, of safety, and of good convenience.

The numbers of accessories and consumables shall be carefully planned in order to allow appropriate quantity of stocks within processes for the smooth and stable operation.

Since carriers can be manufactured locally by showing the detailed specifications and dimensions, it is better to distinguish local carriers from imported.

(b) Laboratory Equipment

The existing laboratory equipment is located in three separate places, i.e. the CP-1, CP-2 Mills and the Central Laboratory. It is recommendable that both the CP-1 and CP-2 Mills shall be equipped with only those required for the daily quality control due to the direct relation with production operations, and that the central laboratory shall be equipped with all other particular laboratory equipment in order to control the product quality comprehensively. Laboratory equipments were selected from the viewpoint if it is useful for the betterment of product quality through the feedback to operation side of recorded data, after checking and confirming fully the existing equipments and classifying them into 3 categories of equipments (to be supplied with spare parts, to be replaced and to be renewed).

5-2-3 Fundamental Specifications

1) Fundamental Specifications for Production Machines

In compliance with the basic design conditions, the major fundamental specifications of respective production machines are spelled out in the following tables.

– Table 18-1: Specifications for Main Production Machinery for CP-1 Mill
– Table 18-2: Specifications for Main Production Machinery for CP-2 Mill

Table 18-1 SPECIFICATION FOR MAIN PRODUCTION MACHINERY

(CP-1 Mill)

Item No.	Machine/Equipment	Quantity
RS-1 Blowing Section		
RS-1-1	Blow Room Machinery	2 lines
	1) Lap feeding system to card	
	2) Individual waste collecting system	
	3) Line arrangement	
	(1) for Cotton A-line	
	2-Bale opener	
	1-Blending conveyor	
	4-Fan condenser	
	2-Feeding unit	
	1-Step cleaner	
	1-Cleaner	
	1-D-type opener	
	1-Pheumatic change box	
	2-Pneumafeeder	
	2-Scutcher	
	1-Electric control	
	3-Rotary air filter	
	(2) for Cotton B-line	
	1-Bale opener	
	3-Fan condenser	
	2-Feeding unit	
	1-Step cleaner	
	1-Cleaner	
	1-D-Type opener	
	1-Pneumafeeder	
	1-Scutcher	
	1-Electric control	
	2-Rotary air filter	
	4) Centralized compressed air system	
RS-2 Carding Section		
RS-2-1	Semi High Production Card	54 sets
	1) To modify all existent carding machine to semi high production type	
	2) Lap feeding system	
	3) Fly comb system	

Item No.	Machine/Equipment	Quantity
	4) Sliver can size: 36" diameter x 42" height 5) Individual waste collecting system	
RS-3 Combing Section		
RS-3-1	High Speed Drawing Frame (Pre-Drawing) 1) Number of deliveries per frame: 2 deliveries 2) Number of feeding slivers per delivery: 8 slivers 3) Feeding can size: 36" diameter x 42" height 4) Delivery can size: 20" diameter x 42" height 5) Drawing system: 5 over 4 drafting system with pressure bar 6) Automatic can changing	5 sets
RS-3-2	Sliver Lap Former 1) Number of feeding slivers per frame: 42 slivers 2) Feeding can size: 20" diameter x 42" height 3) Drafting system: 3 over 2 drafting system 4) Taking up size of lap: 450 mm diameter x 267 mm width 5) Automatic doffing system	3 sets
RS-3-3	High Production Comber 1) Number of combing heads per frame: 8 heads 2) Number of deliveries per frame: 2 deliveries 3) Delivery can size: 20@ diameter x 42" height 4) Comb cylinder: 127 mm diameter with Hi-comb 5) Drafting system: 2 over 2 drafting system	22 sets
RS-4 Drawing Section		
RS-4-1	High Speed Drawing Frame (1st Drawing) 1) Number of deliveries per frame: 2 deliveries 2) Number of feeding slivers per delivery: 8 slivers 3) Feeding can size: 20" diameter x 42" height 4) Delivery can size: 20" diameter x 42" height 5) Drawing system: 5 over 4 drafting system with pressure bar 6) Automatic can changing	5 sets

Item No.	Machine/Equipment	Quantity
RS-4-2	High Speed Drawing Frame 1) Number of deliveries per frame: 2 deliveries 2) Number of feeding slivers per delivery: 8 slivers 3) Feeding can size: 20" diameter x 42" height 4) Delivery can size: 20" diameter x 42" height 5) Drawing system: 5 over 4 drafting system with pressure bar 6) Automatic can changing	5 sets
RS-5 Roving Section		
RS-5-1	High Speed Simplex Fly Frame 1) Number of spindles per machine: 108 spindles 2) Lift: 16" lift 3) Nominal full bobbin diameter: 6" 4) Drafting system: 4 roller double apron overhead type 5) Feeding can size: 20" diamter x 42" height	9 sets
RS-6 Spinning Section		
RS-6-1	Ring Spinning Frame 1) Number of spindles per machine: 400 spindles 2) Spindle gauge: 75 mm 3) Lift: 203 mm 4) Inside diameter of ring: 45 or 47 mm 5) Drafting system: 3 line 2 zone double apron with Mini Tension 6) Overhead travelling cleaner: BS & B type	78 sets
RS-7 Winding Section		
RS-7-1	Automatic Cone Winder 1) Number of drums per machine: 60 drums 2) Take-up package: 6" traverse x 5°57' cone 3) Supply package: Ring spinning bobbin 4) Air splicer knotter: Individual type 5) Centralized compressed air & Exhaust air system 6) Auxiliary equipment – Yarn length counter – Electronic yarn clearer – Overhead travelling cleaner: B.S. type	8 sets

Item No.	Machine/Equipment	Quantity
RS-7-2	RT. Cone Winder 1) To modify all existent R.T. cone winder 2) Number of drums per machine: 100 drums 3) Take-up package: 6" traverse x 5°57' cone 4) Supply package: Ring spinning bobbin 5) Auxiliary equipment – Yarn length counter – Electronic yarn clearer – Overhead travelling cleaner	2 sets

Table 18-2 SPECIFICATION FOR MAIN PRODUCTION MACHINERY

(CP-2 Mill)

Item No.	Machine/Equipment	Quantity
RS-1 Blowing Section		
RS-1-1	Blow Room Machinery for Cotton 1) Lap feeding system to card 2) Individual waste collecting system 3) Line arrangement 1-Bale opener 3-Fan condenser 2-Feeding unit 1-Step cleaner 1-Cleaner 1-D-type opener 1-Pneumafeeder 1-Scutcher 1-Electric control 2-Rotary air filter 4) Centralized compressed air system	1 line
RS-1-2	Blow Room Machinery for Polyester 1) Lap feeding system to card 2) Individual waste collecting system 3) Line arrangement 1-Creeper lattice 1-Hopper mixer 1-Cylinder opener 1-Control feeder 1-Scutcher 1-Control panel 1-Air filter box 4) Centralized compressed air system 5) To modify all existent blow room machinery for polyester on scutcher	1 line
RS-2 Carding Section		
RS-2-1	Semi High Production Card for Cotton 1) To modify all existent carding machine to semi high production type 2) Lap feeding system 3) Fly comb system 4) Sliver can size: 36" diameter x 42" height 5) Individual waste collecting system	19 sets

Item No.	Machine/Equipment	Quantity
RS-2-2	Semi High Production Card for Polyester 1) To modify all existent carding machine to semi high production type 2) Lap feeding system 3) Fly comb system 4) Sliver can size: 36" diameter x 42" height 5) Individual waste collecting system	18 sets
RS-3 Combing Section		
RS-3-1	High Speed Drawing Frame (Pre-Drawing) 1) Number of deliveries per frame: 2 deliveries 2) Number of feeding slivers per delivery: 8 slivers 3) Feeding can size: 36" diameter x 42" height 4) Delivery can size: 20" diameter x 42" height 5) Drawing system: 5 over 4 drafting system with pressure bar 6) Automatic can changing	2 sets
RS-3-2	Sliver Lap Former 1) Number of feeding slivers per frame: 42 slivers 2) Feeding can size: 20" diameter x 42" height 3) Drafting system: 3 over 2 drafting system 4) Taking up size of lap: 450 mm diameter x 267 mm width 5) Automatic doffing system	1 set
RS-3-3	High Production Comber 1) Number of combing heads per frame: 8 heads 2) Number of deliveries per frame: 2 deliveries 3) Delivery can size: 20" diameter x 42" height 4) Comb cylinder: 127 mm diameter with Hi-comb 5) Drafting system: 2 over 2 drafting system	8 sets
RS-4 Drawing Section		
RS-4-1	High Speed Drawing Frame (Grain adjust drawing for polyester) 1) Number of deliveries per frame: 2 deliveries 2) Number of feeding slivers per delivery: 8 slivers	2 sets

Item No.	Machine/Equipment	Quantity
	3) Feeding can size: 36" diameter x 42" height 4) Delivery can size: 20" diameter x 42" height 5) Drawing system: 5 over 4 drafting system with pressure bar 6) Automatic can changing	
RS-4-2	High Speed Drawing Frame (1st Drawing for P. 65%: C. 35%) 1) Number of deliveries per frame: 2 deliveries 2) Number of heads of pre-draft part: 3 heads 3) Number of feeding slivers per delivery: 24 slivers 4) Feeding can size: 20" diameter x 42" height 5) Delivery can size: 20" diameter x 42" height 6) Drawing system: A) Finisher part: 4 or 5 over 3 or 4 drafting system with pressure bar B) Pre-draft part: 3 over 3 drafting system with pressure bar 7) Automatic can changing	2 sets
RS-4-3	High Speed Drawing Frame (1st Drawing for P. 48%: C. 52%) 1) Number of deliveries per frame: 2 deliveries 2) Number of heads of pre-draft part: 3 heads 3) Number of feeding slivers per delivery: 24 slivers 4) Feeding can size: 20" diameter x 42" height 5) Delivery can size: 20" diameter x 42" height 6) Drawing system: A) Finisher part: 4 or 5 over 3 or 4 drafting system with pressure bar B) Pre-draft part: 3 over 3 drafting system with pressure bar 7) Automatic can changing	2 sets
RS-4-4	High Speed Drawing Frame (2nd Drawing for P. 65%: C. 35%) 1) Number of deliveries per frame: 2 deliveries 2) Number of feeding slivers per delivery: 8 slivers 3) Feeding can size: 20" diameter x 42" height 4) Delivery can size: 20" diameter x 42" height 5) Drawing system: 5 over 4 drafting system with pressure bar 6) Automatic can changing	2 sets

Item No.	Machine/Equipment	Quantity
RS-4-5	High Speed Drawing Frame (2nd Drawing for P. 45%: C. 52%) 1) Number of deliveries per frame: 2 deliveries 2) Number of feeding slivers per delivery: 8 slivers 3) Feeding can size: 20" diameter x 42" height 4) Delivery can size: 20" diameter x 42" height 5) Drawing system: 5 over 4 drafting system with pressure bar 6) Automatic can changing	2 sets
RS-5 Roving Section		
RS-5-1	High Speed Simplex Fly Frame for P. 65%: C.35% 1) Number of spindles per machine: 108 spindles 2) Lift: 16" lift 3) Nominal full bobbin diameter: 6" 4) Drafting system: 4 roller double apron overhead type 5) Feeding can size: 20" diameter x 42" height	3 sets
RS-5-2	High Speed Simplex Fly Frame for P. 48%: C. 52% 1) Number of spindles per machine: 108 spindles 2) Lift: 16" lift 3) Nominal full bobbin diameter: 6" 4) Drafting system: 4 roller double apron overhead type 5) Feeding can size: 20" diameter x 42" height	2 sets
RS-6 Spinning Section		
RS-6-1	Ring Spinning Frame for P. 65%: C. 35% 1) To modify all existent ring spinning frame 2) Number of spindles per machine: 400 spindles 3) Spindle gauge: 76.2 mm (3") 4) Lift: 203 mm 5) Inside diameter of ring: 47 mm 6) Drafting system: 3 line 2 zone double apron 7) Overhead travelling cleaner: BS & B type	38 sets

Item No.	Machine/Equipment	Quantity
RS-6-2	Ring Spinning Frame for P. 48%: C. 52% 1) To modify all existent ring spinning frame 2) Number of spindles per machine: 400 spindles 3) Spindle gauge: 76.2 mm (3") 4) Lift: 203 mm 5) Inside diameter of ring: 47 mm 6) Drafting system: 3 line 2 zone double apron 7) Overhead travelling cleaner: BS & B type	36 sets
RS-7 Setting Section		
RS-7-1	Full Automatic Vacuum Steam Setter 1) Machine and capacity (a) New machine: approx. 300 kg/charge 1 set (b) To modify existent machine: approx. 200 kg/charge 1 set 2) Construction (a) Vacuum chamber 1 set (b) Desuper heater 1 set (c) Separator 1 set (d) Return pump 1 set (e) Vacuum pump 1 set (f) Condenser 1 set (g) Control panel 1 set (h) Valves and piping 1 set (i) Air compressor 1 set 3) Small boiler for steam setter	2 sets 1 set
RS-8 Winding Section		
RS-8-1	Automatic Cone Winder for P. 65%: C. 35% 1) Number of drums per machine: 60 drums 2) Take-up package: 6" traverse x 5°57' cone 3) Supply package: Ring spinning bobbin 4) Air splicer knotter: Individual type 5) Centralized compressed air & Exhaust air system 6) Auxiliary equipment – Yarn length counter – Electronic yarn clearer – Overhead travelling cleaner: B.S type	4 sets
RS-8-2	Automatic Cone Winder for P. 48%: C. 52% 1) Number of drums per machine: 60 drums 2) Take-up package: 6" traverse x 5°57' cone	4 sets

Item No.	Machine/Specification	Quantity
	3) Supply package: Ring spinning bobbin 4) Air splicer knotter: Individual type 5) Centralized compressed air & Exhaust air system 6) Auxiliary equipment – Yarn length counter – Electronic yarn clearer – Overhead travelling cleaner: B.S type	
RS-8-3	R.T. Cone Winder (Re-Winding) 1) To modify all existent R.T. cone winder 2) Number of drums per machine: 100 drums 3) Take-up package: 6" traverse x 5°57' cone 4) Supply package: Ring spinning bobbin 5) Auxiliary equipment – Yarn length counter – Electronic yarn clearer – Overhead travelling cleaner	1 set

2) Fundamental Specifications for Auxiliary Equipment

In compliance with the basic design conditions, the major fundamental specifications of respective auxiliary equipment, accessories, and laboratory equipment are spelled out in the following tables.

– Table 19-1: Specifications for Auxiliary Equipment and Accessories.
– Table 19-2: Specifications for Laboratory Equipment

Table 19-1 SPECIFICATION FOR AUXILIARY EQUIPMENT AND ACCESSORIES

Item No.	Equipment/Accessories	Quantity
AUX-1 Blowing Section		
AUX-1-1	Cart for lap transport 1) Size (approximate) Length: 1,350 mm Width: 1,210 mm Height: 2,011 mm 2) Wheel Fixed wheel: 2 pcs Diametre: 150 mm Swivel wheel: 2 pcs Diametre: 130 mm 3) Maximum loading capacity (approximate): 150 kg	7 sets
AUX-1-2	Carrier for waste and reusable fiber 1) Size (approximate) Length: 1,050 mm Width: 500 mm Height: 1,050 mm 2) Wheel Fixed wheel: 2 pcs Diametre: 150 mm Swivel wheel: 2 pcs Diametre: 130 mm 3) Maximum loading capacity (approximate): 100 kg	20 sets
AUX-1-3	Hand lift truck 1) Size (approximate) Length: 1,284 mm Width: 480 mm Height: 205 mm Lift: 120 mm	4 sets

Item No.	Equipment/Specification	Quantity
	2) Wheel 200 mm in diameter x 50 mm width, 2 pcs 82 mm in diametre x 70 mm width, 2 pcs 3) Maximum loading capacity (approximate): 1,500 kg	
AUX-1-4	Lap sheet 1) Size (approximate) Length: 1,670 mm Width: 1,050 mm 2) Material: PVC coated cloth 0.35 mmt 3) Weight: 570 g ± 10 g	370 sets
AUX-2 Carding Section		
AUX-2-1	Metallic wire mounting machine complete set 1) Width of cylinder or doffer: 1,016 mm (40") 2) Accessory equipment (a) Motor: single phase, 220V, 50HZ 0.75 KW x 4 P ..... 1 set 0.4 KW x 4 P ..... 1 set (b) Frame: 1 set (c) Side pressure equipment with tension meter 1 set (d) Speed reduction gear & frame 1 set (e) Interchangeable gear 1 set (22T, 30T, 36T, 46T, 56T, 62T, 72T, 80T ..... Total 8 pcs/set) (f) Reel 1 set (g) Groove cutter 1 set (h) Electric welder 1 set (i) Electric soldering iron 1 set (j) Tools and consumption articles 1 set 3) Extra accessory & spare parts (a) Side pressure plate with superhard alloy 1 pce (b) Cutting bit 6 pcs (c) Spare heater 4 pcs (d) Solder & solder cream 2 kgs	2 sets
AUX-2-2	Bare surface grinder 1) Travers: 1,060 mm (41 3/4") 2) Grinding stone (approximate) Diameter: 305 mm Width: 36 mm 3) Individual driving by V belt	1 set

Item No.	Equipment/Specification	Quantity
	4) Motor: single phase, 220V, 50HZ, 0.75 KW x 4 P 5) Extra accessory & spare parts (a) Dressing apparatus for the above with diamond tool: 1 set (b) Ratch & fork: 2 sets (c) Grinding stone: 1 pce	
AUX-2-3	Licker-in roller mounting machine 1) Working: mounting, grinding, dressing, burnishing 2) Driving shaft revolutaion: 300 R.P.M. 3) Motor: 3 phases, 380V, 50HZ, 0.75 KW x 4 P 4) Extra accessory & spare parts (a) dressing apparatus for traverse wheel grinder with diamond tool: 1 set (b) grinding stone: 1 pce (c) burning fillet #28 x 39 mm x 13 m: 1 coil	1 set
AUX-2-4	Flat clipping machine 1) Width of flat bar: 1,016 mm (40") 2) Type of flat bar: 90 & 160 pcs, flat bar 3) Driving pulley revolution: 130 R.P.M. 4) Motor: 3 phases, 330V, 50HZ, 2.2 KW x 4 P 5) Standard accessory (a) Lining plate for straight rail: 0.5t – 2 pcs (b) Lining plate for straight rail: 0.2t – 1 pce	1 set
AUX-2-5	Flat grinding machine 1) Width of flat bar: 1,016 mm (40") 2) Type of flat bar: 90 & 106 pcs, flat bar 3) Grinding pulley revoluation: 400 R.P.M. 4) Grinding method: 3 flats at one time 5) Motor: 3 phases, 330V, 50HZ, 0.75 KW x 4 P 6) Extra accessory & spare parts (a) Flat tester with dial indicator: 1 set (b) Hi-emery fillet #30 x 39 mm x 36.5 m: 1 coil	2 sets
AUX-2-6	Flat tester 1) Width of flat: 1,016 mm (40") 2) Dial indicator: unit 1/100 mm 3) Fixed wheel: 75 mm in diametre, 4 pcs	2 sets

Item No.	Machine/Specification	Quantity
AUX-2-7	Traverse hose roller grinder for MCC 1) Width of cylinder or doffer: 1,016 mm (40") 2) Length of roller on barrel: 1,194 mm (47") 3) Grinding stone (approximate): 180ϕ x 130ϕ x 50W mm 4) Extra accessory & spare parts (a) Ratch & fork: 2 sets (b) Grinding stone: 4 pcs	4 sets
AUX-2-8	Traverse hose roller grinder for Top 1) Width of cylinder or doffer: 1,016 mm (40") 2) Length of roller on barrel: 1,194 mm (47") 3) Diameter of emery wheel: 6 11/16" 4) Extra accessory & spare parts (a) Hi-emery fillet #30 x 25 mm x 36.5 m: 1 coil (b) Ratch & fork: 2 sets	4 sets
AUX-2-9	Stripping roller 1) Width of cylinder or doffer: 1,016 mm (40") 2) Length of roller on barrel: 1,054 mm (41 1/2") 3) Bare diameter: 140 mm (5 1/2") 4) Extra spare parts (a) Stripping fillet 27/30 x 39 mm x 12 m: 2 coils (b) Tacks for card size approximate 6 mmϕ x 16 mm 500g Net	2 sets
AUX-2-10	Burnishing roller 1) Width of cylinder or doffer: 1,016 mm (40") 2) Length of roller on barrel: 1,054 mm (41 1/2") 3) Bare Diameter: 140 mm (5 1/2") 4) Extra spare parts (a) Burnishing fillet #28 x 39 mm x 13 m: 2 coils	2 sets
AUX-2-11	Long grinding roller 1) Width of cylinder or doffer: 1,016 mm (40") 2) Length of roller on barrel: 1,054 mm (41 1/2") 3) Bare Diameter: 170 mm (6 11/16") 4) Extra spare parts (a) Hi-emery fillet #30 x 39 mm x 36.5 m: 1 coil	2 sets

Item No.	Machine/Equipment	Quantity
AUX-2-12	Movable motor device for stripping & burnishing roller 1) Motor: single phase, 220V, 50HZ, 0.4 KW x 4 P 2) Floor lock: pedal system 3) Fixed wheel: 100 mm in diametre, 4 pcs	2 sets
AUX-2-13	Chain washing machine 1) Motor: 3 phases, 380V, 50HZ, 0.4 KW x 4 P 2) Type of flat chain: 90 & 106 links chain 3) Driving shaft revolution: 100 R.P.M.	1 set
AUX-2-14	Truck for flat bar 1) Width of flat bar: 1,016 mm (40") 2) Type of flat bar: 90 & 160 pcs, flat bar 3) Size (approximate) Length: 1,326 mm Width: 493 mm Height: 1,156 mm 4) Wheel Fixed wheel: 200 mm in diametre, 2 pcs Swivel wheel: 150 mm in diametre, 2 pcs 5) Loading capacity: 150 kg in maximum	4 sets
AUX-2-15	Truck for traverse hose roller 1) Width of cylinder or doffer: 1,016 mm (40") 2) Size (approximate) Length: 1,980 mm Width: 750 mm Height: 1,296 mm 3) Wheel Fixed wheel: 200 mm in diametre, 2 pcs Swivel wheel: 150 mm in diametre, 2 pcs 4) Loading capacity: 700 kg in maximum	2 sets
AUX-2-16	36"ϕ can with spring & caster 1) Can size (approximate) 1 set Diameter: 915 mm (36") Height: 1,067 mm (42") 2) Spring size (approximate) 1 set Diameter of plate: 890 mm Free height: 930 mm 3) Single caster: 3 pcs/set	440 sets
AUX-2-17	Side scope 1) Complete set	2 sets

Item No.	Machine/Equipment	Quantity
	(a) Micro-scope with mirror 1 set	
	(b) Pen-light (battery: 1.5V x 2 pcs) 1 pce	
	(c) Battery (AA/R6 1.5V) with spare 4 pcs	
	(d) Portable case 1 pce	
	2) Magnification of eye lens x 20	
AUX-2-18	Cylinder & doffer jack set	2 sets
	1) Lifting length (approximate)	
	(a) cylinder with pedestal	
	Maximum: 1,070 mm	
	Minimum: 770 mm	
	Lift: 300 mm	
	(b) Doffer	
	Maximum: 870 mm	
	Minimum: 570 mm	
	Lift: 300 mm	
AUX-2-19	Cylinder balance tester set	1 set
	1) Outside diametre of cylinder bearing: 140 mm	
AUX-3 Combing Section		
AUX-3-1	Bobbin for comber	550 sets
	1) Size	
	Diameter: 130ϕ mm	
	Length: 266.7 mm	
	2) Material: Nylon	
AUX-3-2	20"ϕ can with spring & caster	200 sets
	1) Can size (approximate)	
	Diameter: 508 mm (20")	
	Height: 1,067 mm (42")	
	2) Spring size (approximate)	
	Diameter of plate: 490 mm	
	Free height: 1,023 mm	
	3) Single caster: 3 pcs/set	
AUX-4 Drawing Section		
AUX-4-1	20"ϕ can with spring & caster	3,000 sets
	1) Can size (approximate)	
	Diameter: 508 mm (20")	
	Height: 1,067 mm (42")	
	2) Spring size (approximate)	
	Diameter of plate: 490 mm	
	Free height: 1,023 mm	
	3) Single caster: 3 pcs/set	

Item No.	Equipment/Accessories	Quantity
AUX-5 Roving Section		
AUX-5-1	Cart for roving 1) Size (approximate) Length: 1,200 mm Width: 560 mm Height: 1,645 mm 2) Wheel (approximate) Fixed wheel: 200 mm, 2 pcs Swivel wheel: 130 mm, 2 pcs 3) Loading capacity (approximate): 400 kg	25 sets
AUX-5-2	Cart for roving bobbin 1) Size (approximate) Length: 650 mm Width: 310 mm Height: 720 mm 2) Wheel (approximate) Fixed wheel: 150 mm, 2 pcs Swivel wheel: 100 mm, 2 pcs 3) Loading capacity (approximate): 60 kg	20 sets
AUX-5-3	Bobbin for simplex fly frame 1) Size (approximate) Diameter of straight part: 45 mm Total length: 445 mm 2) Material: plastic resin	94,000 sets
AUX-5-4	Polivel picker Length of rod: 200 mm & 300 mm Hand type	25 sets
AUX-6 Spinning Section		
AUX-6-1	Cop box with separator 1) Size (approximate) Inside / Outside Length: 565 mm / 603 mm Width: 270 mm / 300 mm Height: 350 mm / 355 mm 2) Loading capacity: 50 kg in maximum 3) Thermal stability Maximum temperature: 120°C Minimum temperature: −20°C 4) Material: plastic resin 5) Separator: movable plate in cop box	570 sets

Item No.	Machine/Equipment	Quantity
AUX-6-2	Hanger for doffing 1) Size (approximate) Length: 450 mm Width: 70 mm Height: 472 mm 2) Maximum loading capacity: 25 kg	36 sets
AUX-6-3	Cart for cop transportation 1) Size (approximate) Length: 960 mm Width: 560 mm Height: 1,185 mm 2) Wheel Fixed wheel: 150 mm, 2 pcs Swivel wheel: 100 mm, 2 pcs 3) Loading capacity: 200 kg in maximum	10 sets
AUX-6-4	Spira cleaning machine 1) Tank capacity Cleaning oil tank: 19 litres Fresh oil tank: 15 litres 2) Filtering capacity: 600 litres/hour 3) Pump Cleaning oil pump: 4 kg/cm², 1,720 R.P.M. Fresh oil pump: 4 kg/cm², 230 R.P.M. 4) Motor for oil pump: single phase, 220V, 50HZ 0.4 KW x 4 P 5) Electric wire length: 25 metres	2 sets
AUX-6-5	Clearer cleaning machine 1) Size (approximate) Length: 930 mm Width: 400 mm Height: 1,020 mm 2) Motor: 200W x 1 95W x 1 single phase-220V, 50HZ	4 sets
AUX-6-6	Heating press for spindle tape 1) Size of HABASIT belt to be used Maximum width: 100 mm Maximum thickness: 5 mm 2) Heater with thermostat: 220V, 50HZ, 100W	2 sets

Item No.	Machine/Equipment	Quantity
AUX-6-7	Roller picker with hose 1) Air pressure: 2 ~ 3 kg/cm² 2) Revolution of spindle: 8,000 ~ 10,000 R.P.M. 3) Air comsumption: 0.1 m³/min 4) Total length (approximate): 180 mm 5) Hose with joint Diametre: 6.3 mm Length: 30 m/set	16 sets
AUX-6-8	Can containing travellers Type of travellers MS/hf, OSY, ZS/hf	1,000 cans
AUX-6-9	Traveller magazine 1) Size (approximate) Length: 130 mm Width: 38 mm 2) Material: iron sheet	310 sets
AUX-6-10	Bobbin for ring spinning frame 1) Specifications of spindle Spindle type: taper touch Lift: 205 mm 2) Bobbin size (approximate) Length: 235 mm 3) Material: polycabonate resin	260,000 pcs
AUX-6-11	Blow cleaner for ring spinning frame 1) Distribution Type CP-1 CP-2 Blowing and suction 40 sets 38 sets Blowing 38 sets 36 sets 2) Travelling system: fore and back by belt driving 3) Travelling speed: 10 m/min	152 sets
AUX-6-12	TT-collecter 1) Size (approximate) Center distance of groove: 75 mm Total length of wire: 113 mm 2) Material Body: phenol resin Tube: Nylon Wire holder: stainless steel	31,000 sets

Item No.	Machine/Equipment	Quantity
AUX-7 Winding Section		
AUX-7-1	Cart for cone	40 sets
	1) Size (approximate)	
	Length: 1,250 mm	
	Width: 370 mm	
	Height: 1,050 mm	
	2) Wheel	
	Fixed wheel: 150 mm, 2 pcs	
	Swivel wheel: 100 mm, 2 pcs	
	3) Loading capacity: 120 kg	
AUX-7-2	Scale for automatic winder	10 sets
	1) Weighing capacity: 2 kg	
	2) Minimum indication: 5 g	
AUX-8 Maintenance Section		
AUX-8-1	Movable tool box with vise	4 sets
	1) Size (approximate)	
	Length: 900 mm	
	Width: 600 mm	
	Height: 750 mm	
	2) Wheel	
	Fixed wheel: 130 mm, 2 pcs	
	Swivel wheel: 100 mm, 2 pcs	
	3) Loading capacity: 200 kg in maximum	
	4) Size of vice: 5 inches	
AUX-8-2	Movable tool box	7 sets
	1) Size (approximate)	
	Length: 900 mm	
	Width: 600 mm	
	Height: 750 mm	
	2) Wheel	
	Fixed wheel: 130 mm, 2 pcs	
	Swivel wheel: 100 mm, 2 pcs	
	3) Loading capacity: 200 kg in maximum	
AUX-8-3	Handling carrier	7 sets
	1) Size (approximate)	
	Length: 900 mm	
	Width: 600 mm	
	Height: 850 mm	
	2) Wheel	
	Fixed wheel: 130 mm, 2 pcs	
	Swivel wheel: 130 mm, 2 pcs	
	3) Loading capacity: 300 kg in maximum	

Item No.	Machine/Equipment	Quantity
AUX-8-4	General tool	1 lot
AUX-8-5	Spare parts for existent auxiliary equipment	1 lot
AUX-8-6	Portable crane with chain block 1) Maximum effective hanging height: 2,500 mm 2) Permissible limit weight: 2 tons 3) Dimension Machine width: 3,500 mm Working width: 2,700 mm	1 set
AUX-9 Roller Shop		
AUX-9-1	Gum cot grinding machine with attachment 1) Maximum working length: 500 mm 2) Maximum working outer diametre: 180 mm 3) Traverse speed: 435 mm, 706 mm, 1,153 mm/min 4) Revolution of grinding wheel spindle: 2100,2400 R.P.M. 5) Outer diametre of grinding wheel: 305 mm 6) Width of grinding wheel: 38 mm 7) Bore diametre of grinding wheel: 44.45 mm 8) Motors: 3 phases, 380V, 50HZ, 1.5 KW x 4 P, 1 pce 200 W x 4 P, 2 pcs 150 W x 4 P, 1 pce 9) Auxiliary equipment & accessories (a) Attached equipment: 1 lot (b) Exhaust equipment: 1 set (c) Tool & gauges: 1 lot	1 set
AUX-9-2	Roller eccentricity tester 1) Working length: 300 mm in maximum 2) Unit of indication: 1/100 mm in minimum	2 sets
AUX-9-3	Heavy type roller assembling machine 1) Manual type 2) Maximum length of roll to be mounted: 100 mm 3) Maximum diametre of roll to be mounted: 45 mm 4) With attached equipment: 1 lot	2 sets

Item No.	Machine/Equipment	Quantity
AUX-9-4	Roller tester 1) Maximum length of roll: 300 mm 2) Maximum diametre of roll: 50 mm 3) Unit of indication: 1/100 mm in minimum	2 sets
AUX-9-5	Automatic ultraviolet rays rubber roller treatment machine 1) Applicable size of rubber roller (approximate) Maximum diametre: 50 mm Maximum length: 470 mm 2) Treating capacity (approximate) 1,800 pcs/hour in case of treating roller 75 mm length 3) Air supply: by air compresser for roller presser 4) Motors: 3 phases, 380V, 50HZ blower for exhaust, 0.36 KW varying speed motor, 0.4 KW 5) Mercury lamp: single phase, 220V, 50HZ, 2KW, 2 pcs	1 set
AUX-9-6	Miscellaneous accessories	1 lot

Table 19-2 SPECIFICATION FOR LABORATORY EQUIPMENT

Item No.	Machine/Equipment	Quantity
LAB-1	Digital Fibrograph 1) Fibrograph Length determination of cotton and man-made fibrer up to 65 mm in accordance 2) Accessory Fibro sampler: 1 set Sliver clamps: 1 set 3) Spare parts: 1 lot	1 set
LAB-2	Micronaire with Balance 1) Portable micronaire complete: 1 set (a) Measuring: resistance of air flow (b) Indication: micron gramme by float in vertical tube 2) Balance: (a) Capacity: 20 g (b) One division: 0.01 g 3) Compressor: centralized compressed air system Air: 40 ℓ/min, 8 ~ 9.9 kg/cm² 4) Sample size: 50 grains (3.24 grams) or 11 OZS	1 set
LAB-3	Stelometer (Finess/maturity tester) 1) Range: 2 to 7 kg – force breaking strength 0 to 50% elongation for the 1/8 inch gauge length 2) Sample: flat bundle, 3 to 6 milligrams 11.7 mm for zero gauge length 15 mm for 1/8 inch gauge length 3) Accessories (a) Vise: 1 set *Equipped with clamp for attachment to table thickness up to 2 inches (b) Hand comb: 1 set (c) Stelometer clamp: 1 set (d) Fiber knife: 1 set (e) Clamp wrench 1 set (f) Tweezers: 1 set (g) Zero gauge test strip: 1 set	1 set

Item No.	Machine/Equipment	Quantity
	(h) 1/8 inch gauge test strip: 1 set	
	(i) Sample clip: 1 set	
	(j) Leathers and glue kit: 1 set	
	(k) Bottle dashpot oil: 1 set	
LAB-4	Microscope with Photographing Device	1 set
	1) Microscope	
	(a) Total magnification: 40x ~ 1,000x	
	(b) Object lens: magnification: CF 4x, CF 10x, CF 20x, CF 40x, CF 100x.	
	(c) Eye piece: magnification: CFW 10x	
	(d) Abbe condenser:	
	(e) Trans:	
	(f) Polarizing accessories:	
	(g) Spare parts:	
	Slide glass 100 pcs	
	Cover glass 400 pcs	
	Imageon oil 100 cc	
	Bulb 5 pcs	
	2) Photographing device PFX-35 type 1 pce	
	Shutter's speed: T, B, 1/2, 1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250 sec.	
	Prism turning reflex type	
	(a) Camera box FX-35 type 1 pce	
	(b) Mount B 1 pce	
	(c) Projection lens	
	PL 2.5 x focal distance 63.8 mm 1 pce	
	PL 5 x focal distance 28.5 mm 1 pce	
	(d) Release	
LAB-5	Cotton Standard Box	3 box
	1) United states cotton standars	
	2) Type of standard box	
	SLM (strict low middling) 1 box	
	M (middling) 1 box	
	SM (strict middling) 1 box	
LAB-6	Irregularity Sample	14 pcs
	1) Cotton carded yarn	
	for Ne 10 3 pcs/set	
	for Ne 20 3 pcs/set	
	for Ne 30 3 pcs/set	
	2) Cotton combed yarn 2 pcs/set	

3) Polyester cotton blended yarn 3 pcs/set
Total 14 pcs

LAB-7 Evenness Testing Installation (U%) 1 set

1) Measuring unit and control unit: 1 set
   (a) Measuring range:
   (approximate) 80 Ktex ~ 4 Ktex
   (80 g/m ~ Nm 250)
   (b) Sensitivity: 4 ranges. (±100%, ±50%, +25% & ±12.5%)
   (c) Material feed: 4, 8, 25, 50, 100, 200 & 400 m/min
   (d) Evaluating time: 1, 2.5, 5, 7.5 and 10 minutes
   (e) Diagram speed: 2.5, 5, 10, 25, 50 & 100 cav/min
2) Spectrograph with spectrogram recorder (SPG): 1 set
   Analysing range from 2 cm to 40 m wavelength in one measurement at 400 m/min material feed and at least 5 minutes evaluating time.
3) Imperfection indicator (IPI): 1 set
   Electronic counting
   Thin places: –30, –40, –50, and –60%
   Thick places: +100, +70, +50, and +35%
   Neps: +400, +280, +200 and +140%
4) Small unrolling device: 1 set
5) Air compressor: centralized compressed air system
   Pressure: mimimum 0.5 kg/cm² – 0.5 bar
   Consumption: maximum 10 m³/h
6) Recommended reserve material: 1 lot
   Diagram paper
   Recording ink
   Recording pen
   Filter

LAB-8 Compressor with Sub Tank 1 set

1) Centralized compressed air system
2) Supply for testing equipment
   LAB-2 micronaire
   LAB-7 evenness testing installation
3) Tank volume: 95 ℓ

Item No.	Machine/Equipment	Quantity
LAB–9	Wrap Reel 1) Perimeter of reel: 1.5 yards 2) Stop by auto counter 3) Reeling revolution: 200 R.P.M. 4) Number of reeling yarn: 5 reels	3 sets
LAB-10	Wrap Block 1) Driving system: manual 2) Cylinder size (approximate) Width: 445 mm Circumference: 1 yard	1 set
LAB-11	Grain Balance (chainomatic precision balance) 1) Weighing capacity: 2,000 grain 2) Minimum indication: 0.1 grain 3) Measuring range by chain: 0.1 ~ 5 grain	3 sets
LAB-12	Yarn Fault Classifying Installation to be fit to modified existing R.T. Winder 1) classimat (a) Classifying instrument with built in printed for data distribution and length measuring arrangement 1 set (b) Measuring heads 6 sets (c) Data transducers 6 sets (d) Testing instrument 1 set (e) Fitting material 6 sets (f) Spare parts & printer-paper 2) R.T. Winder (a) to modify all existent R.T. cone winder (b) Number of drums per machine: 14 drums (c) Take-up package: 6" traverse x 5°57' cone (d) Supply package: ring spinning bobbin & 6" x 5°57' cone (e) Auxiliary equipment – Yarn length counter 7 drums – Electronic yarn clearer 7 drums	1 set
LAB-13	Comber Waste Percentage Balance 1) Size (approximate) 460 mm x 310 mm 2) Range of waste percentage 10 ~ 20%	1 set

Item No.	Machine/Equipment	Quantity
LAB-14	Mini Evenness Tester 1) Measuring range of irregularity: 1 ~ 30 U% 2) Range of the material speed: 10 ~ 600 m/min 3) Accessories (a) Electrical charge testing instrument (b) Measuring head for yarns (c) Measuring head for slivers	1 set
LAB-15	Single Yarn Tension Strength Tester 1) Measuring: maximum tensile strength elongation at break 2) Sample yarn length for test: 20 ~ 50 cm 3) Tension speed: 30 cm/min 4) Motor: single phase, 220V, 50HZ, 200 W x 4 P	3 sets
LAB-16	Lap Yard Testing Machine with Balance 1) Driving system: manual 2) Size (approximate) Length: 1,100 mm Width: 1,250 mm Height: 1,100 mm	1 set
LAB-17	Miscellaneous Equipment & Accessories	1 lot

5-2-4 Layout of Production Machines

The layout of the spinning production machines shall be determined taking into consideration various factors, for instance particularly the following:–

- The shape and area of the building, and distance between columns.
- Kinds and numbers of machines, dimensions of packages, and their combination.
- Details of operation, i.e. kinds and flow of products.
- Detailed methods of maintenance, and relative location of maintenance room.
- Power wiring and air conditioning.
- Future plan for remodeling and/or increases of machines.

The layout of both Cilacap Spinning CP-1 and CP-2 Mills has been made up in principle on the basis that all required machines shall be installed in the existing buildings. The following is the basic ways of thinking on the layout and the characteristics for both the mills:–

1) Cilacap Spinning CP-1 Mill (Figure 9)

(a) Summary and Basic Ways of Thinking

The overall layout has been designed taking into account the following:–

- Remodeling of the existing building or new construction shall be minimized.
- Flow of the spinning process shall be changed from current south (cotton feeding) to north (yarn winding) flow to north to south flow taking into consideration the location of the existing product warehouse and the raw material warehouse to be newly constructed.
- The machines shall be positioned taking into account location of columns and also the convenience in operation works.
- The distances between processes and also the direction of machines shall be determined taking into consideration the easiness of machinery supervision by operatives, half-product transportation distance, and efficient operation.
- There shall be appropriate storage spaces for half-products of appropriate quantity.
- The machines of heavy air conditioning load shall be positioned at the closer places to the air conditioning equipment in order to utilize the capacity most effectively.

(b) Layout for Blowing Room

There shall be two (2) lines of Blowroom Machinery. One line consists of 2 Bale Openers and 2 Scutchers for Ne 30's and 40's. The other line consists of 1 Bale Opener and 1 Scutcher for fine count cotton yarns. Since the raw cotton bales transportation from the Raw Material Warehouse to the Blowing Room and their opening is done once a day, there shall be enough room for their storage, opening, and moisture regaining. In addition, the line with one scutcher shall be laid out, so that there shall be enough storage space for laps for the purpose of processing of two kinds of cotton, i.e. one for Ne 30's and 40's, and the other for Ne 60's.

(c) Layout for Carding Process

The Carding Engines shall be laid out, so that the laps coming from the Blowing Process shall be transported smoothly, and also so that the large cans of 36"ϕ x 42"H shall be smoothly transported to the next process of drawing and combing.

Full consideration is taken to the directions of machines and also the spacing between the machines.

The storage space for full cans in front of the subsequent drawing process shall be secured in order not to hinder the operation works.

(d) Layout for Combing and Drawing Process

The machines shall be laid out in order to minimize the transportation distances of both cans 20"ϕ x 42"H and comber laps, and also to reduce the workload. In addition, the roving frames shall be located at the center of the building so that delivery cans of final drawframes can be conveyed to the former in shortest way.

(e) Layout for Roving Process

The nine (9) Roving Frames shall be laid out along one span of about 80 meters of the existing building face to face in order to keep operation convenient.

In addition, the distance with the subsequent spinning process shall be set ideally and appropriately in order to reduce the workload of transporting the full roving bobbins.

(f) Layout of Ring Spinning Process

The seventy eight (78) Ring Spinning Frames shall be laid out parallel to the Roving frames, so that air stream for the purpose of air conditioning shall smoothly flow from the Spinning Room to the Roving Room, therefore the air conditioning ducts can be arranged ideally and the transportation of both roving and spinning bobbins shall be conveniently carried out.

(g) Layout of Winding Process

The Automatic Winders shall be laid out taking into consideration the storage space for both the spinning bobbins and cheeses for packing. The space for packing in a form of carton cases shall be secured sufficiently.

In principle, the Winding Room shall be located at the south end of the existing building where shall be the closest position to the existing products warehouse for the purpose of easy transportation of the packed products.

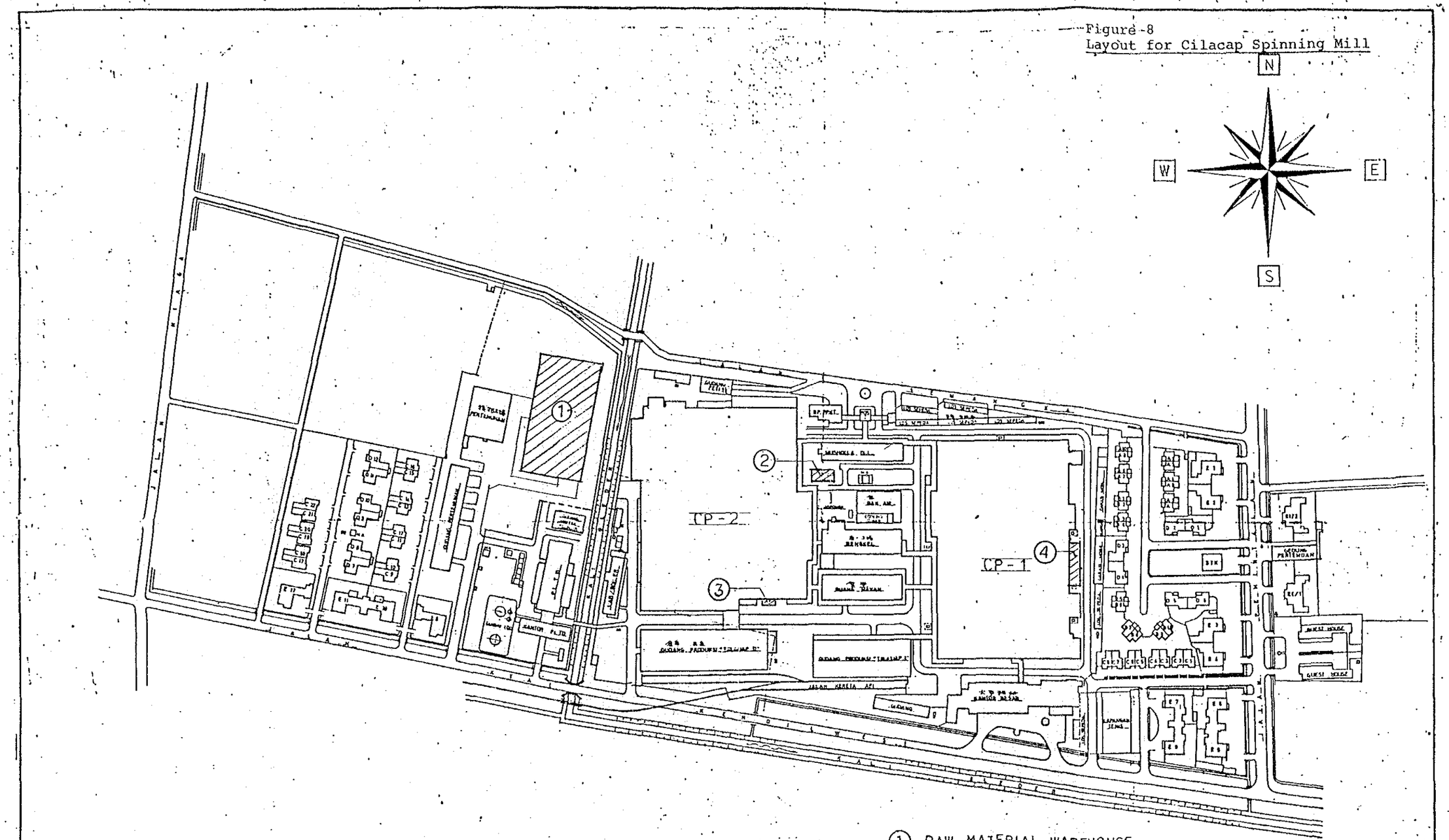
(h) Layout of Auxiliary Rooms

The utilization of auxiliary rooms shall be thoroughly rearranged. As for existing packing room and the product store room, actual partitions must be removed. The existing Roller Maintenance Shop, Laboratory, Offices, Maintenance Room, Pump Room and Waste Fiber Room shall be utilized as the air conditioning room for both the spinning and winding. Instead a new room of about 8 m x 27.4 m shall be newly constructed at the east side of the middle of the existing building for the maintenance and roller maintenance room.

Both the offices and laboratory shall be relocated with a reduced size taking into consideration the scope of works to be implemented there.

Since the existing Cyclone Collector shall not be used in the renovation plan, the room shall be utilized for the maintenance room for both the spinning and winding and for the blower room for the Automatic Winders.

Figure-8
Layout for Cilacap Spinning Mill

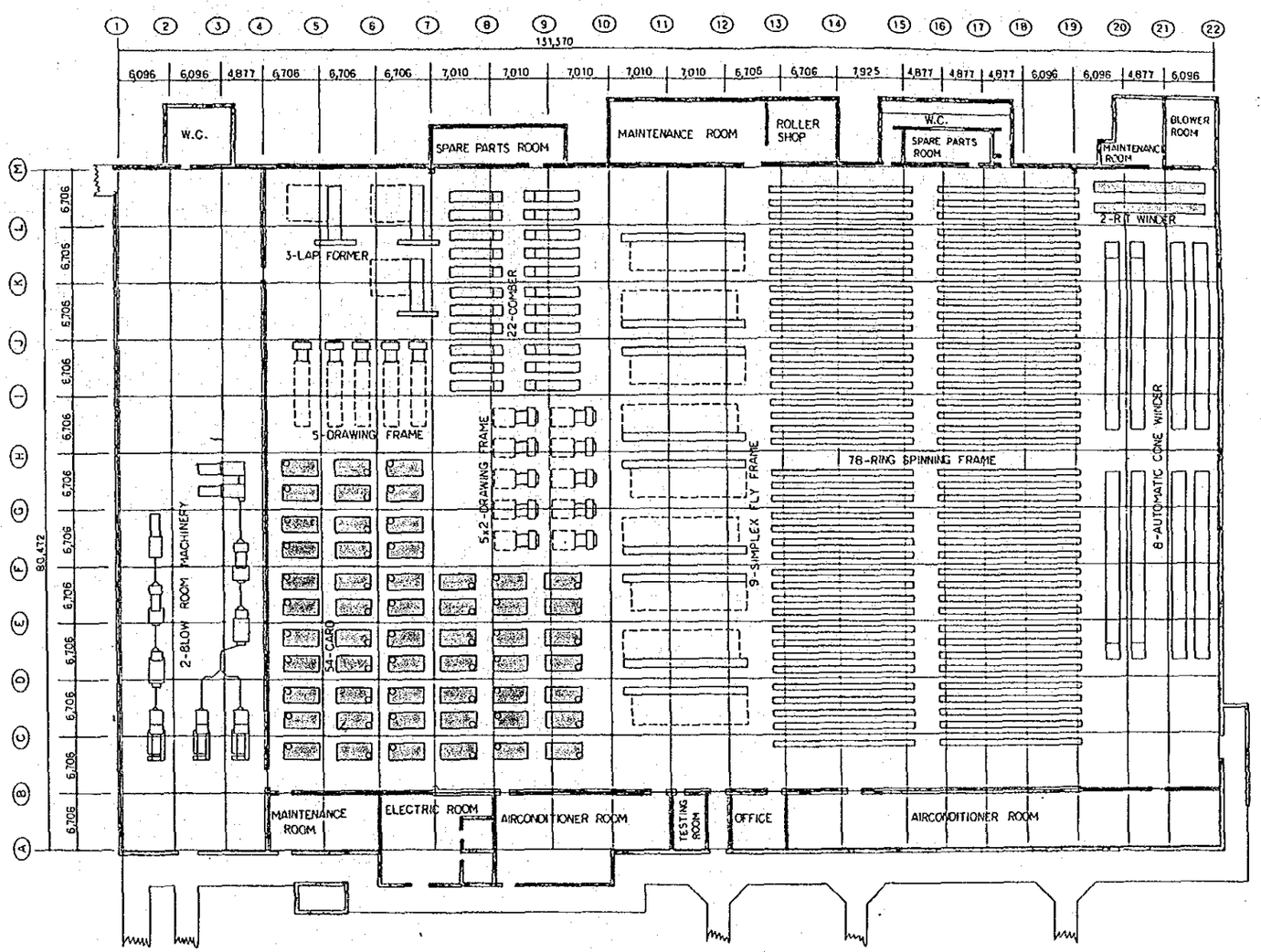


LAYOUT - CILACAP SPINNING MILL

1. RAW MATERIAL WAREHOUSE
2. MAIN POWER STATION
3. BLOWER ROOM
4. MAINTENANCE ROOM

DWG. NO.
EX-146-A-2

Figure 9 Layout for Machinery of CP-1



Remarks:

White colour shows the machines to be newly installed.

Green colour shows the machines to be utilized after improvement through the renovation project plan.

MARK	DESCRIPTION	DATE	CHECKED

REVISIONS

TITLE LAYOUT

CILACAP SPINNING MILL CP-1

DRAWN | DATE 3 SEPT, 1984 SCALE 1/ m.m.

CHECKED

APPROVED | DWG No. EX-146-10

2) Cilacap Spinning CP-2 Mill (Figure 10)

(a) Summary and Basic Ways of Thinking

The overall layout has been designed taking into consideration the following:—

- Remodeling of the existing building or new construction shall be minimized.
- The basic layout of the processes shall be the same as the present one. Namely the raw materials shall be put in the process at the north-west end of the building and the final process which is the winding process shall be located at the south. Such layout shall assure the smooth half-product flow up to the existing yarn dyeing process.
- The machines shall be positioned taking into account the locations of existing columns and also the convenience in operation works.
- The distances between processes and also the direction of machines shall be determinded taking into account the easiness of machinery supervision by operatives, half-product transportation distance, and efficient operation.
- There shall be enough storage spaces for half-products of appropriate quantity.
- The machines of heavy air conditioning load shall be positioned at the closer places to the air conditioning equipment in order to utilize the capacity most effectively.
- Since the CP-2 Mill shall be designed for spinning of Polyester/Cotton Blended yarns, the layout of machines in the preparation processes shall be determined so that the flow path of Polyester half-products shall not be entangled with that of cotton halfproducts.

(b) Layout of Blowing Process

Since a new Raw Material Warehouse shall be constructed within the area, and since the raw material bales transportation from the Raw Material Warehouse to the Blowing Room and their opening shall be planned to be done once a day, the existing blowing room shall be fully utilized for the spaces for bales storage, opening, and moisture regaining.

There shall be 2 lines of Blowroom Machinery, one of which shall be one for cotton of the same arrangement as that in Mill No. 1 with 1 Bale Opener and 1 Scutcher, and the other shall be one for Polyester for which the existing Line shall be remodeled, especially the scutcher shall be replaced with a new one, with 1 Creeper Lattice and 1 Scutcher. Since the Mill No. 2 is intended to produce Polyester/Cotton blended products, the direction of the Blowroom Machinery shall be determined taking into consideration the respective material flow path of Polyester and cotton, proper storage space for both respective raw material and laps.

(c) Layout of Carding Process

The Carding Engines shall be laid out, so that the laps produced by the Blowing Process shall be transported smoothly, and so that the large cans of 36"ϕ x 42"H shall be smoothly transported to the next process, i.e. Pre-Drawing, and also so that the material flow path for cotton shall be clearly separated from that for Polyester, and finally so that the direction and distance between machines shall be ideally taken.

The storage space for the full cans in front of the next process shall be sufficiently secured, so that the operation works shall not be hindered.

(d) Layout of Combing and Drawing Process

The Machines for combing shall be laid out, so that the cans of 20"ϕ x 42"H and the combing laps shall be transported with the possible minimum distances, and so that the cans with combed sliver shall be transported to the mixing drawing frames smoothly, and also so that there shall be enough storage space within the process.

In addition, the finishing drawing frames shall be located at the closest place to the Roving Frames, so that the transportation distance of cans of finished sliver shall be minimized.

(e) Layout of Roving Process

The Roving Frames shall be laid out at the right angle to the Ring Spinning Frames due to the available area within the existing building. It is therefore expected that the arrangement of cans from the preceding drawing process and the delivery of full roving bobbins to the subsequent Spinning process shall be easier and also that the operatives' supervision of the Roving Frames shall be easier and larger numbers of frames shall be supervised by one operative, because the frames shall be arranged in a line.

(f) Layout of Ring Spinning Process

The existing 74 Ring Spinning Frames are intended to be used at the present location after some remodeling. The remaining one Ring Spinning Frame, which is now located in front of the air conditioning room, shall be removed, because the remodeling of its creel due to the larger packages of Roving Bobbins shall be impossible.

(g) Layout of Steam Setting Process

The Steam Setters including the newly procured Steam Setter shall be located in the present Steam Setting Room which shall be however to be expanded. Since all quantity of yarn shall be steam-set in a form of bobbins, the storage space for both those to be steam-set and those steam-set shall be sufficiently secured.

There is no other choice of the location for the steam setting room than the present place taking into account effective utlization of the existing building area and small rooms, although the transportation distance of the steam-set bobbins to the winding process shall be inevitably longer and less convenient.

(h) Layout of Winding Process

The Automatic Winders shall be installed in the space to be made by removing all the existing Ring Twisting Frames. Furthermore the Automatic Winders shall be laid out taking into consideration the storage space for the full bobbins steam-set to be transported for a long distance and also the convenience for the storage/transportation of the wound cheeses to be packed in carton cases in the existing packing room.

(i) Layout of Existing Ring Twisting and Reeling Machines.

In order to utilize the existing Hank Yarn Dyeing Machines effectively in future as well, it is intended to preserve as many existing machines as possible.

Consequently, the following machines shall be shifted to the places closer to the Yarn Dyeing Process:–

– 5 Doubling Winders,
– 9 Ring Twisting Frames,
– 25 Reeling Machines.

Respective locations of machines shall be determined taking into consideration the material flow of half-products and the convenience for operation.

(j) Layout of Other Existing Machines

As regards the Hank Yarn Dyeing Machines, Mercerising Equipment, Hank-to-Cone Winders, and Hank Packing Machine, they shall not be included in this renovation plan and therefore shall be located at the place where they are presently.

(k) Layout of Auxiliary Rooms

The Warehouse for miscellaneous goods and the maintenance room at the north-east shall be remodeled to the air-conditioning room in order to improve the air-conditioning capacity for the Spinning Preparation Processes. The Spare Parts Store Room shall be remodeled to the Maintenance Room for the Blowroom Machinery, Carding Engines, and Roving Frames. The Laboratory shall be reduced and located at the south by means of re-arranging the test items to be carried out, that is to say, the laboratory shall take care of mainly weight control and the central laboratory shall take care of other inspection and controling items.

The Spare Parts Room, Offices, Small Maintenance Room, and Waste Fiber Room shall be remodeled to the new Blowing Room. The existing Blowing Room for Cotton shall be remodeled to the raw cotton storage room in order to secure the spaces for bale opening and regaining as much as possible.

The existing blowing Room for Polyester shall be remodeled to the Waste Fiber Treatment Room.

The existing Bale Opening Room shall be remodeled to the Spare Parts Wavehouse and Maintenance Room for both Ring Spinning Frames and Automatic Winders, and the expansion space of the Steam Setting Room, in order to utilize these auxiliary rooms most effectively.

The Blower Room of 4 m x 10 m for the Automatic Winders shall be newly constructed at the south of the Winding Room.