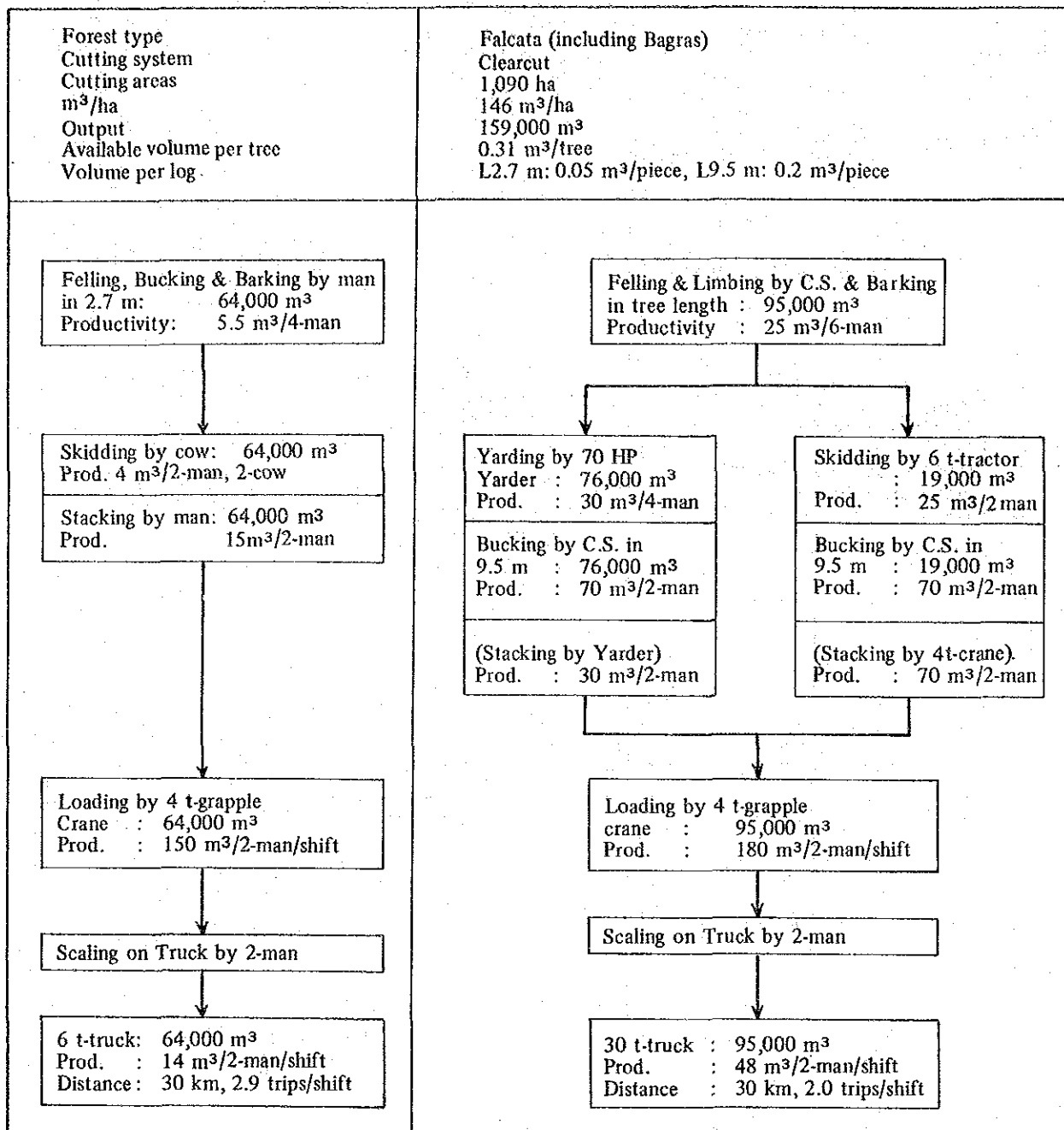


Table IV-16 Flow Chart of Logging Operation in Industrial Tree Plantation in 1984



3-2-2 Other Cost (Road Cost, Overhead, Stumpage Cost, etc.)

- (1) In general, road cost is directly proportional to the hauling distance and inversely to the output of logs. The difference of road cost in 1984 between 1.28 US\$/m³ in natural forest and 1.17 US\$/m³ in industrial tree plantation mainly depends upon the difference of hauling distance.
- (2) Overhead includes personnel expenses of managerial staff and interest on working fund.
- (3) Stumpage cost
1.87 US\$/m³ of stumpage cost of industrial tree plantation shown in Table IV-10 comes from the conversion of the accumulated expenses for the development of the said industrial tree plantation, which are evaluated by Peso, into the U.S. Dollar, at the exchange rate of 14 Peso to the U.S. Dollar in May, 1984.

In this connection, the accumulated expenses for the development of the said industrial tree plantation include the interest that has been levied on the balance at the end of each month from 1980 onward at the interest rate of 2% a month.

Although it is difficult to evaluate, in an inflationary situation, rational stumpage cost of plantation which needs to invest capital for a long period, Study Team has calculated a stumpage cost by discounted value method in accordance with the following conditions to find out a more practical stumpage cost. (Refer to Appendix IV-16 and IV-17).

Plantation development cost :	cost as of September, 1984
Exchange rate :	1 US\$ = 18 Pesos
Interest :	10% a year

Since BOI (the Board of Investments) granted PICOP Preferred Pioneer Status as an integrated wood based industry in 1982, PICOP has been exempted from forest charges which are usually charged to the volume logges out from natural forest at the rate of 30 Pesos per m³.

Silvicultural fees in Table IV-9 are costs for supplemental planting at logged-out settings.

3-3 Cost of Logs in the Future

As mentioned before, cost of logs from industrial tree plantation is higher than cost of logs from natural forest at the mill woodyard despite shorter hauling distance because tree size of industrial tree plantation is much smaller than that of natural forest.

According to PICOP's wood supply plan, virgin forest will stop producing logs from 1989 onward, and harvesting of second growth forest will follow. But second growth forest will be lesser output per hectare, smaller tree size and shorter hauling distance.

Therefore, small rise in road cost and operating costs could occur. As for plantation, since gradual harvesting volume increases (output per hectare) could be expected through tree breeding and improvement of silviculture technique, small drop in stumpage cost, road cost and operating costs would happen.

PICOP is now familiar with heavy logging machinery and equipment suitable for large diameter trees of natural forest. In the future, however, it is inevitable for PICOP to introduce smaller logging machinery and equipment suitable for smaller diameter trees and to develop logging method applicable to smaller trees.

Table IV-17 shows the comparison of pulpwood delivery cost at mill woodyard between in 1984 and in 1992 and Table IV-18 shows the log costs at mill woodyard in 1984 and 1992, produced from natural forest and industrial tree plantation, but costs in 1992 are estimated on the basis of the above-mentioned circumstances along with changes in output and forest condition.

However, stumpage cost of industrial tree plantation in 1992 in the table is the cost calculated by discounted value method described in IV-3-2-2.

Costs listed in Table IV-17 and IV-18 indicate current prices as of September 1984, excluding inflation and other factors.

Table IV-17 Comparison of Output and Delivery Cost of Pulpwood

	1984			1992		
	Output per ha.	Output	Cost at woodyard	Output per ha.	Output	Cost at woodyard
	m ³ /ha.	1,000m ³	US\$/m ³	m ³ /ha.	1,000m ³	US\$/m ³
Natural forest	157	356	13.8	77	75	15.2
Industrial tree plantation	77	159	16.2	90	663	18.1
Agro-Forestry		270	13.9		179	13.9
Wood procurement		81	19.4		0	19.4
Total		866	14.8		917	17.0

Table IV-18 Estimates of Log Costs in 1992

Forest type	Particulars	1984	1992
		US\$/m ³	US\$/m ³
Natural forest	Operating costs	8.3	*1 8.4
	Other costs	5.5	*2 6.8
	Total	13.8	15.2
Industrial tree plantation	Operating costs	9.3	9.3
	Other costs	6.9 (8.4)	(8.8)
	Total	16.2 (17.7)	(18.1)

() : Other costs are substituted by figures within brackets if stumpage costs calculated by discounted value method are used instead of 1.87 US\$/m³ shown in Table IV-10.

*1 : Refer to Appendix IV-18

*2 : Refer to Table IV-19

Table IV-19 Details of Other Costs

	1984	1992
	US\$/m ³	US\$/m ³
<u>Natural forest</u>		
Road cost	1.3	$1.3 \times^{*4} 157/77 \times^{*5} 42/43.5 = 2.6$
Overhead	4.1	4.1
Silvicultural fees	0.1	0.1
Total	5.5	6.8
<u>Industrial tree plantation</u>		
Road cost	1.2	$1.2 \times 77/90 = 1.0$
Overhead	3.8	3.8
Stumpage cost	1.9 ^{*3} (3.4)	^{*3} 4.0
Total	6.9 (8.4)	8.8

- *3 : Refer to Table IV-20
- *4 : Ratio of m³/ha
- *5 : Ratio of hauling distance

Table IV-20 Stumpage Cost Calculated by Discounted Value Method

	1984		1992	
	Output	Stumpage cost	Output	Stumpage cost
	1,000m ³	US\$/m ³	1,000m ³	US\$/m ³
Falcata	158	3.37	458	3.37
Bagras	1	5.32	205	5.32
Total	159	3.38 ≈ 3.4	663	3.97 ≈ 4.0

V. RENOVATION PLAN

V. RENOVATION PLAN

The Government of the Philippines has launched following steps to the pulp and paper industry.

- 1) Importation control since the second half of the year 1982.
By this control, circumstances have changed and brought about PICOP's increased production and increased turnover as well as the substitution of imports by the PICOP's paper products.
- 2) Enforcement of tax incentive and preferential treatments on investment, which is described in section II-2-2 in this report.
- 3) Approval of price raise of paper and paper products since July 1984.

In response to above treatments, PICOP has realized the prompt need to complete rationalization project by its own efforts in view of following conditions.

- 1) Production cost reduction by means of improved efficiency and resolved difficulties on equipment and operation as well.
- 2) Increase of production which will result in immediate increase in turnover and profit.
- 3) To take an opportunity to change over the financial distress, utilizing international collaborating circumstances in addition to the Government preferential treatments.

The Study Team contemplates following principles in preparing renovation plan in that present situation of PICOP has been recognized deep.

- 1) Due to the rise of selling price, it will seemingly be possible to control financial debt increase, however, PICOP is still not in a position to introduce a large investment such as new paper machine in view of cumulative financial deficit.

Accordingly, basic attitudes on making investments should be concentrated to those only for modification of existing facilities. Allowable condition for investment is limited only for improving both efficiency and production.

- 2) As to the substantial investment such as new paper machine project, it shall not

be discussed before the making up of cumulative deficit of PICOP's finance and before the adequate investigation on market concern as well as the real recovery from ill condition of the company.

1. PICOP's Renovation Project

1-1 Basic Policy of the Project

From the distressed financial situation, PICOP planned to pursue relatively small amount of investment mainly modification of existing facilities.

That is:

- 1) Newsprint machine (No. 1 paper machine) is placed in the first priority of modification in accordance with the Government policy of self sufficiency of the newsprint.
- 2) Containerboard machine in Bislig Mill (No. 2 paper machine) is to be modified in order to improve efficiency and reduce production cost.
- 3) Ceased operation board machine in Iligan Mill is to be transferred to Bislig Mill since PICOP has no forest concession or own wood supply in the adjacent area of Iligan Mill. There is little possibility to resume production as far as present condition may continue.

1-2 Objective Facilities in Renovation

PICOP has completed diagnosis of present facilities together with Japanese manufacturer who has delivered them to PICOP, and has obtained price quotation for the remodelling facilities.

The following is the selected items of renovation;

- 1) Modification and running speed increase of No. 1 paper machine
 - (1) No. 1 paper machine
 - Press modification
 - Install top former
 - Head box modification
 - Increase in drive capacity (760 m/min to 915 m/min)
 - Increase in stock approach system capacity
 - Install a new stock cleaning system

- Install hot air blowing rolls
- Calender modification
- Winder modification

(2) Pulping

With reference to No. 1 paper machine speed-up, the furnish is planned to change RGP/TMP 85% and imported NBKP 15%, requiring following items:

- 160 t/d additional RGP/TMP installation
- Install 60 t/d NBKP pulper and concerned

2) Modification of No. 2 paper machine

- Modification of press part
- Capacity increase of auxiliary equipment

3) Modification and transfer of board machine from Iligan to Bislig Mill

- Modification of Ultra formers
- Modification of drive
- Modification of stock preparation system
- Removing waste paper pulping system to Bislig Mill

1-3 Production Capacity

	<u>before</u> <u>renovation</u>	<u>after</u> <u>renovation</u>
No. 1 paper machine (No. 1 PM)	86,000 t/yr	118,000 t/yr
No. 2 paper machine (No. 2 PM)	68,000	78,800
Iligan board machine	28,000	41,200
Total paper & paperboard	182,000	238,000
RGP/TMP	45,500 BDt/yr	101,500 BDt/yr
KP bleaching	42,000	0
UKP plant	112,000	112,000

1-4 Investment (based on 1984 value)

	<u>Million Peso</u>	<u>Million US\$</u>
No. 1 PM modification and concerned work	710	39.4
No. 2 PM modification	55	3.1
Total	765	42.5
Iligan board machine transfer and modification	195	10.8
Grand total	960	53.3

Above stated are the renovation project delivered by PICOP, on the other hand, the basic policy and renovation plan of the Study Team are described hereunder.

2. Outline of Renovation Plan

The Study Team has composed two alternative renovation plans in consideration of swift recovery of PICOP's difficult situation suffered from big financial deficit. During the procedure of composing renovation plan, the content of PICOP's renovation project were examined and also the result of field survey by the Study Team is fully utilized.

In principle, the Study Team agrees with the PICOP's renovation project, however, on the practical view point of the industrial renovation, two plans are selected and described as hereunder.

As to the issue of Iligan Mill, "transfer to Bislig Mill" is treated as major subject.

2-1 Plan A

Plan A contains following items of renovation for Bislig Mill only. The board machine in Iligan Mill is subject to be transferred in future, therefore no description of the mentioned machine is included in Plan A.

- 1) Modification and speed-up of No. 1 paper machine in Bislig Mill
Improvement of operating efficiency, paper quality, and production will be by the following steps,
 - (a) Improve sheet forming and drainage capacities on the Fourdrinier table
 - (b) Decrease web breaks
 - (c) Increase dryer capacity and improve moisture profileTarget speed-up of 915 m/min from present design speed of 760 m/min is expected to be performed without any change in total length of the machine.

- 2) Modification of No. 2 paper machine in Bislig Mill

Improvement of operating efficiency and production will be by the following steps
 - (a) Improve dewatering capacity
 - (b) Prevent web breaks
 - (c) Improve unit steam consumption and moisture profile

- 3) Modification of RGP/TMP plant and installation of CTMP in Bislig Mill
 - Modification for improvement of pulp quality

- Additional installation of CTMP (110 BDt/d) for production increase of newsprint
- 4) Modification of kraft pulping plant in Bislig Mill
 - Modification for reduction of bleaching chemicals

2-2 Plan B

Plan B contains the following items of renovation for Bislig Mill and board machine transfer from Iligan to Bislig Mill.

- 1) Modification and speed-up of No. 1 paper machine in Bislig Mill
 - same as in Plan A
- 2) Modification of No. 2 paper machine in Bislig Mill
 - same as in Plan A
- 3) Additional installation and improvement of TMP in Bislig Mill
 - same as in Plan A
- 4) Transfer and modification of board machine in Iligan Mill (referred to as No. 3 paper machine hereafter)
 - Utilize the stopping facilities for production increase by transfer and modification
- 5) Modification and additional installation of kraft pulping plant and recausticizing plant in Bislig Mill
 - Modification of kraft pulping plant same as in Plan A
 - Additional installation of a batch digester and a white liquor clarifier for production increase of kraft pulp
- 6) Additional installation of evaporator
 - Increase of evaporator capacity for production increase of kraft pulp (UKP)
- 7) Others
 - Additional installation of warehouse for the increase of purchased pulp
 - Additional installation of utility facilities

3. Product Mix

It is agreed to continue present product mix of mass production type from the view point of the market demand to date, of the present specification of paper machines, and of the accumulated operational experiences. Allocation of product mix to each machine is as follows:

No. 1 paper machine: Newsprint, medium grade and low grade printing paper

No. 2 paper machine: Linerboard and corrugating medium

No. 3 paper machine: Linerboard

Newsprint is indispensable for nationwide communication and its supply increase is suited to the Government policy of self sufficiency.

Furthermore, by the import restriction, imports of BKP and fine paper have been limited markedly, rapid demand change in printing and writing paper market is now occurring and consumption of low grade printing paper of low brightness (newsprint grade) is increasing. It is good opportunity for PICOP to assure expanded share in this market.

In the future, when the economy of this country has recovered and some evidence of whiter paper demand may resume, PICOP can consider production plan of such higher grade of paper at the time.

As to the paperboard, importation is mainly linerboard and corrugating medium, and the market is supported by the stability of food industry. The future of the paperboard market in this country is prosperous and even good possibilities to be one of the important product in the Philippines.

There is no positive reason to change present product mix, however, preferential treatment of the Government of the Philippines is supposed to be necessary for a while because international competitiveness of the pulp and paper industry of the Philippines is not strong enough.

4. Demand Forecast

PICOP's production is divided into two categories according to their behavior in the market, that is, newsprint and wood contained paper are for the use of civil and cultural nature, on the other hand containerboard is for the use of industrial nature. In general, supply and demand relationship and its projection procedure are significantly different from each other with relation to GNP, demographic factor, educational levels, rate of industrial activities and communication, etc.

Therefore different methods of demand forecast are adopted and shown in the following description.

4-1 Method of Demand Forecast

In general, there are several methods in forecasting market demands related with demographic factor, past statistics of demand and national economic indices, etc.

In view of demographic aspect of the demand, the population in the Philippines has increased at a steady rate of 2.6% per annum (past ten years average) and reached 52 million in 1983. This substantial increase in population may lead potential demand increase.

However, at the moment, the consumption of newsprint, printing and writing paper is concentrated in the metropolitan and the suburbs area where abundant purchasing power and higher level of education and brisk communication are able to be expected. Therefore the population increase does not necessarily affect the paper demand directly.

Meanwhile, the demand of containerboard may be affected directly by the population increase and the final use is mainly for transporting necessities of life.

As to the methods using demand history and national economic indices, there are three different methods available in hand as below and suitable method is applied in the description hereafter both for newsprint and containerboard.

1) Forecast by means of the least-squares method

With regard to the subject product, regression equation derived by the least-squares method on the past demand and applied to the demand forecast by its regression coefficient.

2) Forecast by the elasticity coefficient

The method of demand forecast where the ratio of the past growth rate of GNP and that of the subjected product are calculated and arithmetically averaged.

The elasticity coefficient is expressed by the following equation:

$$K = \frac{\Delta D/D}{\Delta G/G} \quad \dots (1)$$

where, K : Elasticity coefficient of the demand for the subjected product to the GNP

D : Demand for the product at a certain year

G : GNP at the year

3) Forecast by the elasticity coefficient (modified method)

Since the equation (1), the elasticity coefficient fluctuates by the economic activity variations, smoothed coefficient will be suitable to apply instead of linear regression equation. Smoothed coefficient is obtained from exponential regression equation which is shown by equation (2) hereunder.

From the integration of the equation (1):

$$\text{Log } D = \bar{K} \log G + a \quad \dots (2)$$

where past figures of D and G are known quantity, the figures \bar{K} and a are obtained from the equation of regression curve.

From equation (2):

$$D = A G^{\bar{K}} \quad \dots (3)$$

is derived, where the demand of the subjected product at a certain year can be forecasted with reference to the GNP.

In applying above methods of forecast, separate calculation is necessary for newsprint and containerboard as these grades have a different consumption structure.

4-2 Demand Forecast of Newsprint

In the Philippines, newsprint has been used not only for newspaper but also for general printing and writing paper. In the developed countries, generally, newsprint is classified in low grade paper, and printing and writing paper is classified in fine paper and medium grade paper respectively. On the contrary, in the Philippines, it is hard to make clear classification of above categories.

Furthermore, since around middle of 1983, imported fine paper became hard to obtain due to the repeated devaluation, price raise and import restriction. Demand for printing and writing paper is now shifting into the market of medium grade and low grade paper.

Consequently, it is necessary to include demand statistics of printing and writing paper in addition to that of newsprint in forecasting newsprint demand.

Unfortunately the detailed statistics as to the aggregative paper consumption before 1978 were not available, only growth rates of newsprint were applied.

Careful notice should be applied to the big decline in the production of paper between 1979 and 1982. As stated previously, due to the world wide recession, information taken from those abnormal period of market should be excluded for the demand forecast.

As shown in clause V-4-1, three (3) methods of demand forecast are carried out as follows:

1) Newsprint demand forecast by the least-squares method

In Table V-4-1, PICOP's newsprint consumption after production start-up of 1972 is indicated.

Table V-4-1 Actual Consumption of Newsprint

Year	PICOP *1 Sales Volume t/y	Other Makers Sales Volume t/y	Imported Volume *2 t/y	Consumption Total t/y	Growth Rate %
1971	-	2,900	58,400	61,300	-
1972	12,305	325	41,947	54,577	-10.97
1973	64,237	49	4,607	68,893	26.23
1974	64,853	-	732	65,585	- 4.80
1975	63,426	2,490	786	66,702	1.70
1976	66,206	2,716	60	68,982	3.42
1977	64,549	2,692	363	77,604	12.50
1978	78,492	2,203	4,177	84,872	9.37
1979	81,127	3,202	13,312	97,641	15.05
1980	66,890	6,283	20,012	93,185	Average
1981	70,707	3,452	4,895	79,185	Growth Rate
1982	65,693	2,645	2,671	71,009	6.56%
1983	73,402	3,910	1,190	78,502	

*1 PICOP DATA

*2 PULPAPEL DATA

The linear regression equation is derived from the data between 1972 and 1979 and shown hereunder,

$$D = 4,996 (Y - 1970) + 45,628 \quad \dots (4)$$

where, Y : Year in the Christian Era

D : Newsprint consumption in a Yth year

by shifting the origin to the year of 1983, equation (5) is derived,

$$D = 4,996 (Y - 1970) + 66,271 \quad \dots (5)$$

using the equation (5), demand forecast until 1996 is shown in Table V-4-2 and average growth rate is calculated as 3.14%.

Table V-4-2 Demand Forecast based on Actual Consumption

Year	Demand Forecast *1	
	Demand	Growth
	Volume t/y	Rate %
1983	131,221*2	-
1984	136,200	3.81
1985	141,200	3.67
1986	146,200	3.54
1987	151,200	3.42
1988	156,200	3.30
1989	161,200	3.20
1990	166,200	3.10
1991	171,200	3.01
1992	176,200	2.92
1993	181,200	2.84
1994	186,200	2.76
1995	191,200	2.68
1996	196,200	2.61
Av. Growth Rate		3.14

*1 Demand forecast includes upper grade (fine paper), middle grade and low grade

(This means wood free and wood containing paper.)

*2 Actual data in 1983, refer to Table V-4-8.

2) Demand forecast by the elasticity coefficient

Following two methods are tried in deriving demand forecast of the newsprint.

- (1) By arithmetical mean of elasticity coefficient
- (2) By means of exponential regression equation

a) Method of arithmetic mean of the elasticity coefficient

GNP, growth rate of GNP, newsprint demand and its growth rate are shown in Table V-4-3 during the period between 1974 and 1979. Arithmetic mean of above elasticity coefficients is 0.912.

Table V-4-3 GNP & Newsprint Demand

Year	GNP *1		Demand of Newsprint Grade		To GNP Elasticity Coefficient
	$\times 10^6$ P	Growth Rate %	t/y	Growth Rate %	
1974	64,739	6.34	65,585	-4.80	-0.757
1975	68,530	5.85	66,702	1.70	0.290
1976	72,718	6.11	68,982	3.42	0.560
1977	77,789	6.97	77,604	12.50	1.793
1978	83,070	6.79	84,872	9.37	1.380
1979	88,736	6.82	97,641	15.05	2.207
1980	92,609	4.36		Average	0.912
1981	96,065	3.73			
1982	98,568	2.61			
1983	100,043	1.5			

*1 ; NEDA Data (1972 Constant prices)

Meanwhile regression equation for the GNP forecast after 1984, based on the GNP between 1974 and 1983 are derived and as follows:

$$G = 761,616 \log(Y - 1900) - 1,358,655 \quad \dots (6)$$

where, Y : Year in the Christian Era
G : GNP in a Yth year

By the equation (6), GNP between 1984 and 1996 are calculated and their growth rates together with arithmetic mean of the elasticity coefficient derive growth rate of paper demand.

Table V-4-4 is thus formulated with a shifted origin of 1983. Average growth rate of the paper demand is calculated as 2.73%.

Table V-4-4 Demand Forecast by Arithmetical Mean of Elasticity Coefficient

Year	GNP Forecast by (6)		Av. of Elasticity Coefficient	Demand Forecast	
	GNP x 10 ⁶ P	Growth Rate %		Growth Rate %	Demand t/y
1983					131,221
1984	106,900	3.85	0.912	3.51	135,800
1985	110,800	3.66	0.912	3.34	140,400
1986	114,700	3.49	0.912	3.18	144,800
1987	118,500	3.33	0.912	3.04	149,200
1988	122,300	3.19	0.912	2.91	153,600
1989	126,000	3.06	0.912	2.79	157,900
1990	129,700	2.93	0.912	2.67	162,100
1991	133,400	2.82	0.912	2.57	166,200
1992	137,000	2.71	0.912	2.47	170,300
1993	140,600	2.61	0.912	2.38	174,400
1994	144,100	2.52	0.912	2.30	178,400
1995	147,600	2.43	0.912	2.22	182,400
1996	151,100	2.35	0.912	2.14	186,300
Av. Growth Rate		2.99		2.73	

b) Method of exponential regression model

As stated in the clause V-4-1-3), from the GNP and newspaper demand between 1974 and 1979, $\bar{K} = 1.28$ is derived by equation (2)

Therefore relation between newspaper demand and GNP is indicated by following equation.

$$D = 0.04326 G^{1.28}$$

Introducing actual data of D and G in 1983 the above relationship is modified as follows:

$$D = 0.05015 G^{1.28}$$

By the equation above, demand forecast of newspaper between 1984 and 1996 are calculated in Table V-4-5.

Average growth rate of aggregate paper demand (fine paper, medium grade, low grade) is calculated as 3.85%.

Table V-4-5 Demand Forecast by Exponential Mean of Elasticity

Year	GNP Forecast by (6)		Demand Forecast	
	GNP $\times 10^6$ P	Growth Rate %	Demand t/y	Growth Rate %
1983			131,221	
1984	106,900	3.85	137,700	4.95
1985	110,800	3.66	144,200	4.71
1986	114,700	3.49	150,700	4.49
1987	118,500	3.33	157,100	4.29
1988	122,300	3.19	163,600	4.10
1989	126,000	3.06	170,000	3.93
1990	129,700	2.93	176,400	3.77
1991	133,400	2.82	182,800	3.62
1992	137,000	2.71	189,200	3.48
1993	140,600	2.61	195,500	3.35
1994	144,100	2.52	201,900	3.23
1995	147,600	2.43	208,200	3.12
1996	151,100	2.35	214,400	3.01
Ave. Growth Rate		2.99		3.85

3) Summary of demand growth rate

As a whole, average growth rates of newsprint demand in several methods are as follows:

- (1) Based on actual consumption : 3.14%/yr
- (2) By arithmetical mean of elasticity coefficient : 2.73%/yr
- (3) By exponential mean of elasticity coefficient : 3.85%/yr

Demand forecast based on several methods are indicated in Fig. V-4-1. The average among (1), (2) and (3) is 3.24%, but the Study Team adopts 3% as growth rate of demand, because it seems securer in demand forecast to select

lower growth rate, if the Study Team considers uncertain factors included in demand forecast.

Table V-4-7 shows demand forecast at 3% of growth rate.

Meantime, demand forecast by PICOP is shown in the Table V-4-6, and to be found the growth rate as 3% until 1989 and 4% after 1990.

In comparison with the result of the Study Team, growth rate of 3% is supposed to be reasonable but 4% is rather excessive.

Table V-4-6 PICOP's Demand Forecast

Year	Demand t/y	Growth Rate %
1983		
1984		
1985	136,300	3.0
1986	140,400	3.0
1987	144,700	3.0
1988	149,000	3.0
1989	153,400	3.0
1990	159,700	4.0
1991	166,000	4.0
1992	172,700	4.0
1993	179,600	4.0
1994	186,800	4.0
1995	194,100	4.0
1996	202,000	4.0

Table V-4-7 Team's Demand Forecast

Year	Demand t/y	Growth Rate %
1983	131,221	-
1984	135,200	3.0
1985	139,200	3.0
1986	143,400	3.0
1987	144,700	3.0
1988	152,100	3.0
1989	156,700	3.0
1990	161,400	3.0
1991	166,200	3.0
1992	171,200	3.0
1993	176,400	3.0
1994	181,600	3.0
1995	187,100	3.0
1996	192,700	3.0

4) Consideration for the demand forecast

The consumption demand calculated by the procedure above are contained fine paper market.

Therefore limited demand forecast of medium grade and low grade writing is examined hereafter which are main products of present No. 1 PM in Bislig Mill.

Fig. V-4-1 Demand Forecast

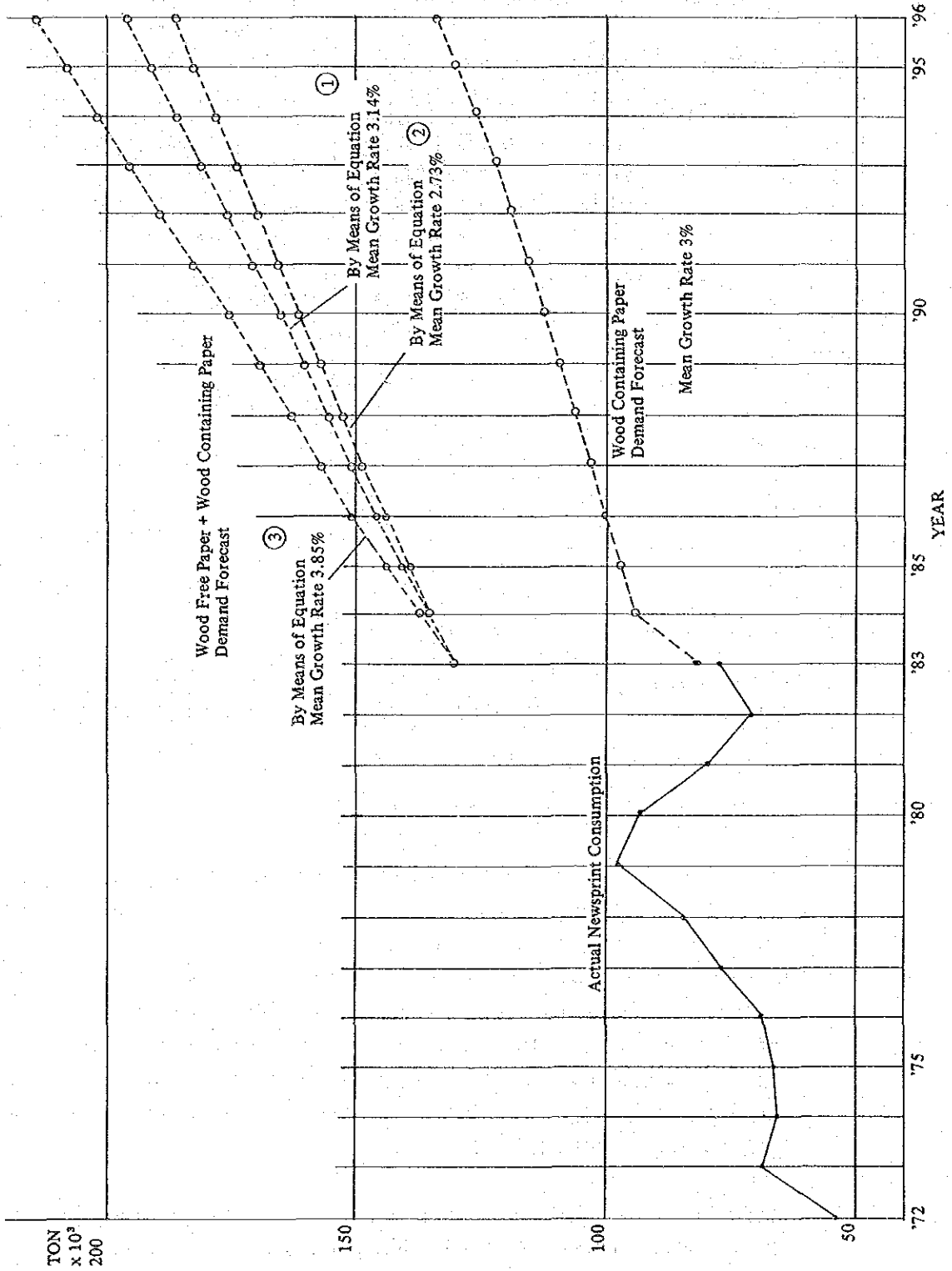


Table V-4-8 is indicating printing paper statistics by the grades since 1979 in that comparatively clear segregation by grade was available.

Table V-4-8 Classification of Actual Consumption

		PULPAPEL DATA				
		Unit : t/yr				
	Classi- fication	1979	1980	1981	1982	1983
Domestic Production						
Newsprint	Low	87,005	77,100	80,611	59,902	75,827
Upgrade Print. Pa.	Upper	30,818	23,075	23,509	20,386	19,139
Book Paper	Upper	4,034	4,410	4,893	5,185	10,876
Mid. Grade Pri.*1	Middle	5,837	3,830	4,849	3,469	4,049
Copy Paper *2	Upper	2,695	2,540	2,351	710	830
Total		130,389	110,955	116,213	89,652	110,721
Importation						
Newsprint	Low	13,312	20,012	4,895	2,671	1,190
Upgrade Print. Pa.	Upper	-	2,945	-	-	-
Book Paper	Upper	488	4,799	1,477	10,456	4,095
Mid. Grade Pri. Pa.	Middle	-	-	-	-	-
Copy Paper	Upper	144	118	51	84	75
Others *3	Upper	7,946	4,078	7,761	8,913	15,138
Total		21,890	31,952	13,984	22,124	20,498
Grand Total	A	152,279	142,907	130,197	111,776	131,219
Middle, Low Total*4	B	106,154	100,942	90,355	66,042	81,066
Ratio of Middle, Low Grade total / Grand Total						
B/A		69.7%	70.6%	69.4%	59.1%	61.8%

*1 Mimeo graph paper

*2 Onion skin paper

*3 Including Coated Paper 5,000t + PPC 2,000t

*4 Newsprint + Middle Grade Printing Paper

According to the Table, 70% of medium and low grades share for the period of 1979 to 1981 suddenly dropped to 60% in 1982 due to the Government's free trade action resulting increase of imported fine paper. In 1983, the share of low printing grade remained almost same level as in 1982 owing to swollen demand of fine paper by the anticipated import control and import of off grade printings. However, those few years period is, as stated before, extraordinary circumstance brought by the economic recession and Government policy change. 70% level of product share is said to be rather acceptable than 60% as the probable figure.

Furthermore, the share rate is supposed to be increased due to the repeated Peso devaluation in mid 1983 and resulting price raise of fine paper.

Table V-4-9 is derived from Table V-4-7 where the production share rate of low grade and medium grade printing paper being estimated as 70%.

In the production and sales schedules of the renovation plan, the demand forecast of medium grade and low grade printing paper above is also taken into consideration.

Table 4-9 Team's Demand Forecast of Middle & Low Grade

Year	Team's Demand Forecast	
	Demand Forecast *1 t/yr	Middle+Low Grade t/yr
1983	131,221	81,068
1984	135,200	94,600
1985	139,200	97,400
1986	143,400	100,400
1987	147,700	103,400
1988	152,100	106,500
1989	156,700	109,700
1990	161,400	113,000
1991	166,200	116,300
1992	171,200	119,800
1993	176,400	123,500
1994	181,600	127,100
1995	187,100	131,000
1996	192,700	134,900

*1 Upper Grade (Fine paper), Middle Grade and Low Grade Paper

4-3 Demand Forecast of Containerboard

1) General

In the Philippines, 50% of containerboard (linerboard and corrugating medium) consumption is dependent on importation.

This high rate of containerboard imports is caused by the fact that the carton case for exporting goods requires high strength which is not attained by domestic supply compared with good qualities of imported board.

Approximate domestic production since 1973 and imports since 1979 are indicated in Table V-4-10 with reference to containerboard.

Table V-4-10 Production and Import of Containerboard in the Philippines

(Unit; t/yr)

Year	Production	Imports	Total	Rate of Imports
1973	80,500	—	—	
1974	77,000	—	—	
1975	76,500	—	—	
1976	82,000	—	—	
1977	107,000	—	—	
1978	88,000	—	—	
1979	100,348	91,231	191,579	52.4
1980	82,511	100,872	183,383	55.0
1981	71,220	99,176	170,396	58.2
1982	62,957	115,725	178,682	64.8
1983	79,621	94,223	173,944	54.2
Average volume of import		100,245		

Domestic production dropped during period from 1980 to 1983. This was caused by increase of cheap imported board owing to the free trade policy of the Government.

However total consumption in terms of imports plus domestic production are decreased 11% from maximum in 1979 to minimum in 1981, which is rather mild change compared with the decrease of 29% of newsprint grade paper consumption.

Above means that the consumption of containerboard is for the use of packaging necessary goods of life such as foods and sundries, etc.

For reference, proportion of final use of the containerboard in Japan is shown below.

Use	Share (%)
Packing case for fresh fruits	20
Packing case for general foods	20
Packing case for Electric and mechanical goods	20
Packing case for general industrial products (including chemicals, sundries)	10
Others	25

In Japan, exports share of electrical and mechanical product in total industries are supposed to be higher, nevertheless, the share of packing case for the use of technical products is 20 – 30% and for the use of foods and necessities is 70 – 80%.

In the Philippines the share rate of those foods and necessities is much higher than in Japan, therefore, market demand of carton case for those use is less influenced by economic circumstance.

2) Consumption of imported containerboard

Imported containerboard is treated as bonded goods when used for packaging export agricultural products. Average annual import between the year 1979 and 1983 was about 100,000 ton.

– Trend of the exporting products –

Major exporting item of the Philippines is banana. Five years statistics of production and exports of banana from 1979 to 1983 is shown below. Almost constant production and exports are maintained.

(Unit: 1,000 t/yr)

Year	1979	1980	1981	1982	1983
Production	4,179	3,977	4,073	4,077	3,688*
Export	859	923	869	927	596

* : In 1983, poor harvest caused by excessive drought

Source: The Statistics of Production and Exports in the Philippines of "Trade of Agriculture, Forestry and Fisheries" issued by JETRO

Because 70 - 80% of banana export executed toward Japan, imports of banana in Japan is shown below.

Also increased tendency of fishery import is shown together.

Year	Banana (t)	Fishery (t)	Total (t)
1975	763,278	2,990	766,278
1976	713,905	7,246	721,151
1977	696,414	7,349	703,763
1978	707,487	5,278	712,765
1979	682,109	6,695	688,804
1980	642,096	6,097	648,193
1981	644,330	6,499	650,829
1982	681,375	9,676	691,051
1983	469,002	8,946	477,948

Source : MITI White Paper

The amount of total imports of banana and fishery is around 700,000 t/yr and kept similar level. From the imports statistics of agricultural and fishery products of Japan, the forecast of the Philippine export would be estimated as same level.

Therefore related amount of containerboard import is said to be continued as about 100,000 t/yr level.

Meanwhile, PICOP's forecast for the containerboard import is 90,000 t/yr at constant amount with reference to use of exporting fruits. (in Table V-4-14)

3) Consumption of domestic containerboard

Consumption of domestic containerboard shows increasing trend from the year 1973 to 1979. The trend stagnated since 1980 due to worldwide recession. (Refer to Table V-4-10.)

In order to forecast market demand, data before 1979 has been used in that data during recession should be excluded by its irregularity.

Methods of forecast are as same as in section V-4-1.

a) Forecast by means of least-squares methods

The linear regression equation is derived from the data between 1973 and 1979 and shown bellow,

$$D = 4,000 (Y-1970) + 63,326 \quad \dots (7)$$

where, Y : Year in the Christian Era
D : Containerboard consumption in the year of Y

by shifting the origin to the year of 1983, equation (8) is derived as follows:

$$D = 4,000 (Y-1970) + 27,621 \quad \dots (8)$$

using the equation (8), demand forecast from 1984 to 1996 is shown in Table V-4-11 and average growth rate is calculated as 3.85%.

Table V-4-11 Demand Forecast by Means of Least-square Methods

Year	Demand (t)	Growth Rate (%)
1984	83,600	
1985	87,600	4.78
1986	91,600	4.57
1987	95,600	4.37
1988	99,600	4.18
1989	103,600	4.02
1990	107,600	3.86
1991	111,600	3.72
1992	115,600	3.58
1993	119,600	3.46
1994	123,600	3.34
1995	127,600	3.24
1996	131,600	3.13
Average Growth Rate		3.85

b) Forecast by elasticity coefficient

As method of arithmetic mean of elasticity coefficient is not applicable due to the data fluctuation, method of exponential mean of elasticity coefficient is used in this case.

As stated in the foregoing, consumption of imported containerboard has proceeded almost unchanged, relationship between GNP and domestic containerboard consumption is examined for domestic demand forecast.

Relationship between 1974 and 1979 is shown below,

$$D = 3.478 G^{0.9024}$$

where, G : GNP
D : Domestic containerboard consumption

By the index ($\bar{K} = 0.9024$) fixed, actual figures of GNP and consumption in 1983 are introduced in the equation above, and following new coefficient is derived for the relationship after 1984.

$$D = 2.448 G^{0.9024}$$

By the equation above, demand forecast from 1984 to 1996 is shown in Table V-4-12 and average demand growth rate is calculated as 2.64%.

Table V-4-12 Demand Forecast by Elasticity Coefficient

Year	GNP Forecast*		Demand Forecast	
	GNP x10 ⁶	Growth Rate Z	Demand t	Growth Rate Z
1984	106,900		84,500	
1985	110,800	3.66	86,300	3.21
1986	114,700	3.49	90,100	3.21
1987	118,500	3.33	92,800	3.00
1988	122,300	3.19	95,400	2.80
1989	126,000	3.06	98,000	2.73
1990	129,700	2.93	100,600	2.65
1991	133,400	2.82	103,200	2.58
1992	137,000	2.71	105,700	2.42
1993	140,600	2.61	108,200	2.37
1994	144,100	2.52	110,700	2.31
1995	147,600	2.43	113,100	2.17
1996	151,100	2.35	115,500	2.12
Average Growth Rate		2.99		2.64

* GNP forecasts are obtained by same equation (6) shown in the foregoing section V-4-2-2.

c) Summary of the growth rate in domestic consumption

The growth rates in domestic consumption derived by the preceding clause a) and b) are:

- (1) by the least-squares method 3.85%
- (2) by elasticity coefficient of demand 2.64%

Average of above figures is 3.25%, however, in consideration of future uncertainty, lower figure of 3.0% is adopted as round number.

In Table V-4-13 demand forecast of domestic consumption as well as that of total consumption are indicated. Average growth rate of total consumption is 1.5% which is obtained by adding constant imports of 100,000 t/yr to the domestic consumption.

Based on the forecast, above production and selling schedule are composed.

Meanwhile, forecast carried out by PICOP is indicated in Table V-4-14, which is based on the growth rate estimation of 3.0% for domestic consumption, 0.27% for imports, and 1.66% for total consumption.

Table V-4-13 Study Team's Demand Forecast

Year	Domestic Consumption	Growth Rate	Imports	Total Consumption	Growth Rate of Total Consumption
	t	%		t	
1983	(79,621)				
1984	82,000	3.0	100,000	182,000	
1985	84,500	3.0	100,000	184,500	1.35
1986	87,000	3.0	100,000	187,000	1.37
1987	89,600	3.0	100,000	189,600	1.40
1988	92,300	3.0	100,000	192,300	1.42
1989	95,100	3.0	100,000	195,100	1.44
1990	97,900	3.0	100,000	197,900	1.46
1991	100,900	3.0	100,000	200,900	1.48
1992	103,900	3.0	100,000	203,900	1.51
1993	107,000	3.0	100,000	207,000	1.53
1994	110,200	3.0	100,000	210,200	1.55
1995	113,500	3.0	100,000	213,500	1.57
1996	116,900	3.0	100,000	216,900	1.59
Average Growth Rate					1.47

() : Actual

Table V-4-14 PICOP's Demand Forecast

Year	Domestic Demand		Exporting Demand				Total	
	Demand t	Growth Rate %	Fruits		Other use		Demand t	Growth Rate %
			Demand t	Growth Rate %	Demand t	Growth Rate %		
	t	%	t	%	t	%	t	%
1985	85,700		90,000		3,300		179,000	
1986	88,300	3.0	90,000	0	3,500	6.1	181,800	1.56
1987	91,100	3.2	90,000	0	3,700	5.7	184,800	1.65
1988	93,600	2.7	90,000	0	3,900	5.4	187,500	1.46
1989	96,000	2.6	90,000	0	4,100	5.1	190,100	1.39
1990	99,200	3.3	90,000	0	4,300	4.9	193,500	1.79
1991	102,200	3.0	90,000	0	4,600	7.0	196,800	1.71
1992	105,200	2.9	90,000	0	4,900	6.5	200,100	1.68
1993	108,400	2.0	90,000	0	5,200	6.1	203,600	1.75
1994	111,700	3.0	90,000	0	5,500	5.8	207,200	1.77
1995	115,000	3.0	90,000	0	5,800	5.5	210,800	1.74
1996	118,500	3.0	90,000	0	6,100	5.2	214,600	1.80
Average Growth Rate		3.0%		0%		5.8%		1.66%
			Average Growth Rate of Exporting Demand 0.27 %					

4) Ratio of linerboard and corrugating medium

The ratio of linerboard and corrugating medium is varied on the supply whether by domestic or imports.

The ratios on the domestic supply in the past few years are shown in Table V-4-15, and that of imports are in Table V-4-16.

Table V-4-15 The Ratio of Linerboard on Domestic Supply

Year	Linerboard t	Corrugating Medium t	Total t	Ratio LB/Total %
1979	60,149	40,199	100,348	59.9
1980	50,281	32,230	82,511	60.9
1981	39,856	31,364	71,220	56.0
1982	30,325	32,632	62,957	48.2
1983	43,645	35,976	79,621	54.2

Table V-4-16 The Ratio of Linerboard on Imports

	t	t	t	%
1979	64,162	27,069	91,231	70.3
1980	71,199	29,673	100,872	70.6
1981	70,047	29,129	99,176	70.6
1982	85,482	30,243	115,725	73.9
1983	68,535	25,688	94,223	72.7

The majority of imported containerboard is used for carton case of exporting banana, and basis weight of linerboard and corrugating medium is represented by 300 g/m² and 160 g/m² respectively.

Using ratio of linerboard to corrugating medium for carton case is calculated by the following formula,

$$LB / (LB + CM) = 300 \times 2 / (300 \times 2 + 160 \times 1.6^*) = 0.70$$

* : coefficient of corrugated board

This ratio coincides with the ratio of LB/CM for the period from 1979 to 1981, 70 vs 30 on imported container board.

In the mean time, the ratio of LB/CM for the domestic supply is estimated as 60 vs 40 which is same level prior to liberalization of imports.

Domestic demand forecast by LB and CM based on the ratio above are shown in Table V-4-17.

Table V-4-17 Demand Forecast by LB and CM

Year	Total t	Linerboard t	Corrugating Medium t
1984	82,000	49,200	32,800
1985	84,500	50,700	33,800
1986	87,000	52,200	34,800
1987	89,600	53,800	35,800
1988	92,300	55,400	36,900
1989	95,100	57,100	38,000
1990	97,900	58,700	39,200
1991	100,900	60,500	40,400
1992	103,900	62,300	41,600
1993	107,000	64,200	42,800
1994	110,200	66,100	44,100
1995	113,500	68,100	45,400
1996	116,900	70,100	46,800

5. Production and Sales Schedule of Paper and Paperboard

Following conditions are taken into consideration in planning production and sales in addition to the domestic demand forecast.

- 1) Output increase on the existing paper machines by small investment.
- 2) The renovation work is described later, and the operation after modification will start in the second half of 1988 by No. 1 and No. 2 paper machine, and in the second half of 1989 by No. 3 paper machine.
Also sales amount is taken as same as that of output.
- 3) In consideration of the degree of familiarization to the modified equipment and installation, the planned output will increase in a limited rate. Separate production schedules are prepared for No. 1, No. 2 and No. 3 paper machines.

5-1 Production and Sales Schedule for Newsprint Grades

The 80% of output of newsprint grades are for a periodicals such as newspaper, magazines, and comic books, etc. Seasonal demand fluctuation is to be observed on the grade pads and text books, however, the share for those uses is as low as 3.0% and total amount through the year is supposed to be kept same level.

Consequently, policy of no change in PICOP's inventories, that is, same amount of sales and output are taken in the financial calculation of the renovation work.

5-1-1 Product Grades of Newsprint

The output ratio of medium grade printing paper among the products of PICOP were varied year by year and are shown in Table V-5-1.

This is supposedly due to the facts that the final consumers of the printing paper are apt to select the grade of paper considering the relationship between varying price and quality of paper. In addition, by the free trade action taken in 1981, large amount of cheap imported fine paper has brought about extended mobility of choice to the final consumers.

However, importation control and devaluation of Peso have caused restriction of above mentioned mobility of choice, and consumption of medium grade printing paper increased again to the level of 1980. As to the ratio after 1984, the control of importation will be continued, and the share ratio of 20% is estimated in this report.

In the meantime, in the forecast of medium grade printing paper demand by PICOP, after gradual increase reaching 20% in 1993, there is clear trend of decrease as shown in Table V-5-3.

This may come from the forecast that after 10 years the Philippine market would prefer the whiter printing paper. Nevertheless as there is no definite evidences in anticipation, steady ratio of 20% is taken through this production plan.

Table V-5-1 Detail of Medium Grade and Low Grade Paper of PICOP's Production

	Grade	1980 t/y	1981 t/y	1982 t/y	1983 t/y
Sales volume A	M + L	66,890	70,707	65,693	73,402
Newsprint	Low	25,018	43,133	41,576	40,016
Magazine	Low	11,021	9,834	7,790	8,386
Comic Book	Low	9,028	6,890	6,197	8,377
Grade School P.	Low	5,319	2,515	2,186	2,322
Others	Low	492	387	411	1,553
Low Grade Total		50,878	62,759	58,160	60,654
Mid. Bookpaper	Mid.	6,677	1,666	1,967	1,772
Commercial Pa.	Mid.	1,367	919	1,005	1,869
Cut Size Pa.	Mid.	7,968	5,363	4,561	9,107
Middle Grade Total B		16,012	7,948	7,533	12,748
Mid. G.T./S.V.	B/A	23.9%	11.2%	11.5%	17.4%

5-1-2 Production Schedule for Newsprint Grade

Production of the newsprint grade since 1984 is planned as follows:

- 1) Output in 1983 is regarded as basis of the plan

Basis weight	49 g/m ²
Trim on rewinder	6,100 mm
Output	74,800 t/yr
Operation days	324 d/yr (STD NP equiv.)
Average output	231 t/d
Average running speed	690 m/min
Paper machine efficiency	77.7 %

2) Output in 1984

As there is no effective modification to be completed, same condition as 1983 should be maintained.

3) Output in 1985 and thereafter until the time of renovation work

The TMP production will be increased by 20 t/d by installing secondary TMP refiners at the end of 1984, and resultant decrease of shives in the furnish as well as the stabilization of the electric power source (owing to the completion of loop network of NPC Mindanao grid in the middle of 1985) will cause improving efficiency of No. 1 paper machine as 80%.

Operation days will also recover 20 more days and make 344 days per annum by eliminating steam and/or power supply shortage as well as chip supply problem.

4) Output in 1988

In June, 1988, 30 days shutdown of paper machines (same condition both in Plan A and Plan B) is to be scheduled for the renovation work.

5) Two months for start-up after the renovation work is regarded as trial operation period, and 50% of the output is as out of quality standards.

6) The machine speed and efficiency are to be increased year by year according to blending softwood chemical pulp and the degree of the familization of the operators to the modified equipments, and finally to reach at maximum output of 115,000 t/yr at the 4th year (1991) after modification.

Annual production plan is indicated in Table V-5-2 on the basis of the conditions stated above. The production of medium grade and low grade printing paper is indicated in Table V-5-3 and demand forecast and production plan given by PICOP are also indicated.

Furthermore, actual sales amount of medium and low grade printing paper by other local producers were ranging from 3,000 to 4,000 t/yr for the period of 1972 to 1983, which is shown in Table V-4-1 of this report.

After the completion of the PICOP's renovation work, those sales amount

above may be squeezed down to the level of 1,000 t/yr particularly in the years 1990 and 1991.

PICOP will be able to compromise, however, any marketing conflicts between the local producers because the deal is the matter of only few per cent of PICOP's own production.

Table V-5-2 Team's Production Plan

Year	Operation Days	Average Speed	Theoretical Pro.	Machine Eff.	Av. Daily Pro.	Production
	d	m/min	t/d	%	t/d	t/y
1983	324	690	297	77.7	231	74,803
1984	324	690	297	77.7	231	74,800
1985	344	690	297	80	238	81,700
1986	344	690	297	80	238	81,700
1987	344	690	297	80	238	81,700
1988						
Before*1	142	690	297	80	238	33,700
After *2	145	750	323	85	274	39,700
						T 73,400
1989	350	800	344	85	293	102,400
1990	350	825	356	90	320	112,000
1991	350	850	366	90	329	115,000
1992	350	850	366	90	329	115,000
1993	350	850	366	90	329	115,000
1994	350	850	366	90	329	115,000
1995	350	850	366	90	329	115,000
1996	350	850	366	90	329	115,000

*1 Before Renovation: Rebuilding term is one month from June, 1988.

$$344 \text{ d} / 2 - 30 \text{ d} = 142 \text{ d}$$

*2 After Renovation: Term of trial run is two months, July and August of 1988.

Off grade volume is 50% of trial run's production.

$$30 \text{ d} \times 2 \times 0.5 = 30 \text{ d}; \text{ Total off grade producing days}$$

Therefore, operating days of salable production;

$$350 \text{ d} / 2 - 30 \text{ d} = 145 \text{ d}$$

Table V-5-3 Demand of Middle Grade & Low Grade Printing Paper and PICOP's Production Plan

Unit: t/y

	1983 actual	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1. Demand of Middle Grade & Low Grade Printing Estimated by Study Team	81,068	94,600	97,400	100,400	103,400	106,500	109,700	113,000	116,300	119,800	123,500	127,100	131,000	134,900
2. Study Team's Production Plan	74,803	74,800	81,700	81,700	81,700	73,400	102,400	112,000	115,000	115,000	115,000	115,000	115,000	115,000
No. 1 Paper Machine														
Low Grade	62,055	59,800	65,400	65,400	65,400	58,700	81,900	89,600	92,000	92,000	92,000	92,000	92,000	92,000
Middle Grade	12,748	15,000	16,300	16,300	16,300	14,700	20,500	22,400	23,000	23,000	23,000	23,000	23,000	23,000
3. Production of Other Companies	6,265	19,800	15,700	18,700	21,700	33,100	7,300	1,000	1,300	4,800	8,500	12,100	16,000	19,900
4. Demand of Middle Grade & Low Grade Printing Estimated by PICOP			136,300	140,400	144,700	149,000	153,400	159,700	166,000	172,700	179,600	186,800	194,100	202,000
5. PICOP's Production Plan				82,000	96,100	96,200	96,400	105,800	115,000	115,000	115,000	115,000	115,000	115,000
Low Grade				76,200	78,500	80,900	83,300	86,600	92,900	91,900	91,000	93,300	97,000	100,900
Middle Grade				5,800	17,600	15,300	13,100	19,200	22,100	23,100	24,000	21,700	18,000	14,100
Middle / PICOP's Grade / Production				7.1 %	18.3 %	15.9 %	13.6 %	16.1 %	19.2 %	20.1 %	20.9 %	18.9 %	15.7 %	12.3 %

On the financial analysis also above condition is deliberately ignored because it will be of temporary nature in a small magnitude and hardly influences the substantial production schedule of PICOP.

5-2 Production and Sales Schedule for Containerboard

Production and sales schedule for containerboard are composed with regard to Plan A which includes only No. 2 paper machine in Bislig Mill as well as Plan B which includes No. 2 paper machine and transferred machine from Iligan Mill (No. 3 PM).

5-2-1 Plan A

Plan A is prepared in response to domestic increase of containerboard consumption.

1) Operating condition of No. 2 PM prior to renovation work

Average basis weight

Linerboard (LB)	188	g/m ²
Corrugating medium (CM)	120	g/m ²
Trim on rewinder	4,100	mm
Operating days	340	d/yr
Paper machine efficiency	83.5	%
(average actual in 1982, 1983)		

Output

Actual in 1983	LB	34,660	t
	CM	29,548	t
		<hr/>	
Total		64,208	t
Plan in 1984	LB	35,502	t
	CM	31,458	t
		<hr/>	
Total		66,960	t

By the mill visit of the Study Team, cumulative production till August for the year 1984 was proceeded in line with annual plan. Furthermore, agricultural production for the year said to be usual and expected to attain normal harvest. Consequently, production schedule of containerboard until renovation work is estimated same as 1984 level.

LB	35,500 t
CM	31,500 t
<hr/>	
Total	67,000 t

2) Renovation Work for No. 2 PM

One month time of June 1988 is allocated for the execution of work.

3) Trial operation period for No. 2 PM

Two months of July and August 1988 are allocated for the trial operation. All the while, 50% of output is regarded as out of quality standards.

4) Operating condition after renovation work for No. 2 PM

Average basis weight, trim and operating days are kept same level before renovation work.

The ratio of LB/CM is changed 60 vs 40.

Paper machine efficiency is improved to 90%.

Production will reach maximum of 79,300 t/yr two years after completion of renovation work.

Table V-5-4 indicates the production schedule for Plan A and Table V-5-5 indicates the relationship between production plan and market demand.

Table V-5-4 Plan A Team's Production Plan

No.2 PM Operating Condition								
Year	Products	Op. Days d	Basis Weight g/m ²	Ave. Speed m/min	Theo. Pro. t/d	Machine Eff. %	Daily Pro. t/d	Produc- tion t/y
1984 & 1987	LB	170	188	225	250	83.5	209	35,500
	CM	170	120	310	220	83.5	184	31,500
	Total	340					Total	67,000
1988 Before*1 After*2	LB	70	188	225	250	83.5	209	14,600
	CM	70	120	310	220	83.5	184	12,900
	Total	140 *1						
	LB	70	188	225	250	90.0	225	15,800
	CM	70	120	310	220	90.0	198	13,900
	Total	140 *2						
	LB	140						30,400
	CM	140						26,800
	Total	280					Total	57,200
1989	LB	194	188	231	256	90.0	231	44,800
	CM	146	120	321	227	90.0	205	29,900
	Total	340					Total	74,700
1990 & After	LB	194	188	245	272	90.0	245	47,600
	CM	146	120	340	241	90.0	217	31,700
	Total	340					Total	79,300

*1 Rebuilding term is one month, June of 1988. $340d / 2 - 30d = 140d$

*2 Term of trial run is two months, July and August of 1988. Off grade volume is 50% of trial run's production. $30d \times 2 \times 0.5 = 30d$, $340d / 2 - 30d = 140d$

Table V-5-5 Containerboard Production Plan (Plan A)

LB : Linerboard

CM : Corrugating medium

Unit : t/y

	1983 actual	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1. Study Team's Estimate Demand of Domestic Market														
L	79,621	82,000	84,500	87,000	89,600	92,300	95,100	97,900	100,900	103,900	107,000	110,200	113,500	116,900
B	43,645	49,200	50,700	52,200	53,800	55,400	57,100	58,700	60,500	62,300	64,200	66,100	68,100	70,100
C	35,976	32,800	33,800	34,800	35,800	36,900	38,000	39,200	40,400	41,600	42,800	44,100	45,400	46,800
M														
2. Study Team's Plan														
L		67,000	67,000	67,000	67,000	67,200	74,700	79,300	79,300	79,300	79,300	79,300	79,300	79,300
B		35,500	35,500	35,500	35,500	30,400	44,800	47,600	47,600	47,600	47,600	47,600	47,600	47,600
C		31,500	31,500	31,500	31,500	26,800	29,900	31,700	31,700	31,700	31,700	31,700	31,700	31,700
M														
3. Market Share		81.7	79.3	77.0	74.8	62.0	78.5	81.0	78.6	76.3	74.1	72.0	69.6	67.8

5--2--2 Plan B

In Plan B, considerable amount of paperboard will be increased by adding No. 3 PM'. The sales strategy is as follows: the present share of containerboard in domestic use of 80 - 90% shall be maintained and the exceeded paperboard shall be transferred to the substitution of import by improving quality.

- 1) Same production schedule as Plan A is maintained until June 1989 when transfer of No. 3 paper machine is scheduled to be finished.
- 2) No. 3 paper machine will produce linerboard only because the machine is suitable for producing heavy weight board.

Average basis weight	
for domestic use	188 g/m ²
for export use	300 g/m ²
Trim on rewinder	2,200 mm
Operating days	340 d/yr
Paper machine efficiency	70%
(machine eff. at reel 88%, trim eff. 80%)	
Max. design speed	260 m/min

- 3) Trial operation period for No. 3 PM

Two months of July and August 1989 are allocated for the trial operation. All the while, 50% of output is regarded as out of quality standards.

- 4) As to the product of No. 2 paper machine, average basis weight of corrugating board for export is estimated as 160 g/m². Same plan as Plan A is applied to those for domestic market.
- 5) Production ratio of linerboard and corrugating medium

The ratio of LB/CM = 60/40 is applied. Since qualities of domestic corrugating medium are as good as imported qualities, domestic corrugating medium can be applied on the exporting use accompanied with the imported linerboard.

By the premise abovementioned, annual production schedule of each paper machine are composed and indicated in Table V-5-6.

The relation between the production schedule and the market demand including export use is shown in Table V-5-7.

Table V-5-6 Plan B Team's Production Plan

No. 3 PM Operating Condition								
Year	Market LB	Ope. Days	Basis Weight g/m ²	Ave. Speed m/min	Theo. Pro. t/d	Machine Eff. %	Daily Pro. t/d	Production t/y
1989	Domestic	86	188	259	154	70	108	9,300
	Export	54	300	186	177	70	124	6,700
	Total	140 ^{*1}					Total	16,000
1990	Domestic	192	188	257	153	70	207	20,600
	Export	148	300	186	177	70	124	18,300
	Total	340					Total	38,900
1991 & After	Domestic	206	188	260	155	70	108	22,300
	Export	134	300	194	184	70	129	17,300
	Total	340					Total	39,600
No. 2 PM Operating Condition								
	Products							
1989	LB Dom.	163	188	231	256	90	231	37,600
	CM Dom.	151	120	326	231	90	208	31,400
	CM Ex.	26	160	245	231	90	208	5,500
	Total	340					Total	74,500
1990	LB Dom.	125	188	245	272	90	245	30,700
	CM Dom.	158	120	340	241	90	217	34,200
	CM Ex.	57	160	255	241	90	217	12,400
	Total	340					Total	77,300
1991 & After	LB Dom.	125	188	245	272	90	245	30,700
	CM Dom.	163	120	340	241	90	217	35,400
	CM Ex.	52	160	255	241	90	217	11,200
	Total	340					Total	77,300

*1 Term of trial run is two months, July and August of 1989. Off grade volume is 50% of trial run's production. $30d \times 2 \times 0.5 = 30d$, $340d / 2 - 30d = 140d$

Table V-5-7 Containerboard Production Plan (Plan B)

Unit: t/y

	1983 actual	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1. Study Team's Estimate														
a. Demand of Domestic Market														
L	79,621	82,000	84,500	87,000	89,600	92,300	95,100	97,900	100,900	103,900	107,000	110,200	113,500	116,900
B	43,645	49,200	50,700	52,200	53,800	55,400	57,100	58,700	60,300	62,300	64,200	66,100	68,100	70,100
M	35,976	32,800	33,800	34,800	35,800	36,900	38,000	39,200	40,400	41,500	42,500	44,100	45,400	46,800
b. Demand of Export Goods														
L	94,223	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
B	68,535	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
M	25,688	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
c. Total	173,844	182,000	184,500	187,000	189,600	192,300	195,100	197,900	200,900	203,900	207,000	210,200	213,500	216,900
2. Study Team's Plan														
a. Products for Domestic Market														
L	64,208	67,000	67,000	67,000	67,000	67,200	67,800	68,500	68,400	68,400	68,400	68,400	68,400	68,400
B	34,600	35,500	35,500	35,500	35,500	30,400	46,900	51,300	53,000	53,000	53,000	53,000	53,000	53,000
M	29,548	31,500	31,500	31,500	31,500	26,800	36,900	34,200	35,400	35,400	35,400	35,400	35,400	35,400
b. Products for Export														
L							12,200	30,700	28,500	28,500	28,500	28,500	28,500	28,500
B							6,700	18,300	17,300	17,300	17,300	17,300	17,300	17,300
M							5,500	12,400	11,200	11,200	11,200	11,200	11,200	11,200
c. Total							96,000	116,200	116,900	116,900	116,900	116,900	116,900	116,900
3. Market Share For Domestic Market % For Export %														
	80.6	81.7	79.3	77.0	74.8	62.0	68.1	87.3	87.6	85.1	82.6	80.2	77.9	75.6
							12.2	30.7	28.5	28.5	28.5	28.5	28.5	28.5
4. PICOP's Plan														
a. Products for Domestic Market														
L					76,200	78,400	81,800	86,200	86,700	89,300	92,000	94,800	97,600	100,600
B					42,600	43,900	46,100	47,400	48,900	50,300	51,800	53,400	55,000	56,600
M					33,600	34,500	35,700	36,800	37,800	39,000	40,200	41,400	42,600	44,000
b. Products for Export														
L					43,800	41,600	38,200	35,800	33,300	30,700	28,000	25,200	22,400	19,400
B					28,700	27,200	25,000	23,400	21,800	20,100	18,400	16,600	14,800	12,800
M					15,100	14,400	13,200	12,400	11,500	10,600	9,600	8,600	7,600	6,600
c. Total					120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000

6. Pulp Combination Plan and Production Schedule

6-1 Pulp Combination Plan for Newsprint

1) Paper strength

In recent worldwide trend of newsprint production by wider and swifter newsprint machine, stronger and tougher qualities of pulp are to be requested (higher breaking length and tear factor).

Unevenness of dewatering across the machine width causes uneven release of the wet web from press roll surface. Difference of stretch across the width is due to uneven dryness at the dryer part.

In such condition above, when the web contains lumps or foreign materials, break will easily take place, even if tensile strength is enough.

Therefore, it is required to improve tearing strength as well.

2) Machine speed and tearing strength

The relationship between machine speed and tearing strength in the typical Japanese newsprint machines is indicated in Fig. V-6-1.

By Fig. V-6-1 tearing strength must be increased as machine speed would rise.

Besides blending pulp of high tearing strength, how to proceed refining is the key factor to produce higher tearing strength of paper.

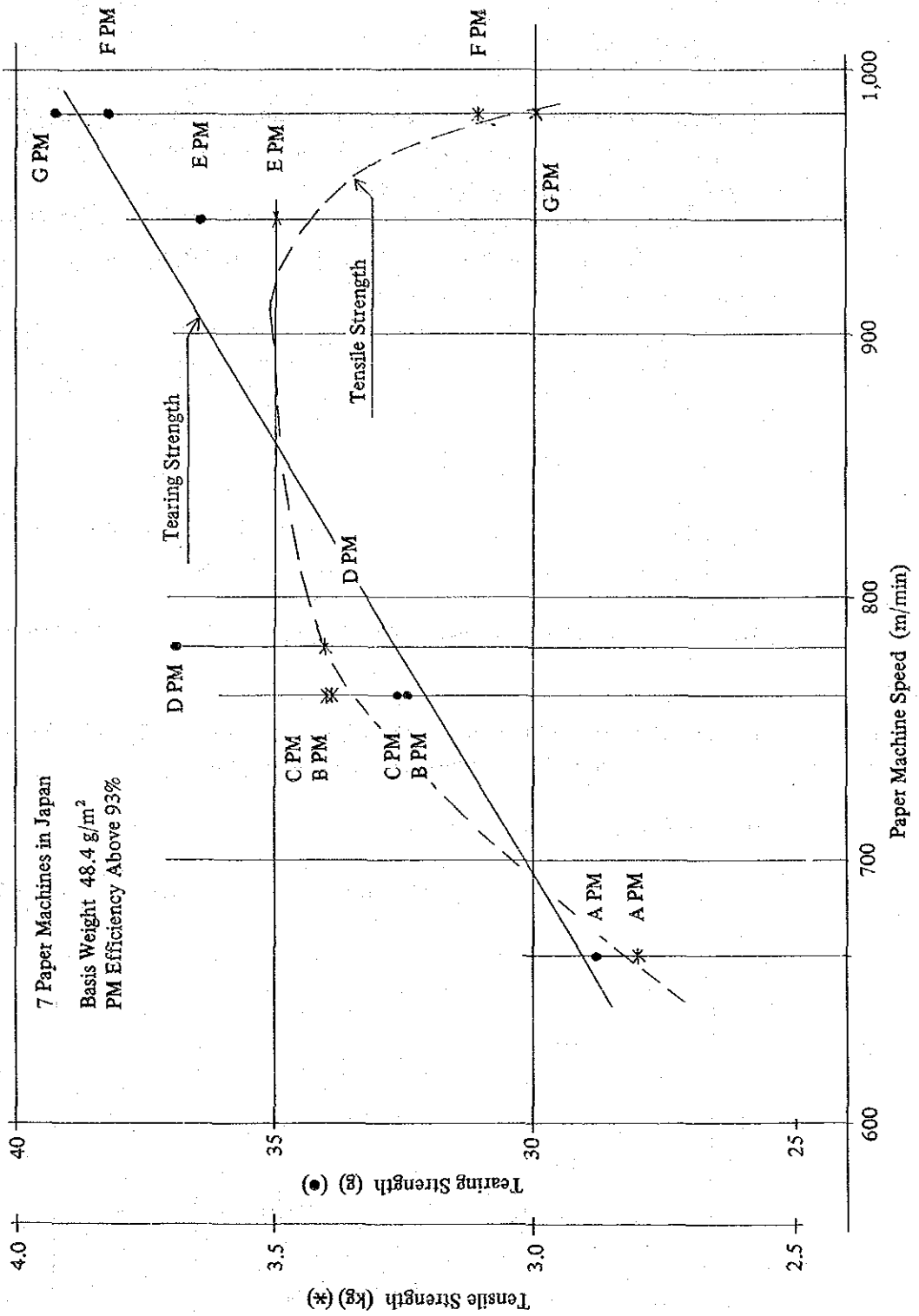
3) Present combination plan in PICOP

The following is present combination plan and characteristics of pulp in PICOP.

	RGP/TMP	EBKP
Rate of combination (%)	55	45
Freeness (ml CFS)	220	290
Density (g/cm ³)	0.34	0.91
Breaking length (km)	1.67	10.51
Tear factor	23	57.82
Brightness (%)	48	50
Opacity (%)	98.9	93.3
Scattering Coefficient	635	(380)*

* estimate

Fig. V-6-1 Paper Machine Speed vs Tearing & Tensile Strength



Tear factor of paper can be estimated from the factor of the following equation.

$$STF = F \times \sum_{i=1}^n (R_i \times PTF_i) \quad \dots (1)$$

where, STF : Factor for tearing strength of Cross Direction
 F : Empirical coefficient
 R_i : Combination rate of pulp i
 PTF_i : Tearing factor of pulp i

therefore:

$$F = 28^{*1} / (0.55 \times 23 + 0.45 \times 57.8) = 0.724 \quad \dots (2)$$

*1 : Tearing strength of standard newsprint

(Refer to Appendix A-2.)

4) Pulp combination in the renovation plan

The pulp combination plans are examined on those delivered by PICOP and investigated by the Study Team and shown below.

Pulps	Combination (%)	
	Planned by PICOP	Planned by Study Team
RGP/TMP	85	40
CTMP	-	30
LSBKP *1	-	20
NSBKP *2	15	10

*1 Semi-bleached kraft pulp of Falcata

*2 Imported bleached softwood kraft pulp

CTMP has been examined often in the developed countries recently, and proved to be superior strength than TMP. Power consumption of CTMP is dependent on the freeness level, wood species, etc., however, there is a good possibility to reduce power consumption as the shive content of CTMP is less than that of TMP even at higher freeness. Pulp yield of CTMP is somewhat lower than that of TMP.

PICOP reported Study Team that they also sent Falcata chip to Sunds Defibrator AB, in Sweden and have obtained stronger pulp than present RGP by the CTMP laboratory test.

Consequently the Study Team adopts CTMP in the renovation plan which can be expected intermediate pulp strength between present RGP and EBK.

In consideration of equipment capacity of RGP/TMP and kraft pulping as well as the pulp qualities and their behavior on the paper machine, pulp combination plan is assumed as stated above.

(a) Strength of pulp

The assumed quality characteristic is shown as hereunder.

	RGP	CTMP *1	EBK *2	NBKP *3
Freeness (ml CFS)	220	220	450	550
Density (g/cm ³)	0.34	0.46	0.69	0.59
Breaking length (km)	1.67	1.67x2= 3.34	7.80	6.63
Tear factor	23	23x1.5=34.5	70	184.7
Brightness (%)	48	48	50	82.4
Opacity (%)	98.9	98	93.3	70.3
Scattering Coeff.	635	585	(380)	275

*1 Laboratory data by Sunds Defibrator reported that breaking length is 2 times of that of RGP and tear factor is 1.5 times of that of RGP.

*2 Freeness is altered from 290 to 450 ml for tear improvement. Bracketed value of scattering factor is estimated.

*3 Softwood bleached pulp (obtainable in the international pulp market)

Paper qualities under different pulp combination are calculated as follows:

	Present	PICOP's plan	Study Team's Plan
Tearing Strength (g)	28	34.2 *1	37.7 *1
Brightness (%) *2	43.2 (actual)	45.2	45.2
Opacity (%) *2	94.8 (actual)	93.5	92.0

*1 derived from formula (2)

*2 derived from formula of Kubelka-Munk

According to Fig. V-6-1, tearing strength of 35 – 37 g will be necessary when average machine speed of 850 m/min and maximum of 915 m/min would be placed as target.

(b) Cost of the furnish

The following is the cost of furnish in the different pulp combination plan.

	Unit cost US\$/BDt	Present US\$/t-paper	PICOP's plan US\$/t-paper	Study Team's plan US\$/t-paper
RGP	232	127.6 (55%)	197.2 (85%)	92.8 (40%)
CTMP	235	-	-	70.5 (30%)
LSBKP	251 *1	113 (45%)	-	-
	240 *2			48 (20%)
NBKP	680	-	102 (15%)	68 (10%)
Total		240.6 (100%)	299.2 (100%)	279.3 (100%)

*1 using current data

*2 after renovation data

Unit cost of each pulp is referred to VI-2-1.

Combination plan by the Study Team shows almost similar in cost and stronger in tearing resistance in comparison with that of PICOP's plan.

6-2 Pulp Combination Plan for Containerboard

1) Containerboard strength

As stated in the foregoing paragraph III-2-6-3), quality of containerboard of PICOP will be enough for domestic use but for export package purpose linerboard shall be improved somewhat.

2) Pulp combination plan for linerboard

Present pulp combination plan for linerboard is 16% NUKP and 84% LUKP. The strength of product exerted by pulp combination above is enough for use, similar is applied on the renovation plan.

In case of Plan B, for the exporting linerboard grade (mainly for banana carton) 25% NUKP is necessary to maintain quality standard.

3) Pulp combination plan for corrugating medium

Enough strength is able to be obtained by the present combination plan of 100% LUKP, similar is applied on the renovation plan. In Japan, there are examples utilizing waste paper into the corrugating medium as much as 40 to 50%. Brief discussion about the use of waste paper is described hereunder.

(1) Generation of waste paper in the Philippines

Per capita consumption in the Philippines is 8 kg per annum and very low in comparison with 153 kg in Japan.

The generation of waste paper is proportional to paper consumption, however, it is very difficult to exploit a new supply source of waste paper in the developing countries since repeated utilization of waste paper in secondary or tertiary purpose is quite frequent. Furthermore, recent waste paper price becomes dearer than that of own LUKP in PICOP. The use of local waste paper for this purpose is hard to execute.

Price of waste paper and its recent history is as follows:
(purchasing price of PICOP)

Year	Pesos per ton
1980	1,400
1981	1,440
1982	1,862
1983	1,727
1984	4,085
LUKP in PICOP	3,123 ^{*1}

*1: PICOP's estimate

(2) Imported waste paper

Supply country is U.S.A. and the importation in Asian countries in 1983 are indicated herein.

Importing countries	Amount (1,000 t/yr)	Share (%)
Australia	1	0.1
China	24	1.7
Japan	241	17.5
Korea	505	36.6
Philippines	37	2.7
Taiwan	494	35.8
Thailand	36	2.6
Other area	41	3.0
Total in Asia	1,379	100

Source : American Paper Institute

The fact that Korea and Taiwan shared 72.4% of total waste paper imports in Asia is caused by freight benefits which can be expected to the return vessels of exporting cargo to U.S.A.

In the Philippines, on the other hand, there are little opportunities to utilize special freight rate and the shortage of foreign exchange makes difficult to import waste paper as well. Accordingly waste paper combination is not considered at the moment and in future when the situation change may occur, reconsideration on using waste paper may be the case.

4) Summary for the pulp combination plan for renovation

	LUKP	NUKP
Linerboard for domestic market	84 %	16 %
Linerboard for export market	75 %	25 %
Corrugating medium	100 %	-

6-3 Pulp Production Schedule and Pulping Capacity

6-3-1 Annual Pulp Requirement

Ten years pulp production schedule between 1988 to 1997 is indicated in Table V-6-1, which is calculated on the bases of foregoing production and sales schedule of paper and paperboard as well as pulp combination plan. The calculation bases of unit consumption and pulp yield are shown as follows:

(1) Pulp unit consumption of each paper (unit : BDT/t - paper)

	<u>Planned by Study Team</u>	<u>Actual in PICOP (*)</u>
Newsprint	0.97	0.945
Linerboard	0.97	0.950
Corrugating medium	0.98	0.950

* : by PICOP's Briefing Materials

(2) Pulp yield in bleaching (per cent against unbleached pulp)

	<u>Planned by Study Team</u>	<u>Actual in PICOP</u>
Semi-bleached KP	93.5	90
Bleached RGP/TMP	97.9	N.A.
Bleached CTMP	97.9	-

PICOP's actual figures on the newsprint and corrugating medium indicate extremely good unit consumption in comparison with that of average Japanese mills.

Table V-6-1 Annual Pulp Requirement (Unit ; BDt/yr)

	Pulp	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Without Renovation	EBK	38,346	38,346	38,346	38,346	38,346	38,346	38,346	38,346	38,346	38,346
	(L-SBKP)	35,662	35,662	35,662	35,662	35,662	35,662	35,662	35,662	35,662	35,662
	KF-LB	28,925	28,925	28,925	28,925	28,925	28,925	28,925	28,925	28,925	28,925
	KF-CM	30,870	30,870	30,870	30,870	30,870	30,870	30,870	30,870	30,870	30,870
	Sub-total of UKP	98,141	98,141	98,141	98,141	98,141	98,141	98,141	98,141	98,141	98,141
After Renovation (Plan A)	RGP/TMP (Exist. Plant)	43,587	43,587	43,587	43,587	43,587	43,587	43,587	43,587	43,587	43,587
	N-UKP (Purchased)	5,510	5,510	5,510	5,510	5,510	5,510	5,510	5,510	5,510	5,510
	Total Requirement	147,238	147,238	147,238	147,238	147,238	147,238	147,238	147,238	147,238	147,238
	EBK	15,312	21,361	23,363	23,989	23,989	23,989	23,989	23,989	23,989	23,989
	(L-SBKP)	14,240	19,866	21,728	22,310	22,310	22,310	22,310	22,310	22,310	22,310
After Renovation (Plan B)	KF-LB	26,481	36,503	38,784	38,784	38,784	38,784	38,784	38,784	38,784	38,784
	KF-CM	24,304	29,302	31,066	31,066	31,066	31,066	31,066	31,066	31,066	31,066
	Sub-total of UKP	66,097	87,166	93,213	93,839	93,839	93,839	93,839	93,839	93,839	93,839
	RGP (Exist. Plant)	28,480	39,731	43,456	44,620	44,620	44,620	44,620	44,620	44,620	44,620
	CTMP (New Plant)	21,360	29,799	32,592	33,465	33,465	33,465	33,465	33,465	33,465	33,465
After Renovation (Plan B)	N-BKP (Purchased)	7,120	9,933	10,864	11,155	11,155	11,155	11,155	11,155	11,155	11,155
	N-UKP (Purchased)	5,044	6,953	7,388	7,388	7,388	7,388	7,388	7,388	7,388	7,388
	Total Requirement	128,101	173,582	187,513	190,467	190,467	190,467	190,467	190,467	190,467	190,467
	EBK	15,312	21,361	23,363	23,989	23,989	23,989	23,989	23,989	23,989	23,989
	(L-SBKP)	14,240	19,866	21,728	22,310	22,310	22,310	22,310	22,310	22,310	22,310
After Renovation (Plan B)	KF-LB	26,481	43,088	55,112	55,770	55,770	55,770	55,770	55,770	55,770	55,770
	KF-CM	24,304	36,162	45,668	45,668	45,668	45,668	45,668	45,668	45,668	45,668
	Sub-total of UKP	66,097	100,611	124,143	125,427	125,427	125,427	125,427	125,427	125,427	125,427
	RGP (Exist. Plant)	28,480	39,731	43,456	44,620	44,620	44,620	44,620	44,620	44,620	44,620
	CTMP (New Plant)	21,360	29,799	32,592	33,465	33,465	33,465	33,465	33,465	33,465	33,465
After Renovation (Plan B)	N-BKP (Purchased)	7,120	9,933	10,864	11,155	11,155	11,155	11,155	11,155	11,155	11,155
	N-UKP (Purchased)	5,044	8,904	12,400	12,421	12,421	12,421	12,421	12,421	12,421	12,421
	Total Requirement	128,101	188,978	223,455	227,088	227,088	227,088	227,088	227,088	227,088	227,088

There are no chip weighing facilities either in KP plant and in RGP/TMP plant of the PICOP's mill and it should seem that accurate pulp yield in each plant is not grasped.

Therefore pulp unit consumption of average Japanese mill are used in this report. Also pulp yield in bleaching at the average Japanese mills are used in that the cooking yield will be reduced to the economical level by the renovation.

6-3-2 Capacity of Pulping and Ancillary Equipment

The capacity of pulp manufacturing facilities is calculated on the bases of product mix and rate of production. On the other hand, those facilities as recausticizing, evaporator and recovery boiler are evaluated on the bases of average daily production.

Table V-6-2 indicates the average daily pulp production equivalent to the annual paper and paperboard production shown in Table V-6-1, and also Table V-6-3 indicates the average daily UKP production equivalent to products grades and their average daily production of each paper machine.

1) Existing capacity without renovation

(1) Kraft pulp and related equipment

a) Cooking

Three different UKP have been produced in Bislig Mill by means of only one pulp manufacturing line.

The output capacities are varied with regard to the wood supply, cooking yield, and cooking cycle as well as the production ratio of different pulps.

In case no renovation work, annual production in PICOP will proceed 81,700 t/yr of newsprint, 35,500 t/yr of linerboard, and 31,500 t/yr of corrugating medium. When present kraft pulp combination plan may be maintained, total average daily production of 289 BDt/d is required, which is composed of 113 BDt/d of EBK, 85 BDt/d of KF-LB, and 91 BDt/d of KF-CM.

Table V-6-2 Average Daily Pulp Production (Unit: BDT/d)

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Kraft Pulp Production	Without Renovation	Kind of Pulp	113	113	113	113	113	113	113	113	113
		EBK (L-SBKP)	(102)	(102)	(102)	(102)	(102)	(102)	(102)	(102)	(102)
		KF-LB	85	85	85	85	85	85	85	85	85
		KF-CM	91	91	91	91	91	91	91	91	91
Total of UKP		289	289	289	289	289	289	289	289	289	289
	After Renovation (Plan A)	Kind of Pulp	44	61	66	68	68	68	68	68	68
		EBK (L-SBKP)	(41)	(57)	(62)	(64)	(64)	(64)	(64)	(64)	(64)
		KF-LB	78	107	114	114	114	114	114	114	114
		KF-CM	71	86	91	91	91	91	91	91	91
Total of UKP		193	254	271	273	273	273	273	273	273	273
	After Renovation (Plan B)	Kind of Pulp	44	61	66	68	68	68	68	68	68
		EBK (L-SBKP)	(41)	(57)	(62)	(64)	(64)	(64)	(64)	(64)	(64)
		KF-LB	78	127	162	164	164	164	164	164	164
		KF-CM	71	106	134	134	134	134	134	134	134
Total of UKP		193	294	362	366	366	366	366	366	366	366
	Without Renovation	RGP/TMP	125	125	125	125	125	125	125	125	125
		Total	142	199	217	223	223	223	223	223	223
	After Renovation (Plan A)	RGP/TMP	81	114	124	127	127	127	127	127	127
		CTMP	61	85	93	96	96	96	96	96	96
Total		142	199	217	223	223	223	223	223	223	223
	After Renovation (Plan B)	RGP/TMP	81	114	124	127	127	127	127	127	127
		CTMP	61	85	93	96	96	96	96	96	96
Total		142	199	217	223	223	223	223	223	223	223

Table V-6-3 Average Daily UKP Production
Paper machine and Products-Wise

(Unit ; BDT/d)

Kind of Pulp	No.1 PM: News.			No.2 PM: News.			No.3 PM: News.			No.1 PM: News.			No.2 PM: News.			No.3 PM: News.		
	No.1 PM: LB(D)	No.2 PM: LB(D)	No.1 PM: CM(D)	No.1 PM: LB(D)	No.2 PM: LB(D)	No.1 PM: CM(D)	No.1 PM: LB(D)	No.2 PM: LB(D)	No.1 PM: CM(D)	No.1 PM: LB(D)	No.2 PM: LB(D)	No.1 PM: CM(D)	No.1 PM: LB(D)	No.2 PM: LB(D)	No.1 PM: CM(D)	No.1 PM: LB(D)	No.2 PM: LB(D)	No.1 PM: CM(D)
Without Renovation	113 (102)	171	113 (102)															
			182															
Total of UKP	284		295															
After Renovation (Plan A)	68 (64)	200	68 (64)															
			213															
Total of UKP	268		281															
After Renovation (Plan B)				68 (64)	200	68 (64)	68 (64)	200	68 (64)	68 (64)	200	68 (64)	68 (64)	200	68 (64)	68 (64)	200	68 (64)
				90	92	90	90	92	90	90	92	90	90	92	90	90	92	90
Total of UKP				358	360	371	373	369	371	373	369	371	373	369	371	373	369	371

Note: D: For domestic market
E: For exporting products

On the other hand, combination of products would require following quantities of pulp.

	<u>case 1</u>	<u>case 2</u>
No. 1 paper machine	Newsprint (233 t/d)	Newsprint (233 t/d)
No.2 paper machine	Linerboard (209 t/d)	Corrugating medium (185 t/d)

Necessary amount of pulp:

EBK	113 BDt/d	113 BDt/d
KF-LB	171 BDt/d	—
KF-CM	—	182 BDt/d
Total	284 BDt/d	295 BDt/d

In this case the rate of capacity utilization (*) are estimated as 98% in case 1 and 104% in case 2.

This means the shortage of catch-up capacity, and counter-measures such as UKP output increase by means of steam packer, purchased BKP blend into newsprint furnish, and waste paper blend into corrugating medium will be required.

(*): Rate of capacity utilization = Required operation time (min)/ Theoretical available operation time*
 (* 4 digester x 1,440 min/d-digester = 5,760 min/d)

b) Washing equipment for UKP

Effective surface area for each washer is 66 m². Washing capacity is calculated as 376 BDt/d provided that the specific load factor of washing (*) is 5.7 BDt/d-m².

(*): Specific load factor of washing is 7.0 ADt/d.m² (6.3 BDt/d-m²) for LUKP in the average Japanese pulp mills. In Bislig Mill, freeness of KF-LB and KF-CM is as low as 630 ml which is 50 ml lower than that of average LUKP due to the hot stock refining. In consideration of the effect above, 5.7 BDt/d-m² is applied herein.

c) Recausticizing and lime kiln

Actual white liquor output capacity is 545 m³/d in average, 682 m³/d in maximum.

By the calculation in terms of up-flow rate of white liquor in the white liquor clarifier, the relative capacity of recausticizing is indicated as 0.307 m/h of average and 0.385 m/h of maximum in Bislig Mill.

In view of Japanese mill operation practice, it is preferable to maintain the up-flow rate under 0.3 m/h. However, there is an example operating at about 0.35 m/h, thus 620 m³/d is to be obtained if the rate would be applied on Bislig Mill.

650 m³/d is necessary in order to fulfil above pulp output of 289 BDt/d, however, it is most unlikely to supply white liquor with sufficient clarity in a continuous rate.

Actual output of calcined lime is 70 t/d in average and 100 t/d in maximum. The capacity of existing lime kiln is estimated as about 74 t/d when the output factor of 0.3 t/d-m³, which is the standard factor for long type lime kilns, is applied.

In view of average white liquor output of 545 m³/d, average consumption of 70 t/d is excess, judging from operation practice of KP mills in Japan. According to the practice, excess charging rate of calcined lime is at the level of 8% and less. If the rate is applied to the recausticizing process of Bislig Mill, the calcined lime consumption is estimated as about 54 t/d in the white liquor production of 545 m³/d. This means the Mill's lime kiln has enough capacity. Operation problems such as excess calcination and excess addition are supposed as reasons of excess lime charge if there are no any other reasons.

The proper operation of recausticizing process will reduce the calcined lime consumption and save bunker C oil consumption for calcination as a result.

d) Evaporator

Capacity of existing evaporator is shown in the clause III-2-2-8 and Table V-6-4. The capacity is not sufficient because No. 2 line (3 bodies and 3 effects, stand-by) with low heat

economy was engaged in operation for fairly long time in 1983. The operation and capacity of evaporator at the situation without renovation are shown in Table V-6-4, corresponding to unbleached kraft pulp (UKP) requirement. Then, existing evaporator will be able to cope with production increase of UKP by means of increasing the operating time of No. 2 line.

e) Recovery Boiler

Design capacity of recovery boiler is dry solid of 408 DSt/d, therefore as shown in Table V-6-5, recovery boiler will easily cope with the average load of 324 DSt/d at the situation without renovation.

(2) RGP/TMP plant

Average daily production of the existing equipment is 120 BDt/d and which will be increased up to 140 BDt/d after installation of 81,700 t/yr, RGP/TMP should be prepared at the rate of 125 BDt/d, and 140 BDt/d of capacity is enough for without renovation.

Table V-6-4 Operation of Evaporator

			1983 Actual data	Without Renovation	Plan A after Renovation
1.	Production of UKP *1	BDt/yr	86,990	*2 98,140	*2 93,213
2.	Generated dry solid of black liquor	DSt/yr	98,300	110,800	105,330
3.	Operating condition	DSZ	12 → 41	12 → 41	12 → 41
4.	Average capacity				
	No.1 line	DSt/h	11.7	11.7	11.7
	No.2 line	DSt/h	5.7	5.7	5.7
5.	Annual operating time				
	No.1 line	h/yr	7,176	7,200	7,200
	No.2 line	h/yr	2,580	4,700	3,700

Notes ; *1 UKP = EBK + KF-LB + KF-CM (BDt/yr)

*2 Refer to Table V-6-1 Annual Pulp Requirement

Table V-6-5 Operation of Recovery Boiler

	Design values	1983 Actual data	Without Renovation	After Renovation	
				Plan A	Plan B
1. Production of UKP *1	BDE/yr	86,990	98,140	*2 93,213	*2 124,143
2. Generated dry solid of black liquor *1	DSt/yr	98,300	110,800	105,330	140,280
3. Average load *3	DSt/d	408	324	308	410
4. High heating value of black liquor	Kcal/Dskg	3,722	3,400	3,400	3,400
5. Total heat-input *4	Mcal/h	63,274 (100%)	45,900 (72.5%)	43,633 (69.0%)	58,083 (91.8%)
6. Annual operating time	h/yr	-	8,210	8,210	8,210

Notes : *1 Refer to Table V-6-4 Operation of Evaporator

*2 Refer to Table V-6-1 Annual Pulp Requirement

*3 Average load (DSt/d) = Generated dry solid (DSt/yr)/Annual operating time (h/yr) x 24(h/d)

*4 Total heat-input (Mcal/h) = High heating value (Mcal/DSt) x Average load (DSt/d) x 1/24 (h/d)

2) Equipment capacities after Renovation Work (Plan A)

Capacities of pulping and concerned equipment are examined in this paragraph at the state of attaining full production.

(1) Kraft pulping plant and concerned

a) Cooking

The renovation work of Plan A requires average pulp production of 273 BDt/d which composed of EBK 68 BDt/d, KF-LB 114 BDt/d, and KF-CM 91 BDt/d.

On the basis of paper machine products mix, following pulp production is necessary.

case 1

case 2

Product mix

No. 1 paper machine:	Newsprint (329 t/d)	Newsprint (329 t/d)
No. 2 paper machine:	Linerboard (245 t/d)	Corrugating medium (217 t/d)

Pulp consumption

EBK	68 BDt/d	68 BDt/d
KF-LB	200 BDt/d	—
KF-CM	—	213 BDt/d
<hr/>		
Total	268 BDt/d	281 BDt/d

Rate of capacity utilization in cooking are 87% in case 1 and 94% in case 2.

The latter needs some tolerance in catch up capacity and introduction of steam chip packer is recommended.

b) Washing of UKP

Existing capacity is enough for supply.

c) Reausticizing and lime kiln

White liquor consumption will be 620 m³/d under PICOP's cooking condition.

Existing capacity can afford enough supply. Calcined lime consumption will be 61 t/d with excess rate of 8%. This also enough be supplied by existing capacity.

d) Evaporator

As shown in Table V-6-4, existing evaporator will be able to cope with the situation after Plan A because of less UKP production than the situation without renovation.

e) Recovery Boiler

As shown in Table V-6-5, recovery boiler will be able to cope easily with the situation after Plan A same as the situation without renovation.

(2) RGP/TMP plant

223 BDt/d of mechanical pulp is necessary in the average daily production. In this case, RGP/TMP share of the production is 127 BDt/d and existing capacity is enough for it. Balance of 96 BDt/d is to be produced in the new CTMP plant.

3) Equipment Capacities after Renovation Work (Plan B)

The capacities are discussed and examined on the full production rate after the renovation work.

(1) Kraft pulping plant and concerned

a) Cooking

Average daily UKP production after the renovation work of Plan B is estimated as 366 BDt/d which are composed of EBK 68 BDt/d, KF-LB 164 BDt/d, and KF-CM 134 BDt/d. On the basis of paper machine product mix, following pulp production is necessary. One new batch KP digester must be installed in order to produce the above quantity of UKP.

case 1

case 2

Product mix

No.1 paper machine:	Newsprint (329 t/d)	Newsprint (329 t/d)
No.2 paper machine:	Linerboard*(245 t/d)	Corrugating medium (217 t/d)
No.3 paper machine:	Linerboard*(116 t/d)	Linerboard**(116 t/d)

Pulp consumption

EBK	68 BDt/d	68 BDt/d
KF-LB	200 BDt/d	—
KF-LB	92 BDt/d	92 BDt/d
KF-CM	—	213 BDt/d
<hr/>		
Total	360 BDt/d	373 BDt/d

Note: * For domestic market

**For packing case of exporting goods

b) Washing of UKP

Existing capacity is enough for supply.

c) Reausticizing and lime kiln

645 m³/d of white liquor is necessary at average daily production. In this case, both operational index of liquor up-flow speed and load rate of lime mud exceed preferable limit. (*)

Introduction of new clarifier with enough capacity and the converting existing clarifier into primary lime mud washing tank are recommended.

Calcined lime necessary to above condition is about 64 t/d and this is within the existing capacity.

Note: * Existing load rate of lime mud: 1.4 t/d.m²

Average standard: 1.2 t/d.m²

d) Evaporator

Existing evaporator will not be able to cope with large produc-

tion increase (shown in Table V-6-2 and Table V-6-3) of UKP after Plan B, therefore expansion of capacity should be required.

The capacity after Plan B of the renovation will be dry solid of 500 DSt/d, taking account of predicted dry solid load of 410 DSt/d, cleaning time, fluctuation of dry solid generation and improved recovery of black liquor spills.

Improvement plan will be the capacity increase by means of converting the existing evaporator into new 6 effects line in combination with plate type evaporators as stated in the clause III-2-7-6.

Design condition and capacity of new 6 effects line are shown below.

<u>New 6 effects line</u>	
Dry solid	500 DSt/d
Feed black liquor	
Flow rate	173.6 t/h
Concentration	12 %
Product black liquor	
Flow rate	37.9 t/h
Concentration	55 %
Evaporation	135.7 t/h
Number of effects	6

e) Recovery boiler

Average dry solid load of recovery will be 410 DSt/d almost same as design capacity of 408 DSt/d (refer to Table V-6-5 "Operation of Recovery Boiler").

However, in regard to high heating value of black liquor, predicted value (3,400 kcal/kg-DS at present and after renovation) is fairly low. And then, in regard to total heat input of recovery boiler, its value after Plan B will be 91.8% of the design value, therefore recovery boiler will be able to cope with the dry solid load.

(2) Mechanical pulping

Same as renovation work in Plan A.

7. Contents of Renovation Work and Personnel Plan

As the result of mill diagnosis, the following items are selected for the renovation work which are most effective in improving unit consumption and increasing output without large amount of investment.

7-1 Plan A

1) Modification of No. 1 paper machine in Bislig Mill

(1) Stock approach section

For the increased flow due to increased output

- replace fan pump
- increase centri-cleaning system

(2) Stock inlet

For the purpose of eliminating fluctuation of basis weight profile

- replace with hydraulic type stock inlet

(3) Wire part

By means of top former installed on existing wire part, increasing capacity of drainage, eliminating two sidedness of web, and reducing vacuum pump load on the wire suction boxes are to be expected

- install top former

(4) Press part

Improve dewatering and maintain even moisture content across the width by means of increased nip pressure and steaming box

Reduce open-draw as much as possible

- replace press with transfer twinver type press
- double felt and steaming box should be introduced in No. 1 press part.

(5) Dry part

Increase drying capacity and improve moisture profile

- increase dryer cylinders
- install hot air blowing rolls
- modify into totally enclosed dryer hood

(6) Calender

Improve smoothness level and its fluctuation

- change king roll into crown controllable type
- install nip pressure adjusting device

(7) Reel

Minimize loss on spool change

- install spool changing device

(8) Drive

Capacity deficit must be improved by replacing respective section motors.

(9) Hot air supply

Hot air supply fan, circulation fan, and heat exchanger should be renewed.

(10) Rewinder

Maximum design speed of rewinder should be increased from existing 1,520 m/min to 2,200 m/min.

(11) Ancillary equipments

Ancillary facilities with reference to the speed-up

2) Modification of No. 2 paper machine in Bislig Mill

(1) Wire part

Change in wire run, to reduce web breaks between couch and press part.

- install wire turning roll
- install saveall for suction couch roll

(2) Press part

By the modification of both No. 1 and No. 2 presses into double felt type, improved dewatering, steam consumption, moisture profile, and productivity are to be obtained.

- modify bottom roll of second press into crown controllable grooved type.

(3) Drive

Accompanied improvement to the modification above.

(4) Ancillary equipments

Accompanied improvements in ancillary equipment to the modification.

3) New installation of CTMP and modification of RGP/TMP

(1) CTMP installation of 110 BDt/d

Major equipment and machinery is as follows:

- pre-impregnation system
- refiners
- screen, cleaner, thickener
- heating mixer
- bleaching tower
- cushion chest
- ancillary equipment

(2) Modification of existing RGP/TMP equipment

- change in process flow
- chip weight measuring

4) Modification of KP plant

- chip weight measuring
- to install steam chip packer
- installation of secondary knotters

5) Personnel plan

For new installation of CTMP

One operator per shift x 3 shift/day = 3 operators/day

7-2 Plan B

1) Modification of No. 1 paper machine in Bislig Mill

- same as plan A

2) Modification of No. 2 paper machine in Bislig Mill

- same as plan A

3) New installation of CTMP and modification of RGP/TMP

- same as plan A

4) Transfer and modification of No. 3 paper machine

(1) Stock preparation

Three lines of stock preparation, wet broke system and dry broke system are transferred from Iligan Mill to Bislig Mill.

- NUKP line: a part of pulper, cleaner and instrumentation shall be renewed. Others are to be transferred.

- LUKP line: a part of refiner, pumps and instrumentation are to be renewed. Others are to be transferred.
- Waste paper line: transferred from Iligan Mill. (to be used as spare line)
- Wet broke line: a part of thickener and pumps are to be renewed. Others are to be transferred.
- Dry broke line: transferred
- Others: mixing box, fan pump and screen are renewed.

(2) Paper machine

(a) Ultraformer

Existing 6 units of Ultraformer should be replaced by 5 units of highspeed Ultraformers.

Expected speed-up is from 160 m/min to 260 m/min.

- new highspeed Ultraformer
- flow box for top layer is air cushion type and those for intermediate and back layer are hydraulic type, and are all to be renewed.
- couch roll and forming roll are to be reused.

(b) Press part

To strengthen the pressing device, new press roll and modified rolls are introduced.

Moisture after main press will be improved from 68% to 57%.

- new pressing device
- new press rolls for main press part except No. 1 press rolls
- grooving of existing No. 3 press roll in main press part.
- grooving of existing No. 1 and No. 2 press touch roll in primary press part.

(c) Dry part

After press part modification, existing dryer part of 50 cylinders can afford the speed up to 260 m/min.

(d) Winder

Existing winder speed should be improved from 600 m/min to 800 m/min.

(e) Drive

Existing line shaft and DC helper drive system should be modified into DC sectional drive system.

(f) Coating equipment and color kitchen will not be transferred to Bislig Mill in this time.

(3) The No. 3 paper machine will be installed in the separate new building north side of existing No. 1 and No. 2 paper machine room. No. 3 machine building is two storied structure.

5) Modification of KP plant and recausticizing plant

(1) Modification of existing KP plant

– same as plan A

(2) Installation of new digester

– One unit of 142 m³ digester
– ancillary equipments

(3) Recausticizing

– One unit of white liquor clarifier

6) Evaporator

Plate type evaporators are introduced in combination with existing facilities.

Improvement in heat economy and capacity increase for the increased UKP output are expected.

7) Ancillary work

- warehouse for purchased pulp
- change in utility installation with regards to the modification above.

8) Personnel plan

	<u>Persons</u>
Increase in CTMP	3
Increase in No. 3 PM	
- Stock preparation and PM	23
- Purchased pulp and others	23
<hr/>	
Total	49

8. Plant Cost

In Table V-8-1, the plant cost for Plan A in terms of estimated price at October 1984 is indicated and similarly in Table V-8-2 that of Plan B is indicated.

These tables are worked out on the assumption that foreign currency portion should be mainly spent on imported machinery and equipment, supervisors, etc., and also local currency portion should be mainly spent on installation of machinery and equipment, local made machinery and equipment, civil engineering and construction, etc.

PICOP's estimation is indicated as accompanied information and major different between the estimations are as follows:

1) Plan A

(1) Decreased item from the PICOP's estimate

Expected increase in RGP/TMP is 160 BDt/d in PICOP's estimate, however Study Team estimates 110 BDt/d and regarded enough for use.

(2) Increased item from the PICOP's estimate

- a) modification of existing RGP/TMP process
- b) modification of existing KP plant

2) Plan B

Same as the common items to Plan A.

In particular, in this Plan B, by the transfer and increased production at Bislig Mill, KP output increase is inevitable.

Digester (one unit) and white liquor clarifier (one unit) as well as evaporators should be newly introduced together with ancillary equipments.

3) Comparison on estimated amount

	(Unit: 1,000 US\$)
Total plant cost in Plan A	38,096
Total plant cost in Plan B	60,254
<hr/> Difference	<hr/> 22,158

Plan B is 60% more cost than Plan A.

Table V-8-1 Plant Cost (Plan A)

	PICOP'S Estimate (1,000 ₪)			Team's Estimate (1,000 ₪)			Team's Estimate (1,000 US\$)		
	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
I. No. 1 PM Rebuild - Stock preparation, Stock approach system, Headbox, Wire part, Press part, Dryer part, Calender, Reel, Winder, Drive system, Electrical & Instrumentation, Auxiliary equipment, Spare parts, Freight and Engineering fee	269,781	30,147	299,928	277,980	40,350	318,330	15,443	2,242	17,685
II. No. 2 PM Rebuild - Wire part, Press part, Drive system, Auxiliary equipment, Electrical & Instrumentation, Spare parts, Freight and Engineering fee	37,973	5,002	42,975	44,660	6,920	51,580	2,481	385	2,866
III. TMP Plant Rebuild & Expansion - 160 BDt/d plant expansion - 110 BDt/d plant expansion (including Spare parts, Freight, Engineering fee and Existing plant rebuild)	165,474	98,700	264,174	126,500	67,090	193,590	7,028	3,727	10,755
IV. KP Plant Rebuild - Chip weigher, Steam packer, Remodeling of screen system, etc.	-	-	-	2,340	1,250	3,590	130	69	199
V. Others - Insurance, Bank charges, Custom duties, etc.	-	91,835	91,835	-	90,290	90,290	-	5,016	5,016
VI. Contingency	22,754	6,690	29,444	22,570	5,780	28,350	1,254	321	1,575
Total	495,982	232,374	728,356	474,050	211,680	685,730	26,336	11,760	38,096

Note: Team's Estimate was made as of Oct., 1984.

Table V-8-2 Plant Cost (Plan B)

	PICOP's Estimate (1,000 ₱)			Team's Estimate (1,000 ₱)			Team's Estimate (1,000 US\$)		
	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
I. No. 1 PM Rebuild (same as Plan A)	269,781	30,147	299,928	277,980	40,350	318,330	15,443	2,242	17,685
II. No. 2 PM Rebuild (same as Plan A)	39,973	5,002	44,975	44,660	6,920	51,580	2,481	385	2,866
III. TMP Plant Rebuild & Expansion (same as Plan A)	165,474	98,700	264,174	126,500	67,090	193,590	7,028	3,727	10,755
IV. Iligan PM Transfer & Rebuild	99,493	94,328	193,821	99,950	94,330	194,280	5,553	5,240	10,793
V. KP Plant, Recuasticizing Rebuild & Expansion — Addition ... Digester 1 set, Clarifier 1 set, Auxiliary equipment	—	—	—	30,700	19,610	50,310	1,705	1,090	2,795
VI. Evaporator Expansion	—	—	—	42,265	18,125	60,390	2,348	1,007	3,355
VII. Auxiliary Works — Warehouse, Utilities and Others	—	—	—	—	46,000	46,000	—	2,555	2,555
Sub total	574,721	228,177	802,898	622,055	292,425	914,480	34,558	16,246	50,804
VIII. Others — Insurance, Bank charges, etc.	—	91,835	91,835	—	124,410	124,410	—	6,911	6,911
IX. Contingency	22,754	6,690	29,444	31,100	14,620	45,720	1,727	812	2,539
Total	597,475	326,702	924,177	653,155	431,455	1,084,610	36,285	23,969	60,254

Note: Team's Estimate was made as of Oct., 1984.

9. Construction Schedule and Organization

1) Construction schedule

Table V-9-1 shows the construction schedule which is worked out taking into consideration of the period necessary for financing, preparatory work for the project, etc. as follows:

Premise for the time schedule is as follows:

Effectuation of Contract Agreement: End of 1986

Purchase order and start of work: Beginning of January, 1987

Completion of work

— No. 1 PM and concerned: End of June, 1988
(Shutdown period for the work: One month)

— No. 2 PM and concerned: End of June, 1988
(Shutdown period for the work: One month)

— No. 3 PM and concerned: End of June, 1989

Start-up operation

— No. 1 and No. 2 PM:

Commencement of start-up operation: Beginning of July, 1988

Commencement of commercial run: Beginning of September, 1988

(Period of trial operation: Two months)

— No. 3 PM:

Commencement of start-up operation: Beginning of July, 1989

Commencement of commercial run: Beginning of September, 1989

(Period of trial operation: Two months)

2) Organization for construction

The construction schedule is worked out on the assumption that the construction should be executed by PICOP's new division which will have been organized for the project on the past experiences such as construction works, repairing works, etc., being provided with machinery and equipment and field supervisors by the contractor.

In the engineering stage shown in Table V-9-1, PICOP has to complete production schedule, basic design, confirmation of quotation and delivery so as to commence the renovation work immediately after its decision.

And also the construction schedule includes plans that civil engineering and construction together with installation shall be executed by PICOP itself and local contractors.

Table V-9-1 Tentative Time Schedule of Renovation

Item	1985	1986	1987	1988	1989	1990	1991
<ul style="list-style-type: none"> - Presentation of Final Report - Review and Study - Implementation Plan - Government Approval - Loan Negotiation, Agreement 			Contract				
<ul style="list-style-type: none"> - <u>Renovation Project</u> - Engineering - Manufacturing & Construction Work 		Order					
No. 1 PM				Rebuilding (1 month)		Operation	
No. 2 PM				Trial (2 months) Rebuilding (1 month)		Operation	
No. 3 PM (Iligan PM)				Trial (2 months)		Operation	
		Transfer to Eslig, Manufacturing & Construction			Trial (2 months)		

VI. FINANCIAL AND ECONOMIC EVALUATION

VI. FINANCIAL AND ECONOMIC EVALUATION

1. General

1-1 Basic Condition in Financial Analysis

In order to confirm the effectiveness of renovation project, the financial analysis is carried out only for expected increase in production with reference to the subjected renovation works.

The financial analyses on both Plan A and Plan B have been made, which include calculation of the return on investment (ROI), the internal rate of return (IRR) and pay-back period as well as comparison of profitability in these figures.

The financial calculation is based on the budgetary prices for the second half of the year 1984 and indicated in the U.S. Dollars. Exchange rate of 1 U.S. Dollar = 18 Pesos is taken as of official rate in September, 1984 and 245 Yen.

As to the effectiveness of renovation project throughout PICOP, some description is given in section VI-5-5.

1-2 Expected Profit Increase

Expected profit increase after the execution of renovation work (shortened as "after renovation") is given by the formula below;

Expected profit increase

$$= \text{Increase in sales revenue} - (\text{Increase in variable cost, fixed cost, selling commission and excise tax} + \text{Interest on long term foreign loan})$$

Where is:

Increase in sales revenue

$$= \text{Sales revenue after renovation} - \text{Sales revenue without renovation}$$

Increase in variable cost

$$= \text{Variable cost after renovation} - \text{Variable cost without renovation}$$

The variable cost without renovation is estimated, based on the present unit consumption in principle. The variable cost after renovation is estimated, based on the expected unit consumption by the execution of renovation work.

Increase in fixed cost contains depreciation, amortization, interest payable, maintenance and repair cost, taxes, insurance and overhead cost with regard to a new investment for the renovation work.

Personnel expenses for operation of CTMP plant in Plan A, and for operation of CTMP plant and No. 3 paper machine in Plan B are included in the calculation respectively.

2. Production and Sales Schedule

2-1 Production and Sales Schedule

For simplifying economic calculation and production schedule, limited number of product grades are selected in this report as follows:

- Newsprint grades for STD NP and RGNP
- Linerboard grades for domestic market and for package of exporting products.
- Corrugating medium grades for domestic market and for package of exporting products.

2-1-1 Production and Sales Without Renovation

In this report, it is presumed that annual production and sales after the year 1988 of Bisling Mill will be maintained at the production level of the year 1987 described in chapter V-5. That is, the production and sales without renovation are scheduled as follows for the period of 1988 to 1997.

No. 1 paper machine	Newsprint (STD NP)	(t/yr) 65,400
	Newsprint (RGNP)	16,300
	<hr/>	
	Sub total	81,700
No. 2 paper machine	Linerboard (Domestic use)	35,500
	Corrugating medium (Domestic use)	31,500
	<hr/>	
	Sub total	67,000
Total production		148,700

2-1-2 Production and Sales after Renovation

Production and sales plan after renovation work is prepared in accordance with that of chapter V-5. The production and sales schedule for 10 years from 1988 to 1997 is shown in Table VI-1.

There will be no inventory change, and the production after the year 1991 when Bisling Mill attains to full production is scheduled as follows:

— Plan A

		(t/yr)
No. 1 paper machine	Newsprint (STD NP)	92,000
	Newsprint (RGNP)	23,000
Sub total		115,000
No. 2 paper machine	Linerboard (Domestic use)	47,600
	Corrugating medium (Domestic use)	31,700
Sub total		79,300
Total production in Plan A		194,300

— Plan B

		(t/yr)
No. 1 paper machine	Newsprint (STD NP)	92,000
	Newsprint (RGNP)	23,000
Sub total		115,000
No. 2 paper machine	Linerboard (Domestic use)	30,700
	Corrugating medium (Domestic use)	35,400
	Corrugating medium (Export use)	11,200
Sub total		77,300
No. 3 paper machine	Linerboard (Domestic use)	22,300
	Linerboard (Export use)	17,300
Sub total		39,600
Total production in Plan B		231,900

The production of linerboard and corrugating medium for package of exporting agricultural products is planned in Plan B. Export of newsprint is not projected but for domestic use only.

2-2 Selling Price of Products

Based on the price information delivered by PICOP, selling prices of the products are assumed at the site of Bislig Mill as follows:

		<u>US\$/t</u>	<u>P/t</u>
Newsprint (STD NP)		700	12,605
Newsprint (RGNP)		765	13,766
Linerboard	Domestic use	802	14,444
	Export use	637	11,468
Corrugating medium	Domestic use	749	13,484
	Export use	600	10,796

The transfer of board machine in Iligan Mill to Bislig Mill, however, premises substitution of containerboard which is imported free of duties for the use of exporting agricultural products by local supply.

The prices of those imported containerboard are very cheap than selling prices of PICOP's products, and their delivery prices at the bonded warehouses are at the following level:

- Linerboard US\$ 522/t (P 9,396/t)
- Corrugating medium US\$ 457/t (P 8,226/t)

From the viewpoint of promoting agricultural products export, selling prices of containerboard for exporting use are most likely subject to be adjusted to the present price level of importing.

Accordingly, this report includes discussion on the profitability of Plan B when the selling prices of exporting use containerboard are adjusted to the present import prices. In this report, the selling prices are estimated as follows at the site of Bislig Mill by deducting transportation cost between Bislig and Manila from the present import prices.

- Linerboard US\$ 498/t (P 8,694/t)
- Corrugating medium US\$ 433/t (P 8,226/t)

The forecast of sales revenue for 10 years from 1988 to 1997 at this alternative case is indicated in Table VI-2-2.

3. Total Capital Requirement and Source of Fund

3-1 Total Capital Requirement

The total capital requirement in both Plan A and Plan B is estimated respectively as follows.

	<u>Plan A</u> (1,000 US\$)	<u>Plan B</u> (1,000 US\$)
Plant investment cost		
Foreign currency portion	26,336	36,285
Domestic currency portion	11,760	23,969
Sub total	38,096	60,254
Pre-operation and start-up expenses	4,752	5,061
Working capital	2,133	2,352
<hr/>		
Total Capital Requirement	44,981	67,667

Pre-operation and start-up expenses in Plan A are estimated as 1/12 of annual variable cost in 1988. Working capital in Plan A is estimated as 1/2 of annual cost for chemicals and miscellaneous. Pre-operation and start-up expenses in Plan B include the above expenses and similar expenses necessary for renovation of No. 3 paper machine. Working capital in Plan B includes the same amount of Plan A and working capital for No. 3 paper machine renovation.

Both the pre-operation and start-up expenses and the working capital are included in domestic currency portion of total capital requirement.

3-2 Source of Fund

3-2-1 Raising Plan of Fund

Raising plan of fund is as follows in accordance with the policy of PICOP.

85% of foreign currency portion:	by long term foreign loan
15% of foreign currency portion:	by own funds of PICOP
Domestic currency portion:	by own funds of PICOP

Based on the raising plan of fund above, sources of funds for each renovation plan are estimated as follows.

- Plan A:		
	US\$ thousand	
PICOP's own funds	22,575	(50.2%)
Long term foreign loan	22,406	(49.8%)
<hr/>		
Total	44,981	(100.0%)
- Plan B:		
	US\$ thousand	
PICOP's own funds	36,805	(54.4%)
Long term foreign loan	30,862	(45.6%)
<hr/>		
Total	67,667	(100.0%)

3-2-2 Financing Condition of Long Term Foreign Loan

Basically the financing condition of long term foreign loan should be decided by negotiations between the Government of the Philippines and that of loan supplying country before this project comes to implementation. Consequently, for the work of financial analysis, following conditions are assumed temporarily.

Loan period:	10 years (2 years grace plus 8 years)
Repayment:	Semi-annual equal installment
Rate of interest:	10.5% per annum

The interest rate above includes guarantee fee of the Central Bank of the Philippines. The payment of interest during grace period should be postponed until beginning of repayment.

4. Manufacturing Cost

4-1 Material Requirement

The material requirement without renovation is estimated, based on the present unit consumption. As to the facilities which have been remodeled or to be remodeled by PICOP's own, as well as those subjected facilities of renovation work, improved unit consumptions for the remodeling are adopted.

Annual material requirement and their basis of calculation are shown in the following Tables for each case.

Table VI-3	Pulping Condition and Consumption of Chemicals on Kraft Pulping Process
Table VI-4	Pulping Condition and Consumption of Chemicals on Mechanical Pulping Process
Table VI-5	Palp Combination and Consumption on Paper Making Process
Table VI-6	Annual Raw Materials Requirement without Renovation
Table VI-7	Annual Raw Materials Requirement after Renovation (Plan A)
Table VI-8	Annual Raw Materials Requirement after Renovation (Plan B)

4-2 Variable Cost

Variable cost in each case is shown in the following Tables.

Table VI-10	Annual Variable Cost without Renovation
Table VI-11	Annual Variable Cost after Renovation (Plan A)
Table VI-12	Annual Variable Cost after Renovation (Plan B)

1) Pulpwood

The wood cost is based on the PICOP's budgetary cost of second half of 1984. The wood cost is estimated as follows at the chip yard exit in Bislig Mill and shown as follows:

White chip (Falcata)	US\$ 19.5/m ³ as solid (P 351/m ³)
Red chip (Mixed lauan)	US\$ 16.1/m ³ as solid (P 289/m ³)

2) Purchased pulp

Prices of purchased pulp are estimated as follows at Bislig Mill gate.

NBKP	US\$ 670/BDt (P 12,060/BDt)
NUKP	US\$ 534/BDt (P 9,603/BDt)

3) Chemicals

Chemicals other than caustic soda, chlorine, sodium hypochlorite, hydrochloric acid and pitch control agent are to be purchased.

The price list of major chemicals is shown in Table VI-9.

Chemicals of small consumption are handled as other chemicals cost in the aggregate.

4) Utilities

The utility unit costs are assumed as follows:

Purchased electric power	US\$ 23.9/MWH	(P 430/MWh)
Steam	US\$ 14.4/t	(P 260/t)
Mill water	US\$ 25 /1,000 m ³	(P 450/1,000 m ³)
Fuel oil for lime kiln	US\$ 264 /kl	(P 4,752/kl)

Note: Steam and mill water unit costs are derived from PICOP's cost data (1984) as direct costs such as fuel cost and chemicals cost, excluding fixed cost, etc.

5) Miscellaneous cost

Miscellaneous cost includes expendable sundry supplies and packaging materials, etc. The basis of calculation is dependent on the final products and assumed as follows:

	<u>Without Renovation</u>	<u>After Renovation</u>
Newsprint	US\$ 35.3/t	US\$ 36.0/t*
Linerboard	US\$ 17.1/t	US\$ 17.1/t
Corrugating medium	US\$ 15.7/t	US\$ 15.7/t

*: Cost differential is due to the difference of pulp combination.

4-3 Fixed Cost

The fixed cost with reference to the renovation work is calculated as follows, based on the information delivered by PICOP.

1) Depreciation and amortization

a) Depreciation

Machinery and equipment	16 years by straight line method
Building (for processes)	16 years by straight line method

Contingency is included in the cost of machinery and equipment.

b) Amortization

Pre-operation and start-up expenses and interest during construction are amortized in 10 years by straight line method.

The working capital is not subject to amortize.

2) Maintenance

Maintenance cost is estimated as 3% of plant cost per year.

3) General overhead

For each product general overhead is allocated as follows:

	<u>Without Renovation</u>	<u>After Renovation</u>
Newsprint	US\$ 3.1/t	US\$ 2.6/t
Linerboard	US\$ 1.5/t	US\$ 1.5/t
Corrugated medium	US\$ 1.7/t	US\$ 1.7/t

4) Taxes and insurance

The real estate tax, property tax and residence tax are to be levied on the following basis:

$$\text{Real estate tax} = \text{Assessed value of real estate} \times 2\%$$

$$\text{Property tax} = \text{Assessed value of machinery and equipment} \times 2\%$$

$$\text{Residence tax} = \text{Gross revenues} \times 0.1\% + \text{Assessed value of real estate} \times 0.04\%$$

The assessed values of real estate and machinery and equipment are deter-

mined as 40% of their actual value, and insurance premium is counted as 0.3% of actual value of real estate plus machinery and equipment.

5) Personnel cost

Incremental personnel cost for the renovation work is estimated as US\$3,000/yr (P54,000/yr) in Plan A and as US\$40,000/yr (P720,000/yr) in Plan B.

4-4 Income Tax

The rate of income tax is 35% of net profit before tax (taxable income).

The income tax should be levied on total net profit throughout PICOP, however the profitability where income tax would be levied on the net profit increase due to the renovation work is also evaluated.

4-5 Other Cost

1) Interest rate for long term foreign loan

Calculated according to the section of VI-3-2.

2) Sales tax

In accordance with the National Internal Revenue Code (NIRC), sales tax should be exempted.

3) Excise tax

Excise tax is to be levied at the following rate.

Newsprint	US\$ 14.9/t
Linerboard and Corrugating medium	US\$ 12.0/t

Note: While the Team stayed in the Philippines in September 1984, an excise tax on purchases of foreign exchange was in effect; but at present the imposition of the tax is not operative since the tax law was repealed.

4) Selling commission

Four (4) per cent of total sales increase is to be paid to PICOP Trading Company as selling commission.

5. Financial Analysis

5-1 Term of Financial Analysis

The financial calculation is carried out for the term of 11 years from the year 1987, when the renovation work is scheduled to commence, until 1997. That is, the term of commercial operation is 9 and a half years for No. 1 and No. 2 paper machines and 8 and a half years for No. 3 paper machine on practical revenue generation from financial aspect.

5-2 Profitability of Investment

The profitability of renovation plans are estimated by means of rate of return on investment (ROI), internal rate of return (IRR), and pay-back period methods. These indices are derived from financial statements as indicated herein. Meanwhile, the financial statements are prepared on the basis of increased profit earned by the renovation work.

Table VI-13-1	Income Statement on Renovation of Plan A (Before Income Tax)
Table VI-13-2	Income Statement on Renovation of Plan A (After Income Tax)
Table VI-14-1	Income Statement on Renovation of Plan B (Before Income Tax)
Table VI-14-2	Income Statement on Renovation of Plan B (After Income Tax)
Table VI-15-1	Cash Flow Statement on Renovation of Plan A (Before Income Tax)
Table VI-15-2	Cash Flow Statement on Renovation of Plan A (After Income Tax)
Table VI-16-1	Cash Flow Statement on Renovation of Plan B (Before Income Tax)
Table VI-16-2	Cash Flow Statement on Renovation of Plan B (After Income Tax)
Table VI-17-1	Balance Sheet on Renovation of Plan A (Before Income Tax)
Table VI-17-2	Balance Sheet on Renovation of Plan A (After Income Tax)
Table VI-18-1	Balance Sheet on Renovation of Plan B (Before Income Tax)
Table VI-18-2	Balance Sheet on Renovation of Plan B (After Income Tax)

Table VI-19-1	IRR Calculation on Renovation of Plan A (Before Income Tax)
Table VI-19-2	IRR Calculation on Renovation of Plan A (After Income Tax)
Table VI-20-1	IRR Calculation on Renovation of Plan B (Before Income Tax)
Table VI-20-2	IRR Calculation on Renovation of Plan B (After Income Tax)

5-2-1 Return on Investment (ROI)

In this report, the ROI of renovation plans is estimated by the following two methods.

- 1) Average rate of return on investment (after depreciation and amortization)

In this method, the rate of ROI is estimated for total return (net profit + interest on debt) which is cumulated for 10 years from 1988 to 1997. That is, the rate is calculated respectively by the following formulas.

$$\text{ROI before income tax} = \frac{\left(\begin{array}{l} \text{Cumulative net profit} \\ \text{before income tax} \end{array} + \begin{array}{l} \text{Cumulative} \\ \text{interest on debt} \end{array} \right) \times 1/10}{\begin{array}{l} \text{PICOP's own funds} \\ \text{to be invested} \end{array} + \begin{array}{l} \text{Average annual balance of} \\ \text{long term foreign loan} \end{array}} \times 100 (\%)$$

$$\text{ROI after income tax} = \frac{\left(\begin{array}{l} \text{Cumulative net profit} \\ \text{after income tax} \end{array} + \begin{array}{l} \text{Cumulative} \\ \text{interest on debt} \end{array} \right) \times 1/10}{\begin{array}{l} \text{PICOP's own funds} \\ \text{to be invested} \end{array} + \begin{array}{l} \text{Average annual balance of} \\ \text{long term foreign loan} \end{array}} \times 100 (\%)$$

As shown in Table VI-19-1, VI-19-2, VI-20-1 and VI-20-2, the rate of ROI in each case is calculated as follows:

Plan A	Before income tax	30.3%
	After income tax	21.0%
Plan B	Before income tax	34.8%
	After income tax	23.8%

The rates are very high for both plans as shown above and the renovation project is understood in each case as feasible to implement.

In the case of Plan B, when selling prices of containerboard for exporting agricultural goods are adjusted to their imported prices(*), the rate of ROI decreases to 28.4% before income tax and to 19.6% after income tax, but they are high enough.

(*) : hereinafter referred to as alternative case.

Financial statements on the alternative case are indicated in Table VI-14-3, VI-14-4, VI-16-3, VI-16-4, VI-18-3 and VI-18-4.

2) Annual rate of return on investment (after depreciation and amortization)

The rate of ROI in this method is estimated on each year between 1988 and 1997, using the following formulas.

$$\text{ROI before income tax} = \frac{\text{Net profit before income tax} + \text{Interest on debt}}{\text{PICOP's own funds} + \text{Loan balance}} \times 100 (\%)$$

$$\text{ROI after income tax} = \frac{\text{Net profit after income tax} + \text{Interest on debt}}{\text{PICOP's own funds} + \text{Loan balance}} \times 100 (\%)$$

Table VI-21 Annual Rate of Return on Investment Before Income Tax

(Unit: %/yr)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Plan A	-11.2	17.3	28.7	32.9	35.4	38.4	41.8	46.0	51.1	57.4
Plan B	-8.0	18.9	33.1	37.7	40.3	43.3	46.7	50.7	55.5	61.2
Plan B*	-8.0	16.3	26.2	30.9	33.0	35.5	38.3	41.5	45.5	50.2

Note: *; Alternative case

Table VI-22 Annual Rate of Return on Investment After Income Tax

(Unit: %/yr)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Plan A	-11.2	15.2	23.0	23.2	24.6	26.4	28.4	30.9	33.9	37.7
Plan B	-8.0	14.9	24.8	26.7	27.7	29.4	31.5	33.8	36.7	40.1
Plan B*	-8.0	13.2	20.3	22.3	22.9	24.4	26.0	27.9	30.2	32.9

Note: *, Alternative case

The rates of ROI are not good in 1988, but reach high figures sufficiently after a few years. The renovation plans are also understood in each case as feasible.

5--2--2 Internal Rate of Return (IRR)

As indicated in Table VI-19-1, VI-19-2, VI-20-1, VI-20-2, VI-20-3 and VI-20-4, the IRR exceeds 20% in Plan A and Plan B after income tax, and is enough high as 19.7% in Plan B (alternative case). Each renovation plan is recognized as feasible too on IRR term.

Plan A	Before income tax	26.7%
	After income tax	20.1%
Plan B	Before income tax	31.5%
	After income tax	23.3%
Plan B (Alternative case)	Before income tax	26.5%
	After income tax	19.7%

5--2--3 Payback Period

Payback period is the time in terms of years that the initial investment is paid by cumulative returns which are composed of net profit before income tax (or after income tax), depreciation, amortization and interest on debt.

The payback periods are calculated very short though the renovation work is very large scale project, and the renovation plan is understood as feasible in each case.

Payback period:

Plan A	Before income tax	4.5 years
	After income tax	5.2 years
Plan B	Before income tax	4.1 years
	After income tax	4.9 years
Plan B (Alternative case)	Before income tax	4.6 years
	After income tax	5.4 years

5-3 Discussions on Profitability of Investment

In Plan A of renovation work, improvement of operating efficiencies and unit consumption figures are expected by means of rationalized installation in addition to the production increase of the paper machines by the increase of running speed.

In Plan B further output increase is expected by resuming production of No. 3 paper machine.

Effectiveness of investment in both plans are high enough as shown in the preceding clause.

Cumulative net profit after income tax during 10 years from 1988 to 1997 is highest in Plan B and shown as follows.

Cumulative net profit:

Plan A	US\$ 60 million
Plan B	US\$ 111 million
Plan B (Alternative case)	US\$ 88 million

However, Plan A is more advantageous than Plan B since there is no competitive situation with regard to imported containerboard.

5-4 Sensitivity Analysis

Influence of variable factors to the profitability are examined in terms of total variable cost, selling prices and total capital requirement in Plan A. The range of variation is assumed to be +/- 15% and result of calculation is indicated hereunder.

Majority of influence incurred by selling prices is followed by total capital requirement and comparatively small by variable cost.

Table VI-23 Sensitivity of IRR (Case: Plan A, Before Income Tax)

Variation (%) of Variables	Change on IRR (%/yr)						
	-15%	-10%	-5%	0%	5%	10%	15%
Variable Cost	29.4	28.6	27.7	26.7	25.8	24.8	23.8
Total Capital Require.	32.1	30.2	28.4	26.7	25.2	23.8	22.5
Selling Price	18.3	21.3	24.1	26.7	29.2	31.6	33.9

5-5 Prospective Income Account throughout PICOP

5-5-1 Prospective Income Account

As described in section III-1-3, PICOP's cumulative deficit in balance sheet was about 518 million Pesos at the end of fiscal year 1983. Due to the swift recovery of market on pulp and paper products as well as price rise supported by the Government in terms of tariff protection, management performance of PICOP will be improved remarkably. In Table VI-24, PICOP's financial projection is indicated.

By the projection above, 1984 will remain in deficit before income tax due to the low production level of newsprint 74,000 ton/yr. Newsprint production will be increased after 1985 and cumulative financial deficit will also be made up during the fiscal year in 1987, however, PICOP will continue to have financial difficulties during a period until 1988, because he must pay a heavy amount of financial expenses and industrial plantation cost and repay his existing long term loan.

As stated in the foregoing, the renovation project needs PICOP's internal funding equivalent to about 23 million U.S. Dollars between 1987 and 1988 in Plan A, and about 37 million U.S. Dollars between 1987 and 1989 in Plan B.

On the other hand, PICOP's cash balance at the year end for the period is estimated respectively as about 15 million U.S. Dollars in 1987, about 12 million U.S. Dollars in 1988 and about 24 million U.S. Dollars in 1989. This means the shortage of PICOP's own funds for the renovation work.

**Table VI-24 Financial Projection without Renovation
(PICOP's Estimation)**

(Unit: 1,000 US\$)

Year	Net Profit after Income Tax	Cumulative Net Profit after I.T.	Depreciation and Amortization	Financial Expenses	Loan Repayment	Debt Service Ratio
1984	-10,645	-39,418	30,939	48,192	8,494	1.21
1985	14,994	-24,424	26,212	34,783	16,655	1.48
1986	18,469	-5,955	22,806	26,798	22,365	1.38
1987	19,229	13,274	20,083	20,018	32,268	1.13
1988	18,349	31,623	16,585	15,946	24,176	1.27
1989	19,909	51,532	14,377	10,305	13,092	1.91
1990	22,176	73,708	9,514	7,671	13,092	1.90
1991	20,907	94,615	8,695	5,702	2,183	4.48
1992	21,593	116,208	10,222	4,826	2,385	5.08
1993	21,428	137,636	10,179	4,272	2,701	5.15
Total	166,409		169,612	178,513	137,411	1.63

Note: Above financial projection is estimated at the constant price of 2nd semester in 1984.

Debt service ratios during five years from 1984 to 1988 are as low as 1.5, and especially the ratio in 1987, the year when the renovation work is planned to commence, is very low as 1.13. If PICOP covers the above investment by his internal funding under such circumstances, his financial substance at improving stage might get into difficulties again.

After the year 1991, rapid improvement in debt service ratio is expected and there will be no problem in repayment and financial expense payment.

The effectiveness of investment in this renovation work is big enough, however, financial difficulties anticipated during a few years time after commencement of the work have to be eased by means of applying other funding of low interest in

addition to long term foreign loan. It is desired that the Philippine Government should provide every facilities for such fund raising of PICOP.

From the fund raising aspect of the renovation, Plan A is rather of less impact to the PICOP's finance than Plan B. Consequently, it is recommended to begin with Plan A, and transfer of Iligan board machine in Plan B should be handled on condition that the fund surplus may become available.

5-5-2 Effectiveness of Renovation Work

Table VI-25 shows PICOP's projected income statement without renovation work for the period between 1988 and 1997. The statement is calculated on the basis of projected income statement prepared by PICOP and on the assumption that his prospective income balance in 1993 is continued after 1994. According to this statement, the average net profit to sales ratio after income tax is estimated as 16.7%.

The projected income statement throughout PICOP for the above period, when the renovation of Plan A is carried out, is also shown in Table VI-26. This statement is prepared, based on the statement without renovation in Table VI-25. In this case the average net profit to sales ratio after income tax is estimated as 19.0%.

Cumulative net profit after income tax during the period is estimated as 210 million U.S. Dollars for the case without renovation, and as 301 million U.S. Dollars for the case after execution of the renovation work.

The ancillary equipment of Bislig Mill, which is not included in the renovation work of this time, will also be deteriorated in the near future and need to repair in that decade of time has elapsed since the Mill start-up. The prospected profit will contribute to repair and/or renovation of such equipment.

Table VI-27 shows financial projection on renovation Plan A. The projection is prepared on the basis of the PICOP's projection without renovation and on the assumption that the depreciation amount of existing plant in 1993 continues since 1994. By the proejection, debt service ratio in 1988, when the renovation work is completed, shows the lowest figure of 1.25. But the ratio in other year exceeds 2.0 except 1.84 in 1990 when the repayment of long term loan and its interest payment are scheduled to start. This means that very sound financial situation can be maintained after the renovation work.

**Table VI-27 Financial Projection on Renovation of Plan A
(Team's Estimation)**

(Unit: 1,000 US\$)

Year	Net Profit after Income Tax	Cumulative Net Profit after I.T.	Depreciation and Amortization	Financial Expenses	Loan Repayment	Debt Service Ratio
1988	13,285	26,559	20,727	15,946	24,176	1.25
1989	25,416	51,975	19,946	10,305	13,092	2.38
1990	27,422	79,397	12,564	12,890	15,892	1.84
1991	31,452	110,849	11,551	7,687	4,983	4.00
1992	32,805	143,654	13,078	6,517	5,185	4.48
1993	33,756	177,410	13,035	5,669	5,501	4.70
1994	33,948	211,358	13,035	5,375	5,501	4.81
1995	34,139	245,497	13,035	5,081	5,501	4.94
1996	34,330	279,827	13,035	4,787	5,501	5.07
1997	34,521	314,348	13,035	4,493	5,507	5.20
Total	301,074		143,041	78,750	90,839	3.08

Note: Above financial projection is estimated at the constant price of 2nd semester in 1984.

5-6 Discussion on Financing Plan

This section includes some discussion on the profitabilities of renovation project when long term local loan would be borrowed to reduce PICOP's own funding burden. The following is calculated on the assumption that PICOP's own funds are 30% of total capital requirement and foreign loan amount and total amount are not changed.

<u>Year</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
	(1,000 US\$)	(1,000 US\$)	(1,000 US\$)	(1,000 US\$)
Plan A:				
PICOP's own funds	2,453	11,038	—	13,491 (30.0%)
Long term local loan	1,652	7,432	—	9,084 (20.2%)
Long term foreign loan	—	22,406	—	22,406 (49.8%)
Total	4,105	40,876	—	44,981 (100.0%)
Plan B:				
PICOP's own funds	3,241	14,910	2,148	20,299 (30.0%)
Long term local loan	2,511	11,652	2,343	16,506 (24.4%)
Long term foreign loan	—	30,862	—	30,862 (45.6%)
Total	5,752	57,424	4,491	67,667 (100.0%)

Note: 1) Figures in parentheses show the raising ratio of each fund.

2) Financing condition of long term local loan (assumed)

Loan period 10 years (2 years grace plus 8 years)

Repayment Semi-annual equal installment

Interest rate 24% per annum

3) Financing condition of long term foreign loan

Refer to clause VI-3-2-2.

Table VI-28 shows the profitability indicators of renovation project in the alternative financing plan mentioned above. It shows that the rate of ROI drops 1.8% in Plan A and 2.6% in Plan B in the alternative plan, compared with those of both renovation plans in the original financing plan in which no long term local loan is applied. But the indicators are high enough to make both renovation plans feasible even in the alternative financing plan. As stated in the above table, about 13.5 million U.S. Dollars shall be raised by PICOP between 1987 and 1988 in Plan A and about 20.3 million U.S. Dollars between 1987 and 1989 in Plan B. It seems possible for PICOP to raise such amounts of funds in spite of the increase of PICOP's debt.

Table VI-28 Profitabilities in Case of Partial Long Term Local Loan

		Alternative Financing Plan ¹⁾	(Reference) Original Financing Plan ²⁾
Plan A:			
IRR (%)	Before income tax	26.6	26.7
	After income tax	21.4	20.1
ROI (%)	Before income tax	26.2	30.3
	After income tax	19.2	21.0
Plan B:			
IRR (%)	Before income tax	31.3	31.5
	After income tax	24.8	23.3
ROI (%)	Before income tax	29.3	34.8
	After income tax	21.2	23.8

Note: 1) Total capital requirement

= PICOP's own funds + Long term foreign loan + Long term local loan

2) Total capital requirement

= PICOP's own funds + Long term foreign loan (Refer to VI-3-2-2.)

Remarks: In accordance with "Minutes of Meeting on the Draft Final Report", the economic calculation based on the another financial plan of funding requested by PICOP is described in the appendix D.

6. Economic Evaluation

In case the renovation work of PICOP were not implemented, most of future growing demand of newsprint and containerboard will be dependent on foreign supply. As an economic effect of this renovation project, saving of foreign currency is expected by means of supplying the growing demand. Furthermore, saving of foreign currency is also expected by substitution of imported containerboard in Plan B.

Aggregate saving of foreign currency during ten years between 1988 and 1997 are estimated as follows:

Plan A	US\$ 74 million
Plan B	US\$ 195 million

The saving amount is large enough and will exert a great contribution on the Philippine economy. The saving amount is estimated as follows.

Calculation on Foreign Currency Saving

A. Gross Saving of Foreign Currency

(a) Cumulative increase in production

			(t)
Plan A	Newsprint	STD NP	220,200
		RGNP	55,600
		<hr/> Sub-total	275,800
	Linerboard		103,100
	Corrugating medium		-6,700
	<hr/> Total		372,200
Plan B	Newsprint	STD NP	220,200
		RGNP	55,600
		<hr/> Sub-total	275,800
	Linerboard		292,800
	Corrugating medium		119,500
	<hr/> Total		688,100

(b) Cumulative saving of foreign currency

		(US\$ thousand)	
Plan A	Newsprint	STD NP	103,494
		RGNP	28,467
		<u>Sub-total</u>	<u>131,961</u>
	Linerboard	53,818	
	Corrugating medium	-3,062	
	<u>Total</u>	<u>182,717</u>	
Plan B	Newsprint	STD NP	103,494
		RGNP	28,467
		<u>Sub-total</u>	<u>131,961</u>
	Linerboard	152,842	
	Corrugating medium	54,612	
	<u>Total</u>	<u>339,415</u>	

In this calculation, price of imported newsprint is estimated as US\$470/t for STD NP grade and US\$512/t for RGNP grade by deducting tariff and other duties from the current selling price. Imported price of linerboard is assumed as US\$522/t and corrugating medium is assumed as US\$457/t, based on price information investigated by the Study Team.

B. Outflow of Foreign Currency

(a) Repayment of long term foreign loan and increase in interest payment

	(US\$ thousand)
Plan A	35,346
Plan B	48,316

(b) Cost increase in imported pulp for production increase

Incremental volume;

		(t)
Plan A	NBKP	106,002
	NUKP	16,001
	<u>Total</u>	<u>122,003</u>

		(t)
Plan B	NBKP	106,002
	NUKP	58,195
<hr/>		
	Total	164,197
Import price;	NBKP	US\$ 540/BDt
	NUKP	US\$ 364/BDt

Increase in import amount;

		(US\$ thousand)
Plan A	NBKP	57,241
	NUKP	5,824
<hr/>		
	Total	63,065
Plan B	NBKP	57,241
	NUKP	21,183
<hr/>		
	Total	78,424

(c) Cost increase in imported chemicals and supplies necessary for production increase

50% of cost increase in chemicals and supplies is estimated as overseas supply.

	(US\$ thousand)
Plan A:	
Increase in imported chemicals	3,831
Increase in imported supplies	6,089
<hr/>	
Total	9,920
Plan B:	
Increase in imported chemicals	9,314
Increase in imported supplies	8,684
<hr/>	
Total	17,998

(d) Total of outflow

	(US\$ thousand)
Plan A	108,331
Plan B	144,738

C. Net Saving of Foreign Currency

	(US\$ thousand)
Plan A	74,386
Plan B	194,677

Table VI-1 Sales Volume (Unit: t/y)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
SALES VOLUME										
A. WITHOUT RENOVATION										
Newsprint (STD NP)	65,400	65,400	65,400	65,400	65,400	65,400	65,400	65,400	65,400	65,400
Newsprint (RGNP)	16,300	16,300	16,300	16,300	16,300	16,300	16,300	16,300	16,300	16,300
Linerboard (For Domestic Market)	35,500	35,500	35,500	35,500	35,500	35,500	35,500	35,500	35,500	35,500
Corrugat. Medium (For Domestic Market)	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500
Total	148,700	148,700	148,700	148,700	148,700	148,700	148,700	148,700	148,700	148,700
B. AFTER RENOVATION (PLAN A)										
Newsprint (STD NP)	58,700	81,900	89,600	92,000	92,000	92,000	92,000	92,000	92,000	92,000
Newsprint (RGNP)	14,700	20,500	22,400	23,000	23,000	23,000	23,000	23,000	23,000	23,000
Linerboard (For Domestic Market)	32,500	44,800	47,600	47,600	47,600	47,600	47,600	47,600	47,600	47,600
Corrugat. Medium (For Domestic Market)	24,800	29,900	31,700	31,700	31,700	31,700	31,700	31,700	31,700	31,700
Total	130,700	177,100	191,300	194,300	194,300	194,300	194,300	194,300	194,300	194,300
C. AFTER RENOVATION (PLAN B)										
Newsprint (STD NP)	58,700	81,900	89,600	92,000	92,000	92,000	92,000	92,000	92,000	92,000
Newsprint (RGNP)	14,700	20,500	22,400	23,000	23,000	23,000	23,000	23,000	23,000	23,000
Linerboard (For Domestic Market)	32,500	46,900	51,300	53,000	53,000	53,000	53,000	53,000	53,000	53,000
Linerboard (For Exporting Products)		6,700	18,300	17,300	17,300	17,300	17,300	17,300	17,300	17,300
Corrugat. Medium (For Domestic Market)	24,800	31,400	34,200	35,400	35,400	35,400	35,400	35,400	35,400	35,400
Corrugat. Medium (For Exporting Products)		5,500	12,400	11,200	11,200	11,200	11,200	11,200	11,200	11,200
Total	130,700	192,900	228,200	231,900	231,900	231,900	231,900	231,900	231,900	231,900
INCREMENTAL SALES VOLUME										
PLAN A : Newsprint (STD NP)										
Newsprint (RGNP)	-6,700	16,500	24,200	26,600	26,600	26,600	26,600	26,600	26,600	26,600
Linerboard (For Domestic Market)	-1,600	4,200	6,100	6,700	6,700	6,700	6,700	6,700	6,700	6,700
Corrugat. Medium (For Domestic Market)	-3,900	9,300	12,100	12,100	12,100	12,100	12,100	12,100	12,100	12,100
Total	-6,700	-1,600	200	200	200	200	200	200	200	200
PLAN B : Newsprint (STD NP)										
Newsprint (RGNP)	-6,700	16,500	24,200	26,600	26,600	26,600	26,600	26,600	26,600	26,600
Linerboard (For Domestic Market)	-1,600	4,200	6,100	6,700	6,700	6,700	6,700	6,700	6,700	6,700
Linerboard (For Exporting Products)	-3,900	11,400	15,800	17,500	17,500	17,500	17,500	17,500	17,500	17,500
Corrugat. Medium (For Domestic Market)	-6,700	6,700	18,300	17,300	17,300	17,300	17,300	17,300	17,300	17,300
Corrugat. Medium (For Exporting Products)	-18,000	-100	2,700	3,900	3,900	3,900	3,900	3,900	3,900	3,900
Total	-18,000	5,500	12,400	11,200	11,200	11,200	11,200	11,200	11,200	11,200
		44,200	79,500	83,200	83,200	83,200	83,200	83,200	83,200	83,200

Table VI-2-1 Sales Revenue (Unit : 1,000 US\$)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
SALES REVENUE										
A. WITHOUT RENOVATION										
Newsprint (STD NP)	45,780	45,780	45,780	45,780	45,780	45,780	45,780	45,780	45,780	45,780
Newsprint (RGNP)	12,470	12,470	12,470	12,470	12,470	12,470	12,470	12,470	12,470	12,470
Linerboard (For Domestic Market)	28,471	28,471	28,471	28,471	28,471	28,471	28,471	28,471	28,471	28,471
Corrugating Medium (For Domestic Market)	23,594	23,594	23,594	23,594	23,594	23,594	23,594	23,594	23,594	23,594
Total	110,315	110,315	110,315	110,315	110,315	110,315	110,315	110,315	110,315	110,315
B. AFTER RENOVATION (PLAN A)										
Newsprint (STD NP)	41,090	57,330	62,720	64,400	64,400	64,400	64,400	64,400	64,400	64,400
Newsprint (RGNP)	11,246	15,683	17,136	17,595	17,595	17,595	17,595	17,595	17,595	17,595
Linerboard (For Domestic Market)	26,065	35,930	38,175	38,175	38,175	38,175	38,175	38,175	38,175	38,175
Corrugating Medium (For Domestic Market)	18,575	22,395	23,743	23,743	23,743	23,743	23,743	23,743	23,743	23,743
Total	96,976	131,338	141,774	143,913	143,913	143,913	143,913	143,913	143,913	143,913
C. AFTER RENOVATION (PLAN B)										
Newsprint (STD NP)	41,090	57,330	62,720	64,400	64,400	64,400	64,400	64,400	64,400	64,400
Newsprint (RGNP)	11,246	15,683	17,136	17,595	17,595	17,595	17,595	17,595	17,595	17,595
Linerboard (For Domestic Market)	26,065	37,614	41,143	42,506	42,506	42,506	42,506	42,506	42,506	42,506
Linerboard (For Exporting Products)		4,268	11,657	11,020	11,020	11,020	11,020	11,020	11,020	11,020
Corrugating Medium (For Domestic Market)	18,575	23,519	25,616	26,515	26,515	26,515	26,515	26,515	26,515	26,515
Corrugating Medium (For Exporting Products)		3,300	7,440	6,720	6,720	6,720	6,720	6,720	6,720	6,720
Total	96,976	141,714	165,712	168,756	168,756	168,756	168,756	168,756	168,756	168,756
INCREMENTAL SALES REVENUE										
PLAN A : Newsprint (STD NP)										
Newsprint (RGNP)	-4,690	11,550	16,940	18,620	18,620	18,620	18,620	18,620	18,620	18,620
Linerboard (For Domestic Market)	-1,224	3,213	4,666	5,125	5,125	5,125	5,125	5,125	5,125	5,125
Corrugat. Medium (For Domestic Market)	-2,406	7,459	9,704	9,704	9,704	9,704	9,704	9,704	9,704	9,704
Total	-5,019	-1,199	149	149	149	149	149	149	149	149
Total	-13,339	21,023	31,459	33,598	33,598	33,598	33,598	33,598	33,598	33,598
PLAN B : Newsprint (STD NP)										
Newsprint (RGNP)	-4,690	11,550	16,940	18,620	18,620	18,620	18,620	18,620	18,620	18,620
Linerboard (For Domestic Market)	-1,224	3,213	4,666	5,125	5,125	5,125	5,125	5,125	5,125	5,125
Linerboard (For Exporting Products)	-2,406	9,143	12,672	14,035	14,035	14,035	14,035	14,035	14,035	14,035
Corrugat. Medium (For Domestic Market)	-5,019	-75	2,022	2,921	2,921	2,921	2,921	2,921	2,921	2,921
Total	-13,339	3,300	7,440	6,720	6,720	6,720	6,720	6,720	6,720	6,720
Total	-13,339	31,399	55,397	58,441	58,441	58,441	58,441	58,441	58,441	58,441

Table VI-2-2 Sales Revenue (Unit : 1,000 US\$)
Alternative Case

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
SALES REVENUE										
A. WITHOUT RENOVATION										
Newsprint (STD NP)	45,780	45,780	45,780	45,780	45,780	45,780	45,780	45,780	45,780	45,780
Newsprint (RGNP)	12,470	12,470	12,470	12,470	12,470	12,470	12,470	12,470	12,470	12,470
Linerboard (For Domestic Market)	28,471	28,471	28,471	28,471	28,471	28,471	28,471	28,471	28,471	28,471
Corrugat. Medium (For Domestic Market)	23,594	23,594	23,594	23,594	23,594	23,594	23,594	23,594	23,594	23,594
Total	110,315	110,315	110,315	110,315	110,315	110,315	110,315	110,315	110,315	110,315
B. AFTER RENOVATION (PLAN A)										
Newsprint (STD NP)	41,090	57,330	62,720	64,400	64,400	64,400	64,400	64,400	64,400	64,400
Newsprint (RGNP)	11,246	15,683	17,136	17,595	17,595	17,595	17,595	17,595	17,595	17,595
Linerboard (For Domestic Market)	26,065	35,930	38,175	38,175	38,175	38,175	38,175	38,175	38,175	38,175
Corrugat. Medium (For Domestic Market)	18,575	22,395	23,743	23,743	23,743	23,743	23,743	23,743	23,743	23,743
Total	96,976	131,338	141,774	143,913	143,913	143,913	143,913	143,913	143,913	143,913
C. AFTER RENOVATION (PLAN B)										
Newsprint (STD NP)	41,090	57,330	62,720	64,400	64,400	64,400	64,400	64,400	64,400	64,400
Newsprint (RGNP)	11,246	15,683	17,136	17,595	17,595	17,595	17,595	17,595	17,595	17,595
Linerboard (For Domestic Market)	26,065	37,614	41,143	42,506	42,506	42,506	42,506	42,506	42,506	42,506
Linerboard (For Exporting Products)		3,337	9,113	8,615	8,615	8,615	8,615	8,615	8,615	8,615
Corrugat. Medium (For Domestic Market)	18,575	23,519	25,616	26,515	26,515	26,515	26,515	26,515	26,515	26,515
Corrugat. Medium (For Exporting Products)		2,382	5,369	4,850	4,850	4,850	4,850	4,850	4,850	4,850
Total	96,976	139,865	161,097	164,481	164,481	164,481	164,481	164,481	164,481	164,481
INCREMENTAL SALES REVENUE										
PLAN A : Newsprint (STD NP)										
Newsprint (RGNP)	-4,690	11,550	16,940	18,620	18,620	18,620	18,620	18,620	18,620	18,620
Linerboard (For Domestic Market)	-1,224	3,213	4,666	5,125	5,125	5,125	5,125	5,125	5,125	5,125
Corrugat. Medium (For Domestic Market)	-2,406	7,459	9,704	9,704	9,704	9,704	9,704	9,704	9,704	9,704
Total	-5,019	-1,199	149	149	149	149	149	149	149	149
PLAN B : Newsprint (STD NP)										
Newsprint (RGNP)	-4,690	11,550	16,940	18,620	18,620	18,620	18,620	18,620	18,620	18,620
Linerboard (For Domestic Market)	-1,224	3,213	4,666	5,125	5,125	5,125	5,125	5,125	5,125	5,125
Linerboard (For Exporting Products)	-2,406	9,143	12,672	14,035	14,035	14,035	14,035	14,035	14,035	14,035
Corrugat. Medium (For Domestic Market)	-5,019	-75	2,022	2,921	2,921	2,921	2,921	2,921	2,921	2,921
Corrugat. Medium (For Exporting Products)	-13,339	2,382	5,369	4,850	4,850	4,850	4,850	4,850	4,850	4,850
Total	-13,339	29,550	50,782	54,166	54,166	54,166	54,166	54,166	54,166	54,166

Table VI-3 Pulp Yield and Consumption Figure of Chemicals on Kraft Pulping Process

	Without Renovation (after 1988) (Current Operation)			After Renovation (after 1988)		
	EBK	KF-LB	KF-CM	EBK	KF-LB	KF-CM
1. Wood Species	White Chip	Red Chip	Red Chip	White Chip	Red Chip	Red Chip
2. Wood Density	265	373	373	265	373	373
3 Pulping Yield						
Cooking Yield	55.2	51.6	57	53	51.6	57
Deknotting Yield				97		
Screening Yield				97		
Bleaching Yield	90			93.5		
4. Chemicals Consumption	(STD NP)(RGNP)			(STD NP)(RGNP)		
Pulping Chemicals						
Salt cake	40	40	40	40	40	40
Limestone	(75)	(75)	(75)			
Washer Additives	24	24	24	24	24	24
Pitch Dispersion	0.5	0.5	0.3	0.5	0.3	0.3
Bleaching Chemicals	0.25	0.25	0.7	0.25	0.25	0.7
Clorine	55	60		40	44	
Caustic soda	35	35		28	28	
Sodium hypochlorite	23	30		16	18	

Table VI-4 Pulpings Yield and Consumption. Figure of Chemicals on Mechanical Pulping Process

Kind of Pulp	Without Renovation (Current Operation)	After Renovation (after 1988)					
		TMP/RGP		RGP		CTMP	
		STD NP	RGNP	STD NP	RGNP	STD NP	RGNP
Grade of Pulp							
1. Wood Species	BDkg/m ³	White Chip	White Chip	White Chip	White Chip	White Chip	White Chip
2. Wood Density		265	265	265	265	265	265
3. Pulping Yield	%	94	94	94	94	94	94
Unbleached Pulp Yield	%	97.9	97.9	97.9	97.9	97.9	97.9
Bleached Pulp Yield		(4.0 m ³ / Bdt-BP)					
4. Chemicals Consumption							
Sodium Sulfite	kg/Bdt-UP						30
Hydrogen Peroxide	kg/Bdt-BP	7.5	30	7.5	30	7.5	30
Caustic Soda	kg/Bdt-BP	17	35	17	35	17	35
Sodium Silicate	kg/Bdt-BP	6	6	6	6	6	6
Coco Oil	kg/Bdt-BP	3.5	3.5	3.5	3.5	3.5	3.5

Note ; UP : Unbleached pulp

BP : Bleached pulp

Table VI-5 Pulp Combination and Consumption Figure on Paper Making Process

	Without Renovation (after 1988)			After Renovation (after 1988)		
	Newsprint	Linerboard	Corrugating Medium	Newsprint	Linerboard	Corrugating Medium
1. Pulp Combination						
RGP/TMP	45			40		
CTMP				30		
L-SBKP	55			20		
N-BKP				10	(Dom) (Ex)	
KF-LB		84	100		84 75	100
KF-CW						
N-UKP		16			16 25	
2. Pulp Consumption (PICOP's Data)						
	0.97	0.97	0.98	0.97	0.97	0.98
	(0.945)	(0.950)	(0.950)			
3. Chemicals Consumption						
Alum	(STD) (RG)			(STD) (RG)	(Dom) (Ex)	
Rosin Size	15 21	18.2	14.4	15 21	16.9 21.6	13.4
Acetic Acid	0.07 0.08	3.8	2.6	0.07 0.08	3.6 4.5	2.4
Rhodamine Red	0.02 0.02			0.02 0.02		
Methyl Violet	0.09			0.09		

Note ; Dom ;For domestic market Ex:For exporting products STD : Standard grade RG : Roto gravure grade

Table VI-6 Annual Material Requirement Without Renovation

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
A. RAW MATERIALS										
Pulpwood										
White Chip	295,500	295,500	295,500	295,500	295,500	295,500	295,500	295,500	295,500	295,500
Red Chip	449,600	449,600	449,600	449,600	449,600	449,600	449,600	449,600	449,600	449,600
Sub-total	745,100	745,100	745,100	745,100	745,100	745,100	745,100	745,100	745,100	745,100
N-DKP	5,510	5,510	5,510	5,510	5,510	5,510	5,510	5,510	5,510	5,510
B. CHEMICALS										
Salt Cake (100%)	3,977	3,977	3,977	3,977	3,977	3,977	3,977	3,977	3,977	3,977
Limestone	2,386	2,386	2,386	2,386	2,386	2,386	2,386	2,386	2,386	2,386
Washer Additives	38	38	38	38	38	38	38	38	38	38
Pitch Dispersion	52	52	52	52	52	52	52	52	52	52
Chlorine (100%)	1,997	1,997	1,997	1,997	1,997	1,997	1,997	1,997	1,997	1,997
Caustic Soda (100%)	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248
Hypo-chlorite (as ave. Cl)	870	870	870	870	870	870	870	870	870	870
Hydrogen Peroxide	523	523	523	523	523	523	523	523	523	523
Sodium Silicate (100%)	897	897	897	897	897	897	897	897	897	897
Sodium Sulfite (100%)	261	261	261	261	261	261	261	261	261	261
Coco Oil	152	152	152	152	152	152	152	152	152	152
Alum	2,423	2,423	2,423	2,423	2,423	2,423	2,423	2,423	2,423	2,423
Sizing Agent	217	217	217	217	217	217	217	217	217	217
Acetic Acid	5,882	5,882	5,882	5,882	5,882	5,882	5,882	5,882	5,882	5,882
Rhodamine Red	1,634	1,634	1,634	1,634	1,634	1,634	1,634	1,634	1,634	1,634
Methyl Violet	5,886	5,886	5,886	5,886	5,886	5,886	5,886	5,886	5,886	5,886
C. UTILITIES										
Electric Power	119,952	119,952	119,952	119,952	119,952	119,952	119,952	119,952	119,952	119,952
Steam	2,088,337	2,088,337	2,088,337	2,088,337	2,088,337	2,088,337	2,088,337	2,088,337	2,088,337	2,088,337
Bunker C oil For Lime Kiln	5,170	5,170	5,170	5,170	5,170	5,170	5,170	5,170	5,170	5,170
Mill Water	19,440	19,440	19,440	19,440	19,440	19,440	19,440	19,440	19,440	19,440
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Table VI-7 Annual Material Requirement after Renovation
(Plan A)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
A. RAW MATERIALS										
Pulpwood										
White Chip	246,900	320,500	340,000	339,800	339,800	339,800	339,800	339,800	339,800	339,800
Red Chip	323,500	451,300	493,700	506,900	506,900	506,900	506,900	506,900	506,900	506,900
Sub-total	570,400	771,800	833,700	846,700	846,700	846,700	846,700	846,700	846,700	846,700
N-BKP	7,120	9,933	10,864	11,155	11,155	11,155	11,155	11,155	11,155	11,155
N-UKP	5,044	6,953	7,388	7,388	7,388	7,388	7,388	7,388	7,388	7,388
B. CHEMICALS										
Salt Cake (100%)	2,640	3,482	3,724	3,749	3,749	3,749	3,749	3,749	3,749	3,749
Limestone	1,584	2,089	2,235	2,250	2,250	2,250	2,250	2,250	2,250	2,250
Washer Additives	23	30	32	33	33	33	33	33	33	33
Pitch Dispersion (100%)	40	52	55	55	55	55	55	55	55	55
Chlorine (100%)	581	811	886	910	910	910	910	910	910	910
Caustic Soda (100%)	399	556	609	625	625	625	625	625	625	625
Hypo-chlorite (as ave. Cl)	232	324	354	365	365	365	365	365	365	365
Hydrogen Peroxide	470	656	718	737	737	737	737	737	737	737
Sodium Silicate (100%)	924	1,289	1,410	1,448	1,448	1,448	1,448	1,448	1,448	1,448
Sodium Sulfite (100%)	940	1,312	1,460	1,473	1,473	1,473	1,473	1,473	1,473	1,473
Coco Oil	175	243	266	273	273	273	273	273	273	273
Alum	2,071	2,818	3,043	3,092	3,092	3,092	3,092	3,092	3,092	3,092
Sizing Agent	177	233	247	247	247	247	247	247	247	247
Acetic Acid	5,285	7,373	8,064	8,280	8,280	8,280	8,280	8,280	8,280	8,280
Rhodamine Red	1,468	2,048	2,240	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Methyl Violet	5,283	7,371	8,064	8,280	8,280	8,280	8,280	8,280	8,280	8,280
C. UTILITIES										
Electric Power	137,225	185,941	200,850	204,000	204,000	204,000	204,000	204,000	204,000	204,000
Steam	1,379,764	1,869,595	2,019,501	2,051,171	2,051,171	2,051,171	2,051,171	2,051,171	2,051,171	2,051,171
Bunker C Oil For Lime Kiln	3,433	4,527	4,841	4,873	4,873	4,873	4,873	4,873	4,873	4,873
Mill Water	12,522	16,968	18,329	18,616	18,616	18,616	18,616	18,616	18,616	18,616

Table VI-8 Annual Material Requirement after Renovation
(Plan B)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
A. RAW MATERIALS										
Pulpwood										
White Chip	246,900	387,000	493,600	496,800	496,800	496,800	496,800	496,800	496,800	496,800
Red Chip	323,500	451,300	493,700	506,900	506,900	506,900	506,900	506,900	506,900	506,900
Sub-total	570,400	838,300	987,300	1,003,700	1,003,700	1,003,700	1,003,700	1,003,700	1,003,700	1,003,700
N-BKP	7,120	9,933	10,864	11,155	11,155	11,155	11,155	11,155	11,155	11,155
N-UKP	5,044	8,904	12,400	12,421	12,421	12,421	12,421	12,421	12,421	12,421
B. CHEMICALS										
Salt Cake (100%)	2,640	4,019	4,962	5,013	5,013	5,013	5,013	5,013	5,013	5,013
Limestone	1,584	2,412	2,976	3,007	3,007	3,007	3,007	3,007	3,007	3,007
Washer Additives	23	34	42	43	43	43	43	43	43	43
Pitch Dispersion	40	60	77	78	78	78	78	78	78	78
Chlorine (100%)	581	811	886	910	910	910	910	910	910	910
Caustic Soda (100%)	399	556	609	625	625	625	625	625	625	625
Hypo-chlorite (as ave. Cl)	232	324	354	365	365	365	365	365	365	365
Hydrogen Peroxide	470	656	718	737	737	737	737	737	737	737
Sodium Silicate (100%)	924	1,289	1,410	1,448	1,448	1,448	1,448	1,448	1,448	1,448
Sodium Sulfite (100%)	940	1,312	1,434	1,473	1,473	1,473	1,473	1,473	1,473	1,473
Coco Oil	175	243	266	273	273	273	273	273	273	273
Alum	2,071	3,135	3,797	3,861	3,861	3,861	3,861	3,861	3,861	3,861
Sizing Agent	177	296	398	401	401	401	401	401	401	401
Acetic Acid	5,285	7,373	8,064	8,280	8,280	8,280	8,280	8,280	8,280	8,280
Rhodamine Red	1,468	2,048	2,240	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Methyl Violet	5,283	7,371	8,064	8,280	8,280	8,280	8,280	8,280	8,280	8,280
C. UTILITIES										
Electric Power	137,225	189,240	223,870	227,500	227,500	227,500	227,500	227,500	227,500	227,500
Steam	1,379,764	1,848,643	2,186,938	2,222,397	2,222,397	2,222,397	2,222,397	2,222,397	2,222,397	2,222,397
Bunker C Oil For Lime Kiln	3,433	5,226	6,449	6,516	6,516	6,516	6,516	6,516	6,516	6,516
Mill Water	12,522	17,686	20,923	21,262	21,262	21,262	21,262	21,262	21,262	21,262