

**THE FEASIBILITY STUDY
ON
THE RENOVATION PROGRAMME
FOR
AKSU NEWSPRINT MILL
OF
GENERAL DIRECTORATE OF PULP AND
PAPER MILLS OF TURKEY
IN
THE REPUBLIC OF TURKEY**

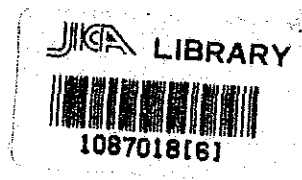
(SUMMARY)

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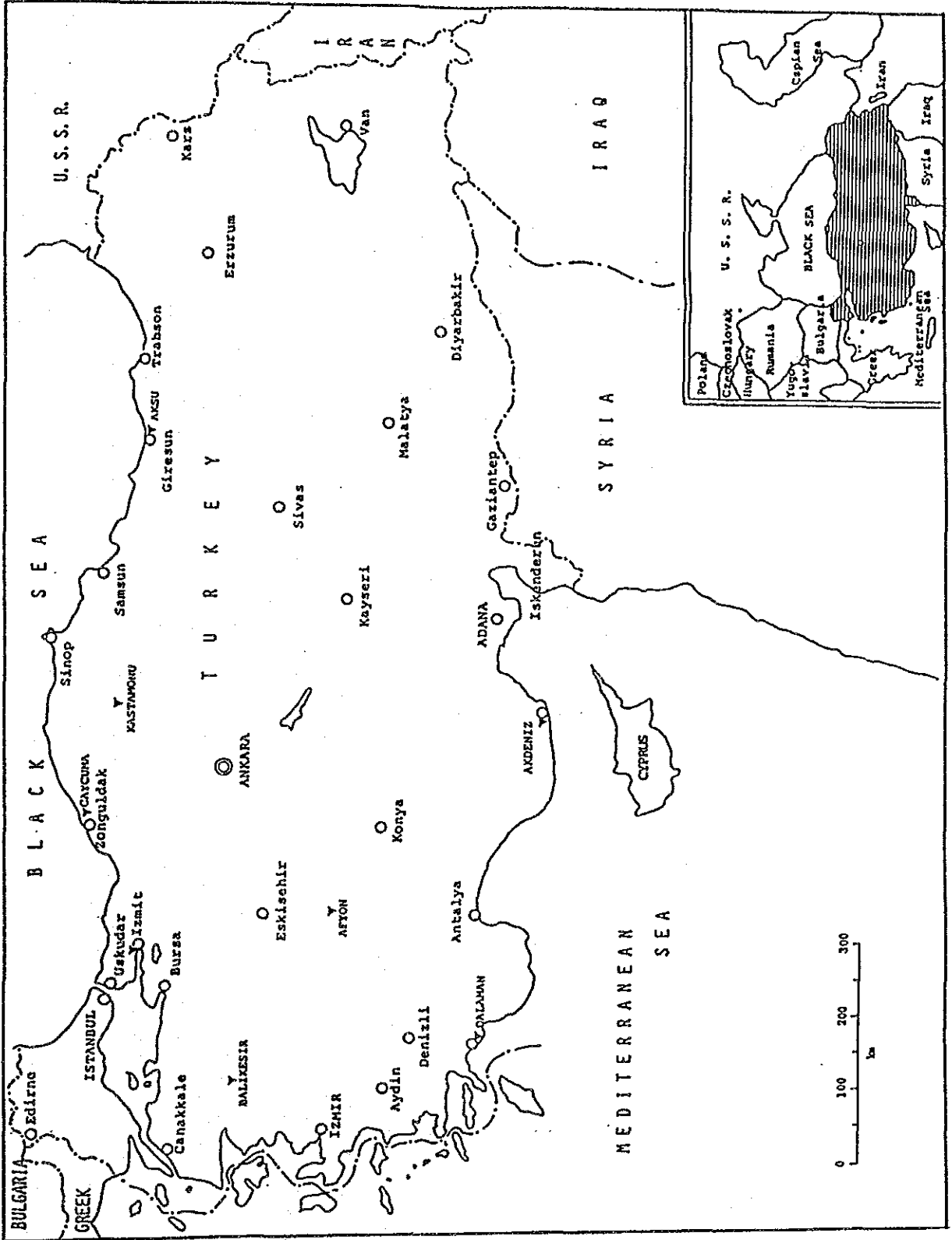
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BULGARIA
GREEK

U. S. S. R.

BLACK SEA

T U R K E Y

IRAN

IRAQ

SYRIA

MEDITERRANEAN SEA

CYPRUS

Poland

Czechoslovakia

Hungary

Romania

Yugoslavia

Bulgaria

U. S. S. R.

BLACK SEA

Caspian Sea

Mediterranean Sea

Syria

Iraq

Iran

0 100 200 300 km

Edirne

Istanbul

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SUMMARY

I. BACKGROUND AND OBJECTIVE OF THE PROJECT

1. Background of the Project

Since 1980, the Government of Turkey has been carrying out a major shift from inward-looking economic policies to free economy policies aimed at effective utilization of market mechanism. Although the Central Government's efforts along this line have steadily been bearing fruit, the country is still faced with a high level of inflation and other problems. In this context, high expectations are placed on the promotion by the central government of its short-term measures to reduce the fiscal deficit, as well as on its long-term measures to acquire foreign currencies.

In the sixth five-year plan launched in 1990, too, the Central Government is stressing the internationalization of the Turkish economy and the strengthening of the country's international competitiveness. One of the main objectives of the five-year plan is to promote industrial development, which includes qualitative improvement of SEEs' operations (including their privatisation).

Under such economic policies, the Government of Turkey has set the average annual growth rate of industrial production in the years ahead at 8.5 percent. In other words, the manufacturing sector is expected to grow faster than any other sector in the near future. One of the central government's goals for the manufacturing sector is to raise the manufacturing sector's share of the national economy from 44.9 percent in 1989 to 47.5 percent in 1994.

In the Turkish pulp and paper industry, SEKA, which is one of the SEEs which were established under the Central Government's policies before 1979, has always been taking the lead in papermaking in the country. While paper and paperboard production in Turkey has grown at an average annual rate of 4.6 percent, which exceeds the global average, the demand has exceeded the supply. As a result, Turkey has been a perennial net importer of paper and paperboard. In addition, imports of paper and paperboard have been increasing from year to year.

2. Objective and Scope of This Study

SEKA's Aksu mill, which is the subject of this study, was constructed by Mitsubishi Heavy Industries, Ltd. It started operation in 1971.

However, its production performance over the past 20 years has not been satisfactory. Its average annual capacity utilization rate for the 12-year period from 1977 to 1988 was a low 72.5 percent. The quality of its products has not yet reached the international level.

This study is aimed at working out a facility renovation project to help save foreign currencies and at the same verifying the feasibility of this project through examination of its technical, financial and economic aspects.

The scope and preconditions of this study are based on the terms of reference and the scope of work on which the governments of Turkey and Japan agreed on November 27, 1989, as well as on the preconditions which were confirmed and agreed on by SEKA and the JICA study team during the on-site investigation conducted in March 1990.

II. MARKET RESEARCH

1. Newsprint Market in Turkey

1.1 Supply and Demand Situation

In Turkey, newsprint is manufactured mainly at SEKA's Aksu mill and Balikesir mill. Aksu mill's designed production capacity is 82,500 tons/year, while that of Balikesir mill is 100,000 tons/years. SEKA's Izmit mill is also manufacturing a very limited quantity of newsprint. The ratio of actual newsprint production to designed newsprint production capacity is relatively low--approximately 80 percent.

On the other hand, demand for newsprint exceeded its domestic production throughout the 1980s. The shortfall in production has been covered by imports from Sweden, the Soviet Union, Rumania and other countries.

Table II-1 Newsprint Production in Turkey

	Aksu mill	Other mills	Total
1980	63,063	22,937	86,000
1985	51,171	97,548	148,719
1986	54,301	97,228	151,529
1987	65,484	93,869	159,353
1988	49,742	65,258	115,000

1.2 Demand Analysis and Projections

Demand for newsprint in Turkey was analyzed using two variables--population correlation and per capita GNP. As a result, it was confirmed that demand for newsprint

correlates closely with both population and per capita GNP. Demand projections were conducted for the following cases.

Case A: demand projection by the use of population correlation model

Case B: demand projection by the use of a GNP correlation model

Case B-1 (case of high growth): growth rate as set in the sixth five-year plan

Case B-2 (case of low growth):

1989 - 1995: 5.7% p.a.

1996 - 2000: 5.6% p.a.

The results of this analysis is as shown in Table II-2. In the combined case, the projected values were slightly lower than those by SPO and SEKA.

1.3 Projected Supply and Demand Situation

When it is assumed that Aksu mill has a production capacity of 74,000 tons/year and Balikesir mill has a production capacity of 100,000 tons/year in the two alternatives of the renovation project, the projected supply and demand situation is as shown in the following table.

In both cases, it is expected that dependence on imports will continue.

	W/O Case	Cases with renovation	
		Case 1	Case 2
Production capacity	174,000T/Y	200,000T/Y	230,000T/Y
1990	-36,700	-36,700	-36,700
1995	-75,000	-49,700	-19,700
2000	-118,000	-92,700	-62,700

TABLE II-2

COMBINED DEMAND FORECAST OF NEWSPRINT IN TURKEY

(T)

Year	JICA			SEKA	SPO	
	CASE A	CASE B				COMBINED
		LOW	HIGH			
1989	205,151	203,985	203,985	204,374	207,000	197,000
1990	213,747	209,846	210,564	211,386	216,000	212,000
1991	225,557	215,871	216,608	219,345	224,000	220,000
1992	231,589	222,821	223,577	225,996	234,000	230,000
1993	240,841	229,207	230,756	233,601	242,000	240,000
1994	250,333	235,776	238,158	241,422	252,000	250,000
1995	260,065	243,345	245,787	249,732	263,000	260,000
1996	269,465	250,312	253,650	257,809		
1997	279,117	257,476	260,898	265,830		
1998	291,237	265,718	269,227	275,394		
1999	299,547	273,314	277,809	283,557		
2000	310,216	281,119	286,649	292,661		
Average Annual						
Growth Rate (%)						
1989-1995	4.0	3.0	3.2	3.4	4.1	4.7
1995-2000	3.6	2.9	3.1	3.2	-	-

1.4 Trends in, Analysis of, and Projections for, Newsprint Prices

The results of the analysis of the prices of home-made newsprint prices relative to fluctuations in the exchange rate for the Turkish Lira against the US dollar proved a close correlation between the two. This correlation is expected to continue in view of the fact that the present prices of home-produced newsprint are set on the basis of the prices of imported newsprint.

Table II-3 gives a summary of the results of the projections for the domestic prices of newsprint, which were conducted on the basis of the export prices (FOB prices) of newsprint in Canada, the world's largest newsprint exporting country. In the projections, a multiple regression formula was worked on the basis of a multi-variate analysis using the US GNP deflator and the world supply-demand balance factors and a time series analysis of the annual supply-demand balance factors.

Table II-3 Projected Prices of Imported Newsprint

	FOB (US\$/T)	CIF (US\$/T)
Actual		
1985	370	410
1986	446	450
1987	516	544
1988 1/4	566	600
1988 2/4	630	650
1989 1/4	606	630
Projected		
1990	501	541
1991	525	565
1993	578	618
1995	615	665
2000	727	767

On the other hand, the prices of imported newsprint are 1.26 times CIF prices when tariff, municipal rates, stamp duty, funds and port dues are added. On the other hand, the prices of home-produced newsprint are set 10 to 20 percent lower than those of imported newsprint.

A formula of the correlation between the prices of imported newsprint and those of SEKA's newsprint was worked out on the basis of the above-mentioned facts.

1.5 Quality

As described in Chapter III of this report, the results of the product quality test indicate that home-made newsprint is inferior in quality to imported newsprint. The main findings of the test are as itemized below.

- a. Low in density.
- b. Low in surface strength.
- c. Low in porosity.
- d. Low in brightness.

On the other hand, the results of evaluation of the quality of home-produced newsprint by newspaper companies, which are the major users of newsprint can be summarized as follows.

- a. Home-made newsprint is inferior in quality to newsprint imported from Western Europe and Canada, but is superior to that imported from Eastern European countries.
- b. Sheet break occurs frequently. It occurs so often in joint.
- c. Pickling occurs so often.

- d. Colors do not come out well on home-produced newsprint. It is also low in whiteness.
- e. Out of register occurs so often.
- f. Flaw of reel occurs so often. Packaging is not good.
- g. Product quality varies widely from one lot to another.

1.6 Distribution

(1) Transportation of SEKA's Products

The major newspaper companies take delivery of newsprint at the warehouses of SEKA's mills, and then have it transported directly to their respective print shops. The transportation cost and the value added tax (KDV: 10 percent) account for approximately 12 percent of the shipped prices. Products for small users are delivered either at the warehouses of SEKA's mills or at SEKA's warehouses located in the major cities. Aksu mill's product warehouse has a capacity of 24,000 tons, which is equivalent to 3.9 months' stock of its designed annual output.

Plano-graphic stock and roll newsprint are both packaged in kraft paper. Roll newsprint is carried in three-bed trucks.

(2) Imported Newsprint

The major newspaper companies import newsprint via import agents and have the imported newsprint stored in their own warehouses. Shown below is a breakdown of the price of imported newsprint as of January 1990.

- CIF Istanbul	\$500/T
- Import Duty	\$5/T
- Municipal tax, stamp duty funds, etc.	\$125/T
- Value added tax (DKV)	\$63/T
- Transportation, storage costs	\$10/T
Total	\$703/T

2. Waste Paper Market in Turkey

2.1 Collection of Waste Paper

Table II-4 shows trends in waste paper collection in Turkey. From 1983 to 1988, the rate of waste paper collection increased by 3.3 percent a year on average. In 1988, the rate rose to 38.5 percent, with the collected quantity of waste water increasing to 336,500 tons.

Table II-4 Trends in Waste Paper Collection in Turkey

(in tons)

Year	(A) Collected quantity	(B) Consumption	(A)/(B)(%)
1983	187,670	570,100	32.9
1984	217,834	746,200	29.2
1985	240,743	733,800	32.8
1986	237,841	767,200	31.0
1987	288,587	940,300	30.7
1988	336,500	873,400	38.5
Average annual growth rate (%)	12.4	8.9	3.2

Source: SEKA

2.2 Trends in Imports of Waste Paper

As shown in Table II-5, imports of newsprint have been increasing from year to year in Turkey. The ratio of imports of waste paper to total consumption of waste paper increased from 1.1 percent in 1983 to 14.0 percent in 1988. Imports of waste paper amounted to 55,080 tons in 1988.

Table II-5 Trends in Imports of Waste Paper

Year	(in Tons)		
	(A) Imports	(B) Consumption	(A)/(B)(%)
1983	2,000	189,600	1.1
1984	12,166	230,000	5.3
1985	22,469	263,222	8.5
1986	3,469	241,452	1.5
1987	41,012	329,599	12.4
1988	55,080	392,574	14.0
Average annual growth rate	94.1	15.7	67.8

Source: SEKA

Newsprint is imported from Western Europe, Eastern Europe, the Middle East, Latin America and the United States.

Shown below is a breakdown of the price of imported waste paper in 1988.

CIF Istanbul	US\$109.80/T
Housing fund	US\$10.00/T
Bank charge (L/C)	US\$3.50/T
Subtotal	US\$123.30/T

2.3 Collection of Home-Made Waste Paper

In 1988, the private sector accounted for 81.5 percent, and the public sector (SEKA) 18.5 percent, of the total collected quantity of waste paper. It appears that the private sector's initiative in waste collection will continue. SEKA has the collected waste paper transported to its Dalaman mill and Izmit mill for use in papermaking.

3. Newspaper/Magazine Market in Turkey

3.1 Newspaper Market

There are ten major newspaper companies in Turkey, of which four--GUNAYDIN, HURRIYET, SABAH AND MILLIYET--publish dailies with circulations of more than 300,000.

The combined total annual circulation of the major newspapers is 1.2 to 1.3 billion. Although it decreased from 1987 to 1989, the number of pages per copy has been on the increase. As a result, newsprint consumption has been increasing. Circulations of the major newspapers are as shown in Table II-6.

Each major newspaper company has its own print shops in the major cities, where local editions are printed.

3.2 Magazine Market

In Turkey, a wide variety of magazines, including 29 weekly magazines, 4 fortnightly magazines and 56 monthly magazines, are published. The total annual magazine circulation for 1989 is estimated at 1.2 million.

3.3 Distribution of Newspapers and Magazines

In Turkey, GAMEDA, which was established with funds from HURRIYET and the other three major newspaper companies, is solely responsible for the distribution of newspapers and magazines, with newspapers accounting for 75 percent, and magazines 25 percent, of the total number of copies distributed. GAMEDA is contracting out distribution work to forwarding agencies. Magazines are transported together with newspapers.

TABLE II-6 NEWSPAPER CIRCULATION BY COMPANY IN TURKEY

COMPANY (NEWSPAPER NAME)	ITEM	1987			1988		1989	
		1st Half	2nd Half	Total	1st Half	1st Half	2nd Half	Total
HURRIYET	Net Sales	126,849	125,180	252,029	122,122	92,734	84,679	177,413
(HURRIYET)	Circulation	155,410	147,863	303,273	147,548	116,753	102,753	219,506
SABAH	Net Sales	103,599	93,522	197,121	91,632	83,717	80,103	163,820
(SABAH)	Circulation	114,995	103,810	218,805	98,083	102,432	95,749	198,181
MILLIYET	Net Sales	48,539	45,875	94,414	43,361	65,110	53,216	118,326
(MILLIYET)	Circulation	66,854	58,675	125,529	56,454	81,035	66,362	147,397
GUNES	Net Sales	34,067	30,646	64,713	32,265	20,102	15,262	35,364
(GUNES)	Circulation	49,813	43,016	92,829	44,744	33,259	29,612	62,871
GUNAYDIN	Net Sales	68,073	74,195	142,268	72,314	85,577	106,256	191,833
(GUNAYDIN)	Circulation	86,233	88,372	174,605	89,618	107,785	132,389	240,174
GUNAYDIN	Net Sales	47,603	40,460	88,063	29,164	40,561	51,077	91,638
(TAN)	Circulation	63,480	54,805	118,285	39,507	54,232	68,018	122,250
GUNAYDIN TOTAL	Net Sales	115,676	114,655	230,331	101,478	126,138	157,333	283,471
	Circulation	149,713	143,177	292,890	129,125	162,017	200,407	362,424
TURKIYE	Net Sales	30,569	31,718	62,287	41,779	26,703	34,690	61,393
(TURKIYE)	Circulation	37,464	36,617	74,081	50,763	33,236	43,150	76,386
TERCUMEN	Net Sales	30,340	29,754	60,094	25,459	19,026	16,612	35,638
(TERCUMEN)	Circulation	58,121	55,039	113,160	50,410	28,595	27,256	55,851
HULVAR	Net Sales	29,565	14,172	43,737	10,701	35,236	11,898	47,134
(HULVAR)	Circulation	31,523	25,017	56,540	19,881	35,236	11,898	47,134
CUMURIYET	Net Sales	21,835	22,701	44,536	22,014	21,110	20,393	41,503
(CUMURIYET)	Circulation	29,451	29,787	59,238	29,494	28,780	27,340	56,120
YENI ASIR	Net Sales	14,811	12,991	27,802	11,563	8,366	8,285	16,651
(YENI ASIR)	Circulation	17,794	15,313	33,107	14,045	10,667	10,259	20,926
TOTAL OF BIG NEWSPAPER COMPANY	Net Sales	555,850	521,214	1,077,064	502,374	498,242	482,471	980,713
	Circulation	711,138	658,314	1,369,452	640,547	632,010	614,786	1,246,796

Source : SEKA

4. World Newsprint Market

4.1 Supply and Demand Situation

4.1.1 Trends in Production Capacity

As shown in Table II-7, the world total newsprint production capacity increased from 30.8 million tons in 1983 to 34.1 million tons in 1988. The world average growth rate for newsprint production capacity for the same period was 2.1 percent. Asia, Africa and Latin America registered relatively high growth rates.

4.1.2 Trends in Newspaper Production

The world total newspaper production increased from 24.7 million tons/year in 1979 to 31.6 million tons in 1988. The major newsprint producing countries are Canada, the United States, Japan, Sweden, Finland, West Germany and Norway. Canada is the world's largest newsprint producing country, with an annual newsprint production of 9.97 million tons, which accounts for 31.5 percent of the world total annual newsprint production, followed by the United States with 5.43 million tons (17.2 percent) and Japan with 3.07 million tons (9.7 percent). Table II-8 shows a breakdown by country or region of the world total annual newsprint production for 1979-88.

4.1.3 Trends in Newsprint Exports

The world total newsprint exports increased from 12.1 million tons in 1979 to 14.6 million tons in 1988 (see Table II-9). The major newsprint exporting countries are Canada, Sweden, Finland, Norway and the United States. The five countries' combined total newsprint exports for 1988 were 12.6 million tons, which represented 86.6 percent of the world total newsprint exports for the year.

TABLE II-7 GLOBAL NEWSPRINT CAPACITY, PRODUCTION AND DEMAND

ITEM	REGION	(1,000T/Y)			
		1983	1988	Total Increase	Annual Average Increase (%)
CAPACITY WORLD TOTAL (A)		30,773	34,129	3,356	2.1
DEV. ED MKT. ECONOMIES		26,562	28,342	1,780	1.3
Northern America		15,185	15,633	448	0.6
Japan		2,837	3,208	371	2.5
Western Europe		7,154	8,284	1,130	3.0
Oceania		685	775	90	2.5
Others		701	442	-259	-8.8
DEV. ING MKT. ECONOMIES		1,753	2,678	925	8.8
Africa		15	140	125	56.3
Latin America		820	1,220	400	8.3
Asia		918	1,318	400	7.5
CENT. PLANNED ECONOMIES		2,768	3,109	341	2.4
Asia		400	731	331	12.8
Eastern Europe		468	478	10	0.4
USSR		1,900	1,900	0	0.0
PRODUCTION WORLD TOTAL (B)		25,812	31,637	5,825	4.2
Operation Rate (B)/(A) (%)		83.9	92.7	8.8	2.0
DEMAND WORLD TOTAL (C)		25,581	31,814	6,233	4.5
Demand/Capacity Ratio (C)/(A) (%)		83.1	93.2	10.1	2.3

Source : CAPACITY ; Pulp & paper International, World Review Number

PRODUCTION And DEMAND ; JICA Team

TABLE II-8 HISTORICAL GLOBAL NEWSPRINT PRODUCTION BY COUNTRY

(1,000T)

Region	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%)	
Country											79-84	84-88
Canada	8,756	8,625	8,946	8,117	8,485	9,013	8,988	9,288	9,669	9,969	0.58	2.55
USA	3,685	4,238	4,752	4,574	4,688	5,035	4,927	5,108	5,300	5,427	6.44	1.89
NORTH AMERICA TOTAL	12,441	12,863	13,698	12,691	13,173	14,048	13,915	14,396	14,969	15,396	2.46	2.32
Finland	1,513	1,569	1,703	1,501	1,613	1,878	1,811	1,646	1,628	1,400	4.42	-7.08
Norway	568	539	691	668	711	840	877	855	845	882	8.14	1.23
Sweden	1,484	1,534	1,605	1,323	1,349	1,507	1,594	1,789	1,975	2,064	0.31	8.18
Scandinavia sub total	3,565	3,692	3,999	3,492	3,673	4,225	4,282	4,290	4,448	4,346	3.46	0.71
Belgium	99	102	108	99	112	102	109	100	111	114	0.60	2.82
Denmark	0	0	0	0	0	0	0	0	0	0	-	-
France	280	267	267	248	219	265	264	304	299	373	-1.10	8.92
Germany Fed. Rep.	611	606	680	660	634	721	722	761	826	897	3.37	5.61
Greece	0	0	0	0	0	0	0	0	0	0	-	-
Italy	272	277	234	198	194	207	178	212	234	264	-5.32	6.27
Netherlands	116	176	180	150	176	182	191	182	212	304	9.43	13.68
Portugal	0	0	0	0	0	0	0	0	0	0	-	-
Spain	114	108	108	93	115	124	134	138	135	175	1.70	8.99
United Kingdom	364	361	114	84	80	236	352	476	496	529	-8.30	22.36
EEC sub total	1,856	1,897	1,691	1,532	1,530	1,837	1,950	2,173	2,313	2,656	-0.21	9.66
Austria	171	176	178	182	176	199	241	234	245	252	3.08	6.08
Switzerland	196	210	218	210	213	231	232	240	248	266	3.34	3.59
Other sub total	367	386	396	392	389	430	473	474	493	518	3.22	4.76
WESTERN EUROPE TOTAL	5,788	5,975	6,086	5,416	5,592	6,492	6,705	6,937	7,254	7,520	2.32	3.74
Bulgaria	0	0	0	0	0	0	0	0	0	0	-	-
Czechoslovakia	74	71	76	77	68	67	76	68	68	74	-1.97	2.52
German Dem. Rep.	114	114	118	113	108	110	112	110	124	131	-0.71	4.46
Hungary	0	0	0	0	0	0	0	0	0	0	-	-
Poland	91	91	82	76	83	84	82	59	69	66	-1.59	-5.85
Romania	100	100	100	100	100	90	90	40	40	40	-2.09	-18.35
U S S R	1,450	1,536	1,532	1,539	1,442	1,445	1,470	1,794	1,671	1,700	-0.07	4.15
Yugoslavia	84	75	70	75	72	70	56	64	55	64	-3.58	-2.22
EASTERN EUROPE	1,913	1,987	1,978	1,980	1,873	1,866	1,886	2,135	2,027	2,075	-0.50	2.69
Turkey	89	86	128	144	147	152	149	152	159	115	11.30	-6.74
Israel	5	4	4	3	2	2	1	1	2	2	-16.74	0.00
Other	0	0	0	0	0	0	0	0	0	0	-	-
MIDDLE EAST TOTAL	94	90	132	147	149	154	150	153	161	117	10.38	-6.64
Japan	2,566	2,674	2,575	2,580	2,562	2,553	2,592	2,641	2,668	3,067	-0.10	4.69
South Korea	194	249	270	244	232	220	228	273	302	368	2.55	13.73
China	320	340	350	376	396	413	425	414	365	334	5.23	-5.17
Taiwan	36	53	52	49	45	24	27	42	74	106	-7.79	44.97
South East Asia	81	84	84	68	70	70	122	155	205	241	-2.88	36.22
India	39	48	58	90	159	160	190	250	276	290	32.62	16.03
Bangladesh	37	42	31	20	49	48	47	46	40	40	5.34	-4.46
Other	0	0	0	0	0	0	0	0	0	0	-	-
ASIA TOTAL	3,273	3,490	3,420	3,427	3,513	3,488	3,631	3,821	3,930	4,446	1.28	6.25
Australia	212	228	243	364	368	373	381	381	393	407	11.96	2.20
New Zealand	309	333	322	299	216	242	298	212	207	255	-4.77	1.32
OCEANIA TOTAL	521	561	565	563	584	615	679	593	600	662	3.37	1.86
Argentina	96	98	110	89	166	203	203	226	226	228	16.16	2.95
Brazil	125	109	105	107	106	108	207	218	232	247	-2.88	22.98
Chile	134	131	131	124	155	170	172	169	179	184	4.87	2.00
Mexico	95	143	157	167	197	264	327	366	351	361	22.68	8.14
Other	33	37	39	61	65	77	102	105	119	120	18.47	11.73
SOUTH AND CENTRAL AMERICA	483	518	542	548	689	822	1,011	1,084	1,107	1,140	11.22	8.52
Egypt	0	0	0	0	0	0	0	0	0	0	-	-
South Africa	224	223	302	362	233	293	326	335	310	250	5.52	-3.89
Other	0	0	0	1	6	10	10	29	31	31	-	32.69
AFRICA TOTAL	224	223	302	363	239	303	336	364	341	281	6.23	-1.87
WORLD TOTAL	24,737	25,707	26,723	25,235	25,812	27,788	28,313	29,483	30,389	31,637	2.35	3.30

Source : Pulp & Paper International, World Review Number

TABLE II-9 HISTORICAL GLOBAL NEWSPRINT EXPORTS BY REGION/BY COUNTRY

(1,000T)

Region	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%)	
Country											79-84	84-88
Canada	7,808	7,642	7,871	7,139	7,470	7,949	7,984	8,180	8,574	8,554	0.36	1.85
USA	65	159	245	279	268	278	285	356	308	386	33.73	8.55
NORTH AMERICA TOTAL	7,873	7,801	8,116	7,418	7,738	8,227	8,249	8,536	8,882	8,940	0.88	2.10
Finland	1,393	1,432	1,542	1,339	1,467	1,676	1,643	1,470	1,437	1,205	3.77	-7.92
Norway	462	523	573	567	584	673	761	706	726	715	7.81	1.52
Sweden	1,200	1,230	1,279	1,030	1,062	1,156	1,260	1,423	1,601	1,756	-0.74	11.02
Scandinavia sub total	3,055	3,185	3,394	2,936	3,113	3,505	3,664	3,599	3,764	3,676	2.79	1.20
Belgium	29	34	35	25	34	29	27	31	40	32	0.00	2.49
Denmark	0	0	0	0	0	1	1	1	2	0	-	-
France	10	12	11	9	8	3	16	22	37	101	-21.40	140.88
Germany Fed. Rep.	88	81	90	108	143	168	175	227	210	205	13.81	5.10
Greece	0	0	0	0	0	0	0	0	0	0	-	-
Italy	33	3	12	4	1	29	28	11	8	5	-2.55	-35.56
Netherlands	21	51	58	48	63	70	91	98	138	184	27.23	27.33
Portugal	0	0	0	0	0	0	0	0	0	0	-	-
Spain	0	1	1	0	0	1	6	0	5	5	-	49.53
United Kingdom	38	58	30	7	9	28	63	72	75	70	-5.92	25.74
EEC sub total	219	240	237	201	258	329	407	462	515	602	8.48	16.31
Austria	74	58	77	77	89	92	137	125	140	153	4.45	13.58
Switzerland	31	28	36	36	44	55	54	45	49	50	12.15	-2.35
Other sub total	105	86	113	113	133	147	191	170	189	203	6.86	8.40
WESTERN EUROPE TOTAL	3,379	3,511	3,744	3,250	3,504	3,981	4,262	4,231	4,468	4,481	3.33	3.00
Bulgaria	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-	-
Czechoslovakia	9	7	12	12	12	9	10	3	0	1	0.00	-42.26
German. Dem. Rep.	19	18	26	32	22	24	23	39	39	33	4.78	8.29
Hungary	0	0	0	0	0	0	0	0	0	0	-	-
Poland	0	0	0	0	0	0	0	0	0	0	-	-
Romania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-	-
U S S R	310	319	340	330	351	350	350	357	363	365	2.48	1.05
Yugoslavia	21	20	22	18	28	22	9	10	2	0	0.93	-100.00
EASTERN EUROPE	359	364	400	392	413	405	392	409	404	399	2.44	-0.37
Turkey	0	0	0	0	0	0	0	5	0	0	-	-
Israel	0	0	0	0	0	0	0	0	0	0	-	-
Other	0	0	0	0	0	0	0	0	0	0	-	-
MIDDLE EAST TOTAL	0	0	0	0	0	0	0	5	0	0	-	-
Japan	100	97	138	121	85	68	81	50	50	59	-7.42	-3.49
South Korea	2	22	25	15	1	66	7	34	40	15	101.23	-30.95
China	n.a.	n.a.	13	3	7	7	10	8	20	7	-	-
Taiwan	0	0	0	0	0	0	0	0	3	5	-	-
South East Asia	0	0	0	0	0	0	0	8	22	21	-	-
India	0	0	0	0	0	0	0	0	0	0	-	-
Bangladesh	0	0	0	0	0	0	0	0	0	0	-	-
Other	0	0	0	0	0	0	0	0	0	0	-	-
ASIA TOTAL	102	119	174	139	93	141	98	100	135	107	6.69	-6.67
Australia	1	1	1	1	1	0	3	4	55	55	-100.00	-
New Zealand	208	241	234	160	143	189	157	143	140	173	-1.90	-2.19
OCEANIA TOTAL	209	242	235	161	144	189	160	147	195	228	-1.99	4.80
Argentina	0	0	0	1	2	17	10	6	5	21	-	-
Brazil	0	0	0	0	0	0	0	15	15	10	-	-
Chile	70	63	39	53	94	110	116	132	126	130	9.46	4.26
Mexico	0	0	78	0	0	0	0	1	80	37	-	-
Other	0	7	0	3	0	0	0	0	0	0	-	-
SOUTH AND CENTRAL AMERICA	70	70	117	57	96	127	126	154	226	198	12.65	11.74
Egypt	0	0	0	0	0	0	0	0	0	0	-	-
South Africa	86	70	107	140	118	147	205	205	195	210	11.32	9.33
Other	0	0	0	0	0	0	0	0	0	0	-	-
AFRICA TOTAL	86	70	107	140	118	147	205	205	195	210	11.32	9.33
WORLD TOTAL	12,078	12,177	12,893	11,557	12,106	13,217	13,492	13,787	14,505	14,563	1.82	2.45

Source : Pulp & Paper International, World Review Number

4.1.4 Trends in Newsprint Imports

The world total newsprint imports increased from 11.8 million tons in 1979 to 14.7 million tons in 1988 (Table II-10). A breakdown by country of the world total newsprint imports for 1988 indicates that the United States was the world's largest importer of newsprint, importing 7.99 million tons of newsprint, which accounted for 58.4 percent of the world total newsprint imports for the year, followed by the United Kingdom (1.46 million tons), West Germany (0.9 million tons), France (0.48 million tons) and the Netherlands (0.36 million tons).

4.1.5 Trends in Demand for Newsprint

The world total demand for newsprint increased from 24.5 million tons in 1979 to 27.5 million tons in 1984, and to 31.8 million tons in 1988. The average annual increase rate for the world total demand for newsprint increased from 2.3 percent for 1979-84 to 3.7 percent for 1984-88. In 1988, in particular, the annual growth rate for the world total demand for newsprint increased to 5.9 percent. As a result, the supply-demand situation became very tight in that year, making newsprint prices rise sharply.

By country, the United States was the world's largest consumer of newsprint, consuming 13 million tons, or 40.9 percent of the world total demand for newsprint, followed by Japan with 3.4 million tons (10.6 percent) and the United Kingdom with 1.9 million tons (6.0 percent). Table II-11 shows a breakdown by country or region of the world total demand for newsprint.

4.1.6 Supply-Demand Balance

As shown in Table II-12, the world supply-demand balance for newsprint registered the largest gap between supply and demand, with an oversupply of 500,000 tons, in 1981.

TABLE II-10 HISTORICAL GLOBAL NEWSPRINT IMPORTS BY COUNTRY

(1,000T)

Region	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%)	
Country											79-84	84-88
Canada	-	-	8	4	4	5	3	4	6	5	-	0.00
USA	6,554	6,604	6,330	5,925	6,277	7,161	7,708	7,791	8,153	7,985	1.79	2.76
NORTH AMERICA TOTAL	6,554	6,604	6,338	5,929	6,281	7,166	7,711	7,795	8,159	7,990	1.80	2.76
Finland	0	0	0	0	0	0	0	0	0	0	-	-
Norway	0	0	0	0	0	0	0	0	0	0	-	-
Sweden	0	0	0	0	0	0	0	0	0	2	-	-
Scandinavia sub total	0	0	0	0	0	0	0	0	0	2	-	-
Belgium	137	134	121	120	125	142	140	140	169	181	0.72	6.25
Denmark	150	153	164	158	166	174	189	205	232	223	3.01	6.40
France	348	392	373	342	386	334	327	355	383	482	-0.82	9.60
Germany Fed. Rep.	611	606	680	660	634	721	722	761	826	897	3.37	5.61
Greece	0	0	0	0	0	0	0	0	0	0	-	-
Italy	43	64	99	122	178	177	268	268	303	265	32.71	10.62
Netherlands	350	335	290	289	290	305	279	336	358	363	-2.71	4.45
Portugal	31	37	40	44	38	33	39	43	54	67	1.26	19.37
Spain	77	81	101	140	117	132	135	146	143	161	11.38	5.09
United Kingdom	1,069	1,076	1,190	1,249	1,208	1,257	1,242	1,136	1,285	1,459	3.29	3.80
EEC Sub total	2,816	2,878	3,058	3,124	3,140	3,275	3,341	3,390	3,753	4,098	3.07	5.76
Austria	5	1	8	9	13	21	6	3	2	20	33.24	-1.21
Switzerland	196	210	218	210	213	231	232	240	248	266	3.34	3.59
Other sub total	201	211	226	219	226	252	238	243	250	286	4.63	3.21
WESTERN EUROPE TOTAL	3,017	3,089	3,284	3,343	3,366	3,527	3,579	3,633	4,003	4,386	3.17	5.60
Bulgaria	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-	-
Czechoslovakia	8	8	9	9	13	11	11	11	11	11	6.58	0.00
German Dem. Rep.	44	45	44	55	62	47	52	54	50	45	1.33	-1.08
Hungary	60	62	65	68	69	68	66	68	69	73	2.53	1.79
Poland	45	36	45	41	44	46	54	50	35	59	0.44	6.42
Romania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-	-
U S S R	50	30	160	140	14	7	7	6	11	10	-32.51	9.33
Yugoslavia	6	5	10	7	13	12	13	12	7	7	14.87	-12.61
EASTERN EUROPE	213	186	333	320	215	191	203	201	183	205	-2.16	1.78
Turkey	46	71	21	32	5	23	15	22	15	48	-12.94	20.19
Israel	35	35	40	43	45	47	46	60	63	68	-	-
Other	7	7	8	8	9	9	10	10	15	15	5.15	13.62
MIDDLE EAST TOTAL	88	113	69	83	59	79	71	92	93	131	-2.13	13.48
Japan	89	127	165	244	232	220	228	273	302	368	19.84	13.73
South Korea	0	0	0	0	0	0	0	0	0	0	-	-
China	150	160	164	167	140	141	162	107	142	102	-1.23	-7.78
Taiwan	53	41	39	46	72	87	86	83	77	107	10.42	5.31
South East Asia	281	298	331	311	320	311	340	284	298	304	2.05	-0.57
India	185	360	325	270	160	180	180	194	189	190	-0.55	1.36
Bangladesh	0	0	0	0	0	0	0	0	0	0	-	-
Other	26	28	32	35	36	40	40	37	52	45	9.00	2.99
ASIA TOTAL	784	1,014	1,056	1,073	960	979	1,036	978	1,060	1,116	4.54	3.33
Australia	319	315	281	175	163	200	303	257	242	240	-8.91	4.66
New Zealand	4	4	4	8	13	7	21	47	26	10	11.84	9.33
OCEANIA TOTAL	323	319	285	183	176	207	324	304	268	250	-8.51	4.83
Argentina	96	98	110	89	166	203	203	226	226	228	16.16	2.95
Brazil	260	164	175	181	190	137	70	213	184	111	-12.03	-5.13
Chile	0	0	0	0	0	0	0	0	0	0	-	-
Mexico	132	192	350	148	67	26	37	26	14	36	-27.74	8.48
Other	249	257	267	270	282	267	162	161	189	193	1.41	-7.79
SOUTH AND CENTRAL AMERICA	737	711	902	688	705	633	472	626	613	568	-3.00	-2.67
Egypt	62	65	67	53	55	56	56	57	58	60	-2.02	1.74
South Africa	0	0	0	0	0	0	0	0	0	0	-	-
Other	54	54	55	56	58	52	54	33	33	34	-0.75	-10.08
AFRICA TOTAL	116	119	122	109	113	108	110	90	91	94	-1.42	-3.41
WORLD TOTAL	11,832	12,155	12,389	11,728	11,875	12,890	13,506	13,719	14,470	14,740	1.73	3.41

Source ; Pulp & Paper International, World Review Number

TABLE II-11. HISTORICAL GLOBAL NEWSPRINT DEMAND BY REGION/BY COUNTRY

Region	Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%)	
												79-84	84-88
	Canada	948	983	1,083	982	1,019	1,069	1,027	1,112	1,101	1,420	2.4	7.4
	USA	10,174	10,683	10,837	10,220	10,697	11,918	12,350	12,543	13,145	13,026	3.2	2.2
NORTH AMERICA TOTAL		11,122	11,666	11,920	11,202	11,716	12,987	13,377	13,655	14,246	14,446	3.1	2.7
	Finland	120	137	161	162	146	202	168	176	191	195	11.0	-0.9
	Norway	106	66	118	101	127	167	116	149	119	167	9.5	0.0
	Sweden	284	304	328	293	287	351	334	366	374	310	4.3	-3.1
Scandinavia sub total		510	507	605	556	560	720	618	691	684	672	7.1	-1.7
	Belgium	207	202	194	194	203	215	222	209	240	263	0.8	5.2
	Denmark	150	153	164	158	166	173	188	204	230	223	2.9	6.6
	France	618	647	629	581	597	596	575	637	645	754	-0.7	6.1
	Germany Fed. Rep.	1,134	1,131	1,270	1,212	1,125	1,274	1,269	1,295	1,442	1,589	2.4	5.7
	Greece	0	0	0	0	0	0	0	0	0	-1	-	-
	Italy	282	338	321	316	371	355	418	469	529	524	4.7	10.2
	Netherlands	445	460	412	391	403	417	379	420	432	483	-1.3	3.7
	Portugal	31	37	40	44	36	33	39	43	54	67	1.3	19.4
	Spain	191	188	208	233	232	255	263	284	273	331	6.0	6.7
	United Kingdom	1,395	1,379	1,274	1,326	1,279	1,465	1,531	1,540	1,706	1,918	1.0	7.0
EEC sub total		4,453	4,535	4,512	4,455	4,412	4,783	4,884	5,101	5,551	6,152	1.4	6.5
	Austria	102	119	109	114	100	128	110	112	107	119	4.6	-1.8
	Switzerland	361	392	400	384	382	407	410	435	447	482	2.4	4.3
Other sub total		463	511	509	498	482	535	520	547	554	601	2.9	3.0
WESTERN EUROPE TOTAL		5,426	5,553	5,626	5,509	5,454	6,038	6,022	6,339	6,789	7,425	2.2	5.3
	Bulgaria	0	0	0	0	0	0	0	0	0	0	17-	17-
	Czechoslovakia	73	72	73	74	69	69	77	76	79	84	-1.1	5.0
	German. Dem. Rep.	139	141	136	136	148	133	141	125	135	143	-0.9	1.8
	Hungary	60	62	65	68	69	68	66	68	69	73	2.5	1.8
	Poland	136	127	127	117	127	130	136	109	104	125	-0.9	-1.0
	Romania	100	100	100	100	100	90	90	40	40	40	-2.1	-18.4
	U S S R	1,190	1,247	1,352	1,349	1,105	1,102	1,127	1,443	1,319	1,345	-1.5	5.1
	Yugoslavia	69	60	58	64	57	60	60	66	60	71	-2.8	4.3
EASTERN EUROPE		1,767	1,809	1,911	1,908	1,675	1,652	1,697	1,927	1,806	1,881	-1.3	3.3
	Turkey	135	157	149	176	152	175	164	169	174	163	5.3	-1.8
	Israel	40	39	44	46	47	49	47	61	65	70	4.1	9.3
	Other	7	7	8	8	9	9	10	10	15	15	5.2	13.6
MIDDLE EAST TOTAL		182	203	201	230	208	233	221	240	254	248	5.1	1.6
	Japan	2,555	2,704	2,604	2,703	2,709	2,705	2,739	2,864	2,920	3,376	1.1	5.7
	South Korea	192	227	245	229	231	154	221	239	262	353	-4.3	23.0
	China	470	500	501	540	529	547	577	513	487	429	3.1	-5.9
	Taiwan	89	94	91	95	117	111	113	125	148	208	4.5	17.0
South East Asia		362	382	415	379	390	381	462	431	481	524	1.0	8.3
	India	224	408	383	360	319	340	370	444	465	480	8.7	9.0
	Bangladesh	37	42	31	20	49	48	47	46	40	40	5.3	-4.5
	Other	26	28	32	35	36	40	40	37	52	45	9.0	3.0
ASIA TOTAL		3,955	4,385	4,302	4,361	4,380	4,326	4,569	4,699	4,855	5,455	1.8	6.0
	Australia	530	542	523	538	530	573	681	634	580	592	1.6	0.8
	New Zealand	105	96	92	147	86	60	162	116	93	92	-10.6	11.3
OCEANIA TOTAL		635	638	615	685	616	633	843	750	673	684	-0.1	2.0
	Argentina	192	196	220	177	330	389	396	446	447	435	15.2	2.8
	Brazil	385	273	280	288	296	245	277	416	401	348	-8.6	9.2
	Chile	64	68	92	71	61	60	56	37	53	54	-1.3	-2.6
	Mexico	227	335	429	315	264	290	364	391	285	360	5.0	5.6
	Other	282	287	306	328	347	344	264	266	308	313	4.1	-2.3
SOUTH AND CENTRAL AMERICA		1,150	1,159	1,327	1,179	1,298	1,328	1,357	1,556	1,494	1,510	2.9	3.3
	Egypt	62	65	67	53	55	56	56	57	58	60	-2.0	1.7
	South Africa	138	153	195	222	115	146	121	130	115	40	1.1	-27.7
	Other	54	54	55	57	64	62	64	62	64	65	2.8	1.2
AFRICA TOTAL		254	272	317	332	234	264	241	249	237	165	0.8	-11.1
WORLD TOTAL		24,491	25,685	26,219	25,406	25,581	27,461	28,327	29,415	30,354	31,814	2.3	3.7

Source ; Pulp & Paper International, World Review Number

TABLE II-12 HISTORICAL GLOBAL NEWSPRINT SUPPLY/DEMAND BALANCE BY REGION/BY COUNTRY

(1,000T)

Region	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Country										
Canada	7,808	7,642	7,863	7,135	7,466	7,944	7,961	8,176	8,568	8,549
USA	-6,489	-6,445	-6,085	-5,646	-6,009	-6,883	-7,423	-7,435	-7,845	-7,599
NORTH AMERICA TOTAL	1,319	1,197	1,778	1,489	1,457	1,061	538	741	723	950
Finland	1,393	1,432	1,542	1,339	1,467	1,676	1,643	1,470	1,437	1,205
Norway	462	523	573	567	584	673	761	706	726	715
Sweden	1,200	1,230	1,279	1,030	1,062	1,156	1,260	1,423	1,601	1,754
Scandinavia sub total	3,055	3,185	3,394	2,936	3,113	3,505	3,664	3,599	3,764	3,674
Belgium	-108	-100	-88	-95	-91	-113	-113	-109	-129	-149
Denmark	-150	-153	-164	-158	-168	-173	-188	-204	-230	-223
France	-338	-380	-362	-333	-378	-331	-311	-333	-346	-381
Germany Fed. Rep.	-523	-525	-590	-552	-491	-553	-547	-534	-616	-692
Greece	0	0	0	0	0	0	0	0	0	0
Italy	-10	-61	-87	-118	-177	-148	-240	-257	-295	-260
Netherlands	-329	-284	-232	-241	-227	-235	-188	-238	-220	-179
Portugal	-31	-37	-40	-44	-36	-33	-39	-43	-54	-67
Spain	-77	-80	-100	-140	-117	-131	-129	-146	-138	-156
United Kingdom	-1,031	-1,018	-1,160	-1,242	-1,199	-1,229	-1,179	-1,064	-1,210	-1,389
EEC sub total	-2,597	-2,638	-2,821	-2,923	-2,882	-2,946	-2,934	-2,928	-3,238	-3,496
Austria	69	57	69	68	76	71	131	122	138	133
Switzerland	-165	-182	-182	-174	-169	-176	-178	-195	-199	-216
Other sub total	-96	-125	-113	-106	-93	-105	-47	-73	-61	-83
WESTERN EUROPE TOTAL	362	422	460	-93	138	454	683	598	465	95
Bulgaria	0	0	0	0	0	0	0	0	0	0
Czechoslovakia	1	-1	3	3	-1	-2	-1	-8	-11	-10
German Dem. Rep.	-25	-27	-18	-23	-40	-23	-29	-15	-11	-12
Hungary	-60	-62	-65	-68	-69	-68	-66	-68	-69	-73
Poland	-45	-36	-45	-41	-44	-46	-54	-50	-35	-59
Romania	0	0	0	0	0	0	0	0	0	0
U S S R	280	289	180	190	337	343	343	351	352	355
Yugoslavia	15	15	12	11	15	10	-4	-2	-5	-7
EASTERN EUROPE	146	178	67	72	198	214	189	208	221	194
Turkey	-46	-71	-21	-32	-5	-38	-15	-17	-15	-48
Israel	-35	-35	-40	-43	-45	-47	-46	-60	-63	-68
Other	-7	-7	-8	-8	-9	-9	-10	-10	-15	-15
MIDDLE EAST TOTAL	-88	-113	-69	-83	-59	-94	-71	-87	-93	-131
Japan	11	-30	-29	-123	-147	-152	-147	-223	-252	-309
South Korea	2	22	25	15	1	66	7	34	40	15
China	-150	-160	-151	-164	-133	-134	-152	-99	-122	-95
Taiwan	-53	-41	-39	-46	-72	-87	-86	-83	-74	-102
South East Asia	-281	-298	-331	-311	-320	-311	-340	-276	-276	-283
India	-185	-360	-325	-270	-160	-180	-180	-194	-189	-190
Bangladesh	0	0	0	0	0	0	0	0	0	0
Other	-26	-28	-32	-35	-36	-40	-40	-37	-52	-45
ASIA TOTAL	-682	-895	-882	-934	-867	-838	-938	-878	-925	-1,009
Australia	-318	-314	-280	-174	-162	-200	-300	-253	-187	-185
New Zealand	204	237	230	152	130	182	136	96	114	163
OCEANIA TOTAL	-114	-77	-50	-22	-32	-18	-164	-157	-73	-22
Argentina	-96	-98	-110	-88	-164	-186	-193	-220	-221	-207
Brazil	-260	-164	-175	-181	-190	-137	-70	-198	-169	-101
Chile	70	63	39	53	94	110	116	132	126	130
Mexico	-132	-192	-272	-148	-67	-26	-37	-25	66	1
Other	-249	-250	-267	-267	-282	-267	-162	-161	-189	-193
SOUTH AND CENTRAL AMERICA	-667	-641	-785	-631	-609	-506	-346	-472	-387	-370
Egypt	-62	-65	-67	-53	-55	-56	-56	-57	-58	-60
South Africa	86	70	107	140	118	147	205	205	195	210
Other	-54	-54	-55	-56	-58	-52	-54	-33	-33	-34
AFRICA TOTAL	-30	-49	-15	31	5	39	95	115	104	116
WORLD TOTAL	246	22	504	-171	231	312	-14	68	35	-177

Source : Pulp & Paper International, World Review Number

4.2 Trends in Newsprint Prices

Prices of newsprint on the international market are controlled by the major newsprint producing countries, or the so-called NOSCAN countries. Newsprint prices on the international market vary with the global supply-demand situation for newsprint. Table II-13 shows the trends in export prices of newsprint in Canada during a period from 1980 to the first quarter of 1989. In recent years, there has been a growing global tendency to shift from a basis weight of 48.8 g/m² to that of 45 g/m². As a result, newsprint prices in area terms have been prevalent.

TABLE II-13 HISTORICAL EXPORT PRICES OF NEWSPRINT IN CANADA

Year	Quarter	Canada Export Price (FOB)	
		C\$/T	US\$/T
1980		631.44	528.5
1981		615.37	518.9
1982		606.44	493.3
1983		527.75	424.1
1984		489.17	370.2
1985		622.79	445.7
1986	1Q	603.07	431.6
	2Q	563.05	406.0
	3Q	674.25	485.6
	4Q	621.50	450.2
	Yealy	615.47	443.4
1987	1Q	656.03	502.7
	2Q	677.75	509.1
	3Q	657.92	502.6
	4Q	670.06	515.5
	Yealy	665.44	507.5
1988	1Q	698.56	566.1
	2Q	763.23	639.4
	3Q	753.80	619.3
	4Q	733.07	614.6
	Yealy	737.17	609.8
1989	1Q	723.36	606.2

Source : Statistics Canada

5. World Waste Paper Market

5.1 Trends in Waste Paper Collection

As shown in Table II-14, the world total collected quantity of waste paper was 73.7 million tons in 1988. While the world total collected quantity of waste paper increased at an average annual rate of 4.4 from 1977 to 1984, it increased at an average annual rate of 6.5 percent from 1984 to 1988. By country, the United States was the world's largest collector of waste paper, collecting 23.2 million tons (31.5 percent of the world total), followed by Japan with 12.0 million tons (16.2 percent) and West Germany with 5.0 million tons (6.8 percent).

5.2 Trends in Waste Paper Consumption

In 1988, the world total waste paper consumption was 74.0 million tons, which was nearly equal to the world total collected quantity of waste paper for the year. By country, the United States was the world's largest consumer of waste paper, consuming 17.7 million tons of waste paper in that year, followed by Japan (12.5 million tons) and West Germany (0.45 million tons). By region, such Far Eastern countries as Japan, China, South Korea and Taiwan registered relatively high rates of increase in waste paper consumption.

5.3 Trends in Waste Paper Exports

The world total waste paper exports for 1988 were 9.6 million tons, which accounted for 13 percent of the world total collected quantity of waste paper for the year. By country, the United States was the world's largest waste paper exporting country, exporting 5.1 million tons of waste paper, or 53.2 percent of the world total, in that year, followed by West Germany (1.2 million tons) and the Netherlands (0.6 million tons).

TABLE II-14 HISTORICAL GLOBAL WASTE PAPER COLLECTION BY COUNTRY

Region	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	(1,000T)	
											Average Annual	
											Growth Rate (%)	
Country											79-84	84-88
Canada	577	795	870	832	902	1,019	1,034	1,194	1,227	1,431	12.0	8.9
USA	14,910	15,875	16,020	15,400	16,875	18,424	18,185	20,029	21,316	23,177	4.3	5.9
NORTH AMERICA TOTAL	15,487	16,670	16,890	16,232	17,777	19,443	19,219	21,223	22,543	24,608	4.7	6.1
Finland	216	244	270	280	288	301	342	363	363	384	6.9	6.3
Norway	123	116	119	102	108	118	131	141	156	150	-0.8	6.2
Sweden	560	576	590	615	636	719	763	797	800	865	5.1	4.7
Scandinavia Sub total	899	936	979	997	1,032	1,138	1,236	1,301	1,319	1,399	4.8	5.3
Belgium	430	391	471	458	467	526	530	523	612	795	4.1	10.9
Denmark	193	205	206	226	248	275	291	313	345	345	7.3	5.8
France	1,699	1,710	1,758	1,778	1,818	1,922	1,936	2,392	2,550	2,712	2.5	9.0
Germany Fed. Rep.	3,268	3,248	3,505	3,420	3,587	4,120	4,371	4,560	4,746	5,024	4.7	5.1
Greece	95	106	104	108	110	120	130	128	166	100	4.8	-4.5
Italy	1,339	1,551	1,692	1,545	1,395	1,393	1,313	1,380	1,375	1,627	0.8	4.0
Netherlands	935	982	984	974	1,033	1,133	1,148	1,177	1,411	1,528	3.9	7.8
Portugal	170	175	190	213	217	220	221	223	265	280	5.3	6.2
Spain	1,022	992	993	1,131	1,215	1,225	1,291	1,447	1,462	1,605	3.7	7.0
United Kingdom	2,251	2,187	2,062	1,940	1,993	2,174	2,171	2,355	2,603	2,781	-0.7	6.3
EEC Sub total	11,402	11,547	11,965	11,793	12,083	13,108	13,402	14,498	15,535	16,797	2.8	6.4
Austria	271	263	287	296	308	368	376	414	460	506	6.3	8.3
Switzerland	405	376	411	440	460	494	503	498	553	613	4.1	5.5
Other Sub total	678	639	698	736	768	862	879	912	1,013	1,119	5.0	8.7
WESTERN EUROPE	12,977	13,122	13,642	13,526	13,883	15,108	15,517	16,711	17,867	19,315	3.1	6.3
Bulgaria	30	35	40	40	40	50	80	80	80	80	10.8	12.5
Czechoslovakia	393	413	435	518	534	536	537	550	550	573	6.4	1.7
German. Dem. Rep.	578	593	616	629	627	637	647	664	682	382	2.0	-12.0
Hungary	160	224	230	234	254	288	282	210	220	299	12.5	0.9
Poland	462	481	481	439	455	478	327	496	492	483	0.7	0.3
Romania	50	50	60	65	70	80	80	90	100	100	9.9	5.7
U S S R	1,300	1,300	1,400	1,500	1,720	1,970	2,260	2,585	2,967	3,000	8.7	11.1
Yugoslavia	310	323	350	370	370	370	425	430	435	410	3.6	2.6
EASTERN EUROPE	3,283	3,419	3,612	3,795	4,070	4,409	4,638	5,105	5,526	5,327	6.1	4.8
Turkey	156	164	171	170	188	218	241	238	289	337	6.9	11.6
Iran	40	40	40	40	40	40	40	40	40	50	0.0	5.7
Israel	55	60	60	51	67	73	72	91	90	100	5.8	8.2
Other	114	118	124	140	142	147	138	122	121	124	5.2	-4.2
MIDDLE EAST TOTAL	365	382	395	401	437	478	491	491	540	611	5.5	6.4

5.4 Collection-Consumption Balance

Tables II-15(1) and II-15(2) show the trends in the world collection-consumption balance for waste paper during a period from 1979 to 1988. As can be seen from the tables, in almost all countries, excepting the United States where the collected quantity of waste paper exceeded waste paper consumption (collected quantity exceeded consumption by 5.4 million tons in 1988), waste paper consumption exceeded the collected quantity of waste paper. It seems the world supply-demand situation for waste paper is tightening. In the Far East, in particular, there is a serious shortage of waste paper (the shortfall amounted to 3.5 million tons in 1988).

5.5 Waste Paper Prices

Table II-16 gives a summary of the trends in waste paper prices in West Germany and the United Kingdom.

	West Germany		U.K.	
	A6	B1	A6	B1
1986	\$35.50/T	\$42.50/T	\$49.50/T	\$57.50/T
1987	\$45.00/T	\$58.30/T	\$52.00/T	\$65.70/T
1988	\$67.70/T	\$88.80/T	\$77.70/T	\$93.00/T
1989	\$87.80/T	\$103.20/T	\$91.50/T	\$104.70/T

In the above table, A6 and B1 denote the standard sizes of once read newspaper/leaflet and once read news respectively.

TABLE II-15(1) HISTORICAL GLOBAL WASTE PAPER COLLECTION/CONSUMPTION BALANCE BY COUNTRY

(1,000T)

Region Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Canada	-523	-397	-340	-316	-429	-444	-408	-401	-468	-380
USA	1,955	2,338	2,379	2,306	2,688	3,252	3,333	3,758	4,357	5,432
NORTH AMERICA TOTAL	1,432	1,941	2,039	1,990	2,259	2,808	2,925	3,357	3,889	5,052
Finland	14	30	7	19	20	20	65	83	57	33
Norway	27	11	23	6	9	6	11	17	14	-7
Sweden	-83	-97	-65	-2	-28	-12	4	49	18	6
Scandinavia Sub total	-42	-56	-35	23	1	14	80	149	89	32
Belgium	196	150	200	247	255	307	305	287	352	533
Denmark	70	51	40	54	52	35	68	69	95	81
France	-164	-196	-167	-180	-234	-278	-273	104	90	-100
Germany Fed. Rep.	70	130	216	131	95	134	380	476	430	487
Greece	0	-14	-16	-7	-7	-15	-12	-36	-10	-10
Italy	-757	-649	-566	-529	-503	-645	-702	-666	-680	-772
Netherlands	49	125	49	-2	9	26	-10	-51	-66	-112
Portugal	0	7	-5	-3	7	0	-14	0	3	-25
Spain	-168	-211	-217	-224	-227	-354	-378	-413	-439	-494
United Kingdom	67	178	130	86	166	171	104	208	293	364
EEC Sub total	-637	-429	-336	-427	-387	-619	-532	-22	68	-48
Austria	-187	-279	-276	-307	-327	-333	-428	-452	-473	-498
Switzerland	90	56	79	95	62	63	54	33	67	48
Other Sub total	-97	-223	-197	-212	-265	-270	-374	-419	-406	-450
WESTERN EUROPE	-776	-708	-568	-616	-651	-875	-826	-292	-249	-466
Bulgaria	0	0	0	0	0	0	0	0	0	0
Czechoslovakia	80	80	93	135	146	146	141	140	140	145
German. Dem. Rep.	13	19	11	24	24	-6	-17	5	7	-292
Hungary	0	5	0	1	0	0	-10	-66	-84	-24
Poland	19	31	70	28	79	60	30	34	29	-20
Romania	5	0	0	0	0	0	-10	0	0	0
U S S R	0	0	0	0	0	0	0	0	112	113
Yugoslavia	-90	-113	-125	-112	-145	-190	-142	-130	-125	-70
EASTERN EUROPE	27	22	49	76	104	10	-8	-17	79	-148
Turkey	0	0	0	0	-2	-12	-22	-4	-41	-55
Iran	0	0	0	0	0	0	0	0	0	0
Israel	0	0	-5	-3	-1	-2	-3	-1	-10	-10
Other	50	48	48	53	40	41	20	-3	-5	-2
MIDDLE EAST TOTAL	50	48	43	50	37	27	-5	-8	-56	-67

Table II-15(2) HISTORICAL GLOBAL WASTE PAPER COLLECTION/CONSUMPTION BALANCE BY COUNTRY

(1,000T)

Region	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Country										
Japan	-98	222	119	-114	-114	-65	-290	-219	-557	-582
South Korea	-603	-567	-664	-565	-575	-681	-701	-793	-1,131	-1,326
China	0	0	0	0	0	0	0	0	-296	-384
Taiwan	-450	-556	-548	-680	-810	-940	-959	-1,266	-1,243	-1,256
Indonesia	-30	-30	-30	-25	-38	-53	-60	-80	-127	-14
Malaysia	-10	-10	-12	-4	-3	-3	-2	8	21	17
Thailand	-69	-90	-100	-103	-130	-155	-190	-140	-80	-80
Philippine	-40	-47	-60	-57	-57	-83	-92	-111	-119	-145
S.E.ASIA Sub total	-149	-177	-202	-189	-228	-294	-344	-323	-305	-222
India	0	0	-50	0	-50	-250	-200	-200	-150	-150
Hong Kong	385	397	405	415	415	425	425	435	435	433
Other	19	11	14	22	27	23	22	22	21	21
ASIA TOTAL	-1,224	-1,005	-1,258	-1,452	-1,676	-2,129	-2,393	-2,700	-3,578	-3,818
Australia	-10	-6	33	3	26	18	34	25	81	80
New Zealand	5	23	18	3	4	8	13	11	22	30
OCEANIA TOTAL	-5	17	51	6	30	26	47	36	103	110
Argentina	-4	-6	-3	-4	0	0	-87	-14	-14	12
Brazil	0	0	0	0	0	0	0	29	-24	-25
Chile	0	-1	0	0	0	0	0	7	0	0
Colombia	-9	0	-7	0	0	0	-9	-15	-10	-13
Mexico	-237	-371	-392	-313	-439	-534	-555	-627	-769	-821
Peru	-1	0	-6	0	0	0	0	1	-5	-23
Other	-111	-109	-103	-113	-148	-188	-176	-121	-120	-110
SOUTH & CENTRAL AMERICA	-362	-487	-511	-430	-587	-722	-827	-740	-942	-980
Egypt	0	0	0	0	0	0	0	0	0	0
Nigeria	0	0	0	0	0	0	0	0	0	0
South Africa	0	0	0	0	0	0	0	0	0	0
Other	-6	-20	-21	-13	-18	-19	-26	-33	-32	-32
AFRICA TOTAL	-6	-20	-21	-13	-18	-19	-26	-33	-32	-32
WORLD TOTAL	-864	-192	-176	-389	-502	-874	-1,113	-397	-786	-350

Source : Pulp & Paper International, World Review Number

Table II-16 HISTORICAL WASTE PAPER PRICE IN WEST GERMANY AND U.K.

Year	Quarter		West Germany		United Kingdom		West Germany		United Kingdom		Exchange Rate	
			A6	B1	A6	B1	A6	B1	A6	B1	D4/USS	Pound/USS
			D4/T	D4/T	Pound/T	Pound/T	USS/T	USS/T	USS/T	USS/T		
1986	2	Low	70.0	80.0	35.0	35.0	33.0	37.8	53.6	53.6	2.119	0.653
		High	80.0	100.0	35.0	45.0	37.8	47.2	53.6	68.9	2.119	0.653
		Mean	75.0	90.0	35.0	40.0	35.4	42.5	53.6	61.3	2.119	0.653
	3	Low	40.0	50.0	30.0	38.0	19.8	24.7	43.5	55.1	2.021	0.690
		High	70.0	80.0	35.0	38.0	34.6	39.6	50.7	55.1	2.021	0.690
		Mean	55.0	65.0	32.5	38.0	27.2	32.2	47.1	55.1	2.021	0.690
	4	Low	75.0	90.0	30.0	38.0	38.6	46.4	44.2	56.0	1.941	0.678
		High	95.0	115.0	35.0	38.0	48.9	59.2	51.6	56.0	1.941	0.678
		Mean	85.0	102.5	32.5	38.0	43.8	52.8	47.9	56.0	1.941	0.678
	Yearly	Low	61.7	73.3	31.7	37.0	30.5	36.3	47.1	54.9	2.027	0.674
		High	81.7	98.3	35.0	40.3	40.4	48.7	52.0	60.0	2.027	0.674
		Mean	71.7	85.8	33.3	38.7	35.5	42.5	49.5	57.5	2.027	0.674
1987	1	Low	70.0	80.0	30.0	35.0	38.8	44.3	48.2	56.2	1.805	0.623
		High	90.0	115.0	32.0	45.0	49.9	63.7	51.4	72.2	1.805	0.623
		Mean	80.0	97.5	31.0	40.0	44.3	54.0	49.8	64.2	1.805	0.623
	2	Low	65.0	80.0	30.0	35.0	35.5	43.7	48.3	56.4	1.830	0.621
		High	80.0	90.0	32.0	45.0	43.7	49.2	51.5	72.5	1.830	0.621
		Mean	72.5	85.0	31.0	40.0	39.6	46.4	49.9	64.4	1.830	0.621
	3	Low	70.0	90.0	30.0	35.0	38.1	49.0	48.9	57.0	1.838	0.614
		High	85.0	130.0	32.0	45.0	46.2	70.7	52.1	73.3	1.838	0.614
		Mean	77.5	110.0	31.0	40.0	42.2	59.8	50.5	65.1	1.838	0.614
	4	Low	75.0	100.0	30.0	38.0	47.4	63.3	53.1	67.3	1.581	0.565
		High	95.0	130.0	38.0	40.0	60.1	82.2	67.3	70.8	1.581	0.565
		Mean	85.0	115.0	34.0	39.0	53.8	72.7	60.2	69.0	1.581	0.565
Yearly	Low	70.0	87.5	30.0	35.8	40.0	50.1	49.6	59.2	1.764	0.606	
	High	87.5	116.3	33.5	43.8	50.0	66.5	55.6	72.2	1.764	0.606	
	Mean	78.8	101.9	31.8	39.8	45.0	58.3	52.6	65.7	1.764	0.606	
1988	1	Low	75.0	120.0	30.0	38.0	45.2	72.3	56.4	71.4	1.659	0.532
		High	95.0	140.0	38.0	45.0	57.3	84.4	71.4	84.6	1.659	0.532
		Mean	85.0	130.0	34.0	41.5	51.2	78.4	63.9	78.0	1.659	0.532
	2	Low	90.0	120.0	30.0	38.0	49.4	65.9	51.3	65.0	1.821	0.585
		High	100.0	130.0	38.0	45.0	54.9	71.4	65.0	76.9	1.821	0.585
		Mean	95.0	125.0	34.0	41.5	52.2	68.6	58.1	70.9	1.821	0.585
	3	Low	130.0	160.0	43.0	55.0	69.1	85.1	72.5	92.7	1.880	0.593
		High	140.0	190.0	55.0	65.0	74.5	101.1	92.7	109.6	1.880	0.593
		Mean	135.0	175.0	49.0	60.0	71.8	93.1	82.6	101.2	1.880	0.593
	4	Low	160.0	190.0	53.0	60.0	89.9	106.7	99.4	112.6	1.780	0.533
		High	180.0	220.0	60.0	70.0	101.1	123.6	112.6	131.3	1.780	0.533
		Mean	170.0	205.0	56.5	65.0	95.5	115.2	106.0	122.0	1.780	0.533
Yearly	Low	113.8	147.5	39.0	47.8	63.4	82.5	69.9	85.4	1.785	0.561	
	High	128.8	170.0	47.8	56.3	71.9	95.1	85.4	100.6	1.785	0.561	
	Mean	121.3	158.8	43.4	52.0	67.7	88.8	77.7	93.0	1.785	0.561	
1989	1	Low	160.0	190.0	53.0	60.0	84.5	100.4	89.5	101.4	1.893	0.592
		High	170.0	200.0	60.0	70.0	89.8	105.7	101.4	118.2	1.893	0.592
		Mean	165.0	195.0	56.5	65.0	87.2	103.0	95.4	109.8	1.893	0.592
	2	Low	160.0	180.0	53.0	57.0	82.5	92.8	84.9	91.3	1.939	0.624
		High	170.0	200.0	60.0	70.0	87.7	103.1	96.1	112.1	1.939	0.624
		Mean	165.0	190.0	56.5	63.5	85.1	98.0	90.5	101.7	1.939	0.624
	3	Low	160.0	190.0	53.0	60.0	84.3	100.1	85.8	97.1	1.899	0.618
		High	170.0	200.0	60.0	70.0	89.5	105.3	97.1	113.3	1.899	0.618
		Mean	165.0	195.0	56.5	65.0	86.9	102.7	91.5	105.2	1.899	0.618
	4	Low	160.0	190.0	53.0	60.0	89.4	106.2	83.1	94.0	1.789	0.638
		High	170.0	200.0	60.0	70.0	95.0	111.8	94.0	109.7	1.789	0.638
		Mean	165.0	195.0	56.5	65.0	92.2	109.0	88.6	101.9	1.789	0.638
Yearly	Low	160.0	187.5	53.0	59.3	85.2	99.9	85.8	96.0	1.880	0.618	
	High	170.0	200.0	60.0	70.0	90.5	106.5	97.2	113.4	1.880	0.618	
	Mean	165.0	193.8	56.5	64.6	87.8	103.2	91.5	104.7	1.880	0.618	

Source : PPI's International Fact & Price Book "PRICEWATCH".

Note : Prices are ex.mill.

III. TECHNOLOGICAL DIAGNOSIS OF AKSU MILL

1. Outline of Aksu Mill

1.1 Historical Context of Establishment of Aksu Mill

Aksu Newsprint mill was planned in 1966 as the first modernized large-scale newsprint mill in the Republic of Turkey, under the country's first five-year plan. A contract was concluded in October 1967 between the Government of Turkey and Mitsubishi Heavy Industries, Ltd. of Japan for constructing the mill. Details ranging from construction to start of operations are as follows.

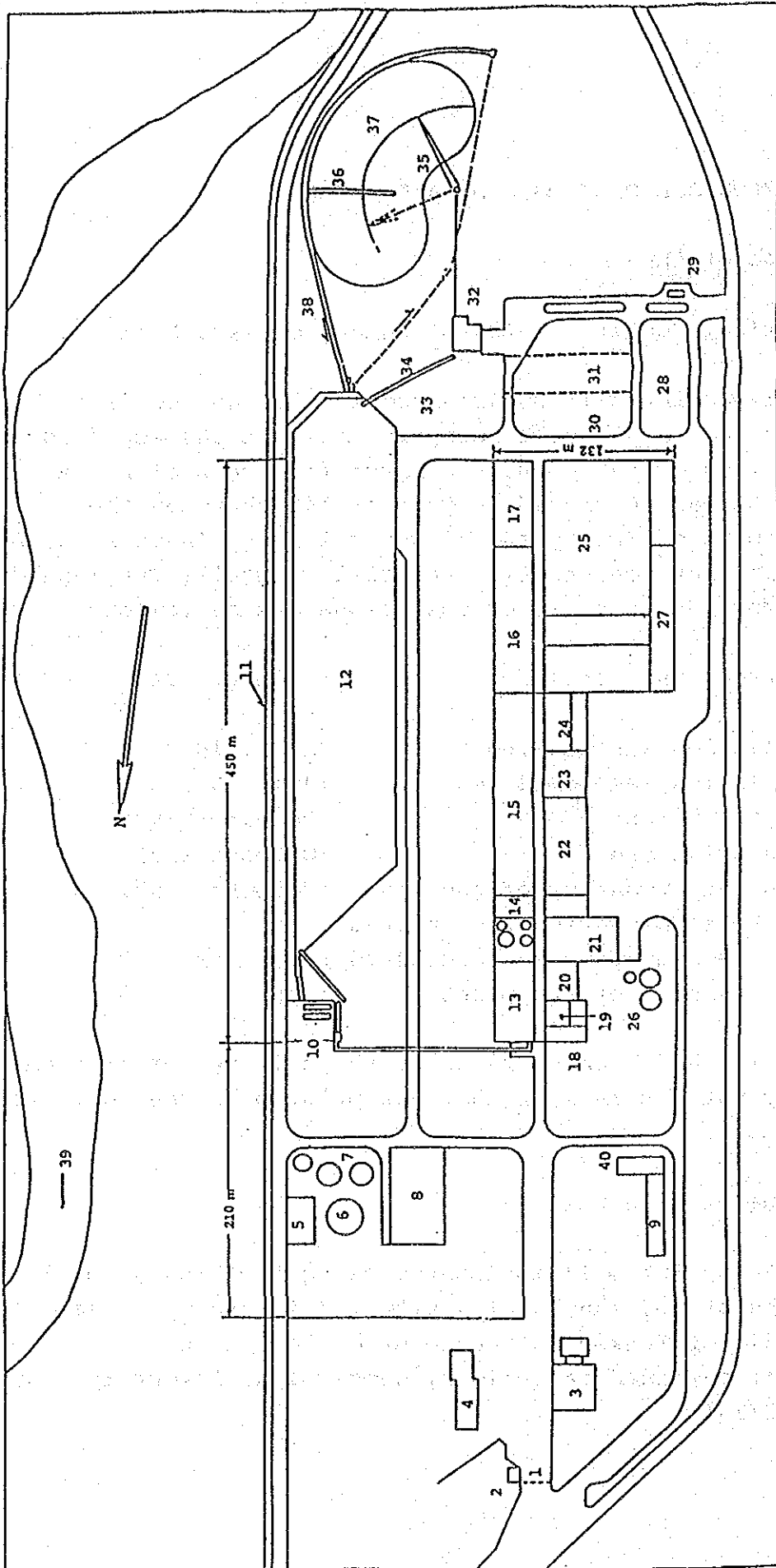
A contract was concluded	:October 1967
Installation was started	:April 1969
Installation was completed	:July 1970
First trial run	:November 1970
Second trial run	:October 1971
Provisional transfer of the plant (Commercial operation was started.)	:November 1971
Guarantee operation was completed	:November 1972
Final transfer of the plant	:February 1973

Aksu mill had been operated as the only newsprint plant in Turkey until SEKA's another newsprint mill was completed in Balikesir.

1.2 Outline of Aksu Mill

Aksu Newsprint mill is located along the Aksu River in the suburbs of Giresun, a city situated in the northeast of the Republic of Turkey on the coast of the Black Sea. Aksu mill is outlined as follows, whose plant layout is shown in Fig. III-1.

Fig. III-1 PLOT PLAN OF EXISTING AKSU MILL



- | | | | | |
|------------------------------|---------------------------|------------------------|---------------------------|---------------------|
| 1 Gate | 9 Motor Pool | 17 Sheet Paper Storage | 25 Roll Paper Storage | 33 Conveyor |
| 2 Guard House | 10 Drum Barker | 18 Substation | 26 Fuel Oil Tank | 34 Recycling Stream |
| 3 Shower Room | 11 Fence | 19 Turbin Room | 27 Truck Loading Terminal | 35 Stacker |
| 4 Office Building | 12 Wood Pond | 20 Boiler House | 28 Log Yard | 36 Conveyor |
| 5 Settling Pond | 13 GP Room | 21 KP Pulper | 29 Log Weigher | 37 Log Pile |
| 6 Clarifier | 14 Stock Preparation Room | 22 Machine Shop | 30 Log Yard | 38 Water Stream |
| 7 Water Treatment Facility | 15 Paper Machine Room | 23 Material Warehouse | 31 Log Crane | 39 Aksu River |
| 8 Parts, Materials Warehouse | 16 Finishing Room | 24 Wet Wrap Machine | 32 Slasher | 40 Fire Station |

(1) Capacity

Newspaper 82,500 tons/year (250 tons/day)

(2) Major equipment

- 1) Wood processing process: wood yard, slasher, stacker, wood pond, drum barker
- 2) Pulp process: Groundwood pulp unit, imported KP refining unit, wet pulp machine (not operated)
- 3) Preparation process: Complete unit
- 4) Papermaking, finishing process:

Fourdrinier paper machine	7,520 mm(wire width)
Max. papermaking speed	700 m/min
Winder trim	6,900 mm
Cutter trim	2,100 mm
Roll wrapping machine	
- 5) Utility equipment: boiler, turbine generator, receiving equipment and transformer water intake equipment, BFW processing equipment
- 6) Auxiliary facilities: Product storehouse, fuel tank, auxiliary material storehouse, repair shop, office building, analysis and testing facilities, spare stock storehouse, corporate houses for employees, etc.

(3) Number of employees

1) Mill Manager, staff to Mill Manager	16
2) Engineering Department	526
3) Clerical Department	266
Total	808

1.3 Actual Output

Output of Aksu mill during the past decade is as shown below.

Year	Output(MT)	Rate of operation(%)
1980	63,063	76.4
1981	63,086	76.5
1982	61,434	74.5
1983	61,100	74.1
1984	60,325	73.1
1985	51,171	62.0
1986	54,301	65.8
1987	65,484	79.4
1988	*49,742	60.3
1989	57,888	70.2
(Average)	(58,759)	(71.2)

* Output decreased because of reduced number of operation days due to a strike at SEKA.

2. Diagnosis of Organization and Management System

2.1 Organization and Its Problems

- (1) It is recommended that personnel curtailment be executed, because the number of employees seems to be too large as a whole for the purpose of cost reduction.
- (2) On the other hand, some divisions of the organization suffer from a lack of hands (e.g., in tool replacement), which fact causes lowered production efficiency.
- (3) It is urgently necessary to promote absorption of advanced technology of Western industrialized countries, in spite of linguistic impediments.

2.2 Quality Control and Problems

2.2.1 Attitude toward Quality Control

The most important attitude toward quality control is making known to every employee of the company the concept of managing the processes with emphasis laid on quality. It is necessary to grasp quality characteristic values throughout the process and to establish appropriate measures for quality improvement. A system wherein customer's needs are reflected in product quality is also needed.

2.2.2 Standardization

Standardization of action is the fundamental of quality control. For thorough quality control, manuals need to be prepared by those who are in charge of the job and maintained so that anyone can use them.

2.2.3 Quality Control of Raw Material Received

Acceptance testing of BKP is adequate. Log testing consists of weighing only. Length of logs should be examined.

2.2.4 Process Testing

Testing in the pulp process is conducted in accordance with the prescribed procedure and the results are reported. The Team would like to recommend the following regarding the pulp process testing.

- A. Equipment of the shive analyzer
- B. Regarding freeness measurement, using a Canadian standard freeness tester is more advantageous for accurate measurement as well as for comparison with products of other producers than using the Schopper-Riegler method, which is currently used.

2.2.5 Product Testing

The only product test includes tests of physical properties of product paper in the laboratory and weighing and labeling of packaged paper. It seems that systematic product testing has not yet been established.

Careless handling of packaged products is apt to cause damage to them, but they are delivered as they are.

It is recommended that a strict standard be employed for product testing, and defective rolls should not be delivered.

A test of Aksu mill products, implemented in a laboratory in Japan, has revealed the following results, which are shown in Table III-I.

Table III-1 COMPARISON IN QUALITY BETWEEN SEKA'S NEWSPRINT

	SEKA AKUSU	SEKA BALIKESIR	CANADA	NORWAY	FRANCE	JAPAN
Unit quantity g/m ²	50.8	51.3	48.9	49.6	49.2	47.6
Thickness	0.098	0.097	0.081	0.084	0.082	0.073
Density g/cm ³	0.52	0.53	0.60	0.59	0.60	0.65
Bursting strength Kgf/cm ²	0.64	0.72	0.83	0.81	0.78	0.93
Tensile strength						
(MD) Kgf	2.87	3.47	3.58	3.44	3.05	4.12
(CD) Kgf	1.28	1.06	1.33	1.31	1.17	1.13
Elongation						
(MD) %	1.1	1.3	1.0	1.1	1.3	1.4
(CD) %	2.1	2.0	2.6	2.9	2.5	3.4
Tear Factor						
(MD) gf	28	21	21	20	22	27
(CD) gf	38	34	27	32	33	43
Porosity sec	14.4	7.6	38.4	55.2	27.8	37.6
Surface strength						
(Surface) A	3	6	7	6	6	8
(Back side) A	3	6	7	6	6	8
Brightness						
(Surface) %	46.3	43.7	55.1	55.8	56.2	53.1
(Back side) %	46.7	43.2	55.6	55.4	56.0	53.6
Opacity %	93.1	91.4	91.2	91.8	92.6	89.7
Moisture content %	9.4	9.2	8.9	9.1	8.3	8.5

Testing conditions: Temperature 20 +
Humidity 65 + 2%

COMPARISON IN SHIVE VALUE BETWEEN
SEKA'S NEWSPRINT AND IMPORTED NEWSPRINT

	SEKA AKUSU	SEKA BALIKESIR	CANADA	NORWAY	FRANCE	JAPAN
Shive Value (time/20g)	60	16	16	14	10	2

- Density is extremely low.
- Surface strength is very low.
- Porosity is low.
- Brightness is poor.

A leading newspaper company, which is a user of Aksu mill products, has additionally pointed out the following.

- Poor hues result in poor coloring in color printing.
- Incomplete roll joints cause sheet break.
- Roll cores are often deformed or different in size, which causes sheet break.
- Defective roll packaging

2.2.6 Recommendations on the Quality Control System

- (1) Though quality standards and production conditions have been set and product testing is implemented, a systematic testing procedure into which test data and the needs of the market have been incorporated has not yet been established.

It is recommended therefore that a link of quality circles be established on the Deming circle quality control approach--a link of plan-do-check-action.

- (2) An example of successful quality control in Japan is introduced in the main volume.

- Company-wide quality control committee, its organization and outline of their activities.
- Mill quality control committee, its organization and outline of their activities.
- Outline of the QC Circle Movement by all mill workers.

2.3 Production and Cost Management

2.3.1 General

The following improvements are needed on the whole.

- More frequent regular patrols
- Keeping instruments in good order
- Removal of construction materials left behind
- Repairs of the mill roads

2.3.2 Wood Processing

- Cost reduction through adjusting log inventory to an appropriate level
- Log quality control through FIFO
- Discontinuance of accepting poplar logs
- Disposal of decomposed logs and the grasping of accurate yearly changes in log quality

2.3.3 Improvement in Pulp Process Management

- Decreasing the frequency of total grinder stoppage and shortening the time for stoppage
- Improvement in the schedule of grinder stone burring
- Use of uniform grinder stones
- Improved maintenance of the measuring instruments

2.3.4 Improvement in Preparation Process Management

- Improved maintenance of the gauges and auxiliary instruments
- Strengthened patrols
- Controlling the addition of dyestuffs according to brightness and hues of pulp
- Improved management of polydisk filter cleaning

2.3.5 Improvement in Papermaking Process Management

(1) Analysis data on stoppages (Table III-2)

Table III-2 Analysis Data on Paper Machine Stoppages

Operation hours 59 days between January 1 and February 28, 1990.

<u>Total</u>	<u>84,960 min</u>	<u>100%</u>
<u>Total planned stoppages</u>	<u>16,305</u>	<u>19.2%</u>
Wire part remodeling	10,800	
Tool replacement	3,840	
Cleaning	1,665	
<u>Total unexpected stoppages</u>	<u>7,995 min</u>	<u>9.4%</u>
Electrical trouble	1,920	
Removal of stuck pulp, cleaning	1,455	
Winder trouble	1,125	
Vacuum pump related trouble	614	
Insufficient consistency control	390	
Rope carrier severance	255	
Pulper, couch chest overflow	240	
Other trouble	1,995	
<u>Total sheet break time</u>	<u>4,410 min</u>	<u>5.2%</u>
Press part	1,465	
Drier part	2,665	
Calender reel	280	
<u>Net operating hour total</u>	<u>56,250 min</u>	<u>66.2%</u>

- Stoppage hours are prolonged because of shortage of hands for tool replacement. Increase of hands and improvement in the cooperation system are needed.
- Planned stoppage hours for cleaning are too long. It is possible to shorten them.

- To solve the problem of unexpected stoppages, it is indispensable for measures and improvements to be established on a case-by-case basis. This is the fundamental of improved production.
- Cleaning of the circulation system will reduce sheet break in the wet part to a large extent.

(2) Other observations

- Insufficient maintenance of the measuring instruments
- Insufficient management of reel spool backlog
- A system wherein those who are in charge of the winder and dry end cooperate is needed for wet paper cleaning (the idea of participation).

2.3.6 Management of Repair and Maintenance System

Staffing for maintenance at Aksu mill and annual repairing expenses are as follows.

Chief, Maintenance Section

	Subchief (Machinery)		Subchief (Electricity)	
Process maintenance	Repair shop	Vehicle Shop	Electricity	Instrumentation
	(1 Head)	(2 Heads)	(1 Head)	(2 Heads)
	3 Foremen	2 Foremen	1 Foremen	2 Foremen
	42 workers	29 workers	9 workers	30 workers
				(1 Head)
				1 Foreman
				6 workers

It is impossible to judge whether this system works or not because it depends on the level of worker's skills and experience. It seems to be in good formation, at least.

	Output (t)	Sales (MMTL)	Maintenance Cost (MMTL)	Ratio to sales (%)
1980	62,931	2,554	86	3.4
1981	60,489	3,556	90	2.5
1982	62,895	5,799	124	2.1
1983	59,565	7,089	216	3.1
1984	60,325	8,489	300	3.5
1985	51,171	10,157	1,137	11.2
1986	54,301	15,710	474	3.0
1987	65,484	23,654	626	2.6
1988	49,742	39,302	1,036	2.6

Regarding maintenance costs, only annual costs were shown. The Team could obtain no information on comparison between estimated and actual maintenance cost or on measures for superannuated equipment.

2.3.7 Education and Training System

(1) Present conditions

Education at SEKA is planned and implemented by the Head Office. The mill invites in-house instructors from the headquarters once a year to give a class lasting several hours, intended mainly for new employees. Usually explanation is given on the whole activities at the mill and safety.

(2) According to the Team's observation, operators in the production system do not have sufficient knowledge of the equipment. Though this may be attributable to high labor turnover at the mill, a more serious reason would be insufficient operational standards. The following are recommended, as a result.

- Preparation of quality standards, operational standards, start-up procedure manuals, shut-down procedure manuals, description of the machines and apparatuses. Standards and manuals that are most appropriate to Aksu mill and agreed upon by those concerned should be prepared.
- A standardization committee should be organized to set operational standards. The committee should consist of persons in charge of operations at their job sites and persons in charge of their supervision.
- A improvement proposing system should be introduced to promote technical improvement and to make participatory circumstances.

3. Diagnosis of Apparatuses and Equipment of Aksu Mill

3.1 Processes in Current Facilities of Aksu Mill

3.1.1 Outline

(1) Purpose of the mill

At Aksu mill, roll paper for newspaper, writing paper of newspaper grade, and GP wet pulp are produced from coniferous logs (fir and spruce).

(2) Production capacity

Roll paper for newspaper:	82,500 metric tons/year
GP wet pulp:	ca. 80 metric tons/day
Packaged sheep paper:	33,000 metric tons/year

(3) Days of operation per year: 330 days

3.1.2 Details of the Existing Equipment

3.2 Diagnosis on the Mill Apparatuses and Equipment

- Additional sprinklers need to be installed for humidifying logs.
- The rotary screen for treating water discharged from the drum barker is left damaged. Measures are needed for bark and chip removal on the spot, from the viewpoint of all-out treatment of discharged water.

3.2.1 Log and Processing Process

- To humidify logs more effectively, increase of sprinklers is desirable.

- The rotary screen for treating waste water from the drum barker and related equipment are left damaged. Bark and chips that are not removed on the spot may affect the general waste treatment system.

3.2.2 Groundwood Pulp Process

- The existing re-chipper type shredder is not suitable.
- It is necessary to replace the pressure screen by a low differential pressure type screen.
- It is necessary to review overall balance of the reject treatment system.
- A cleaner should be introduced as a measure to shives, and addition of polydisk filters should be considered.

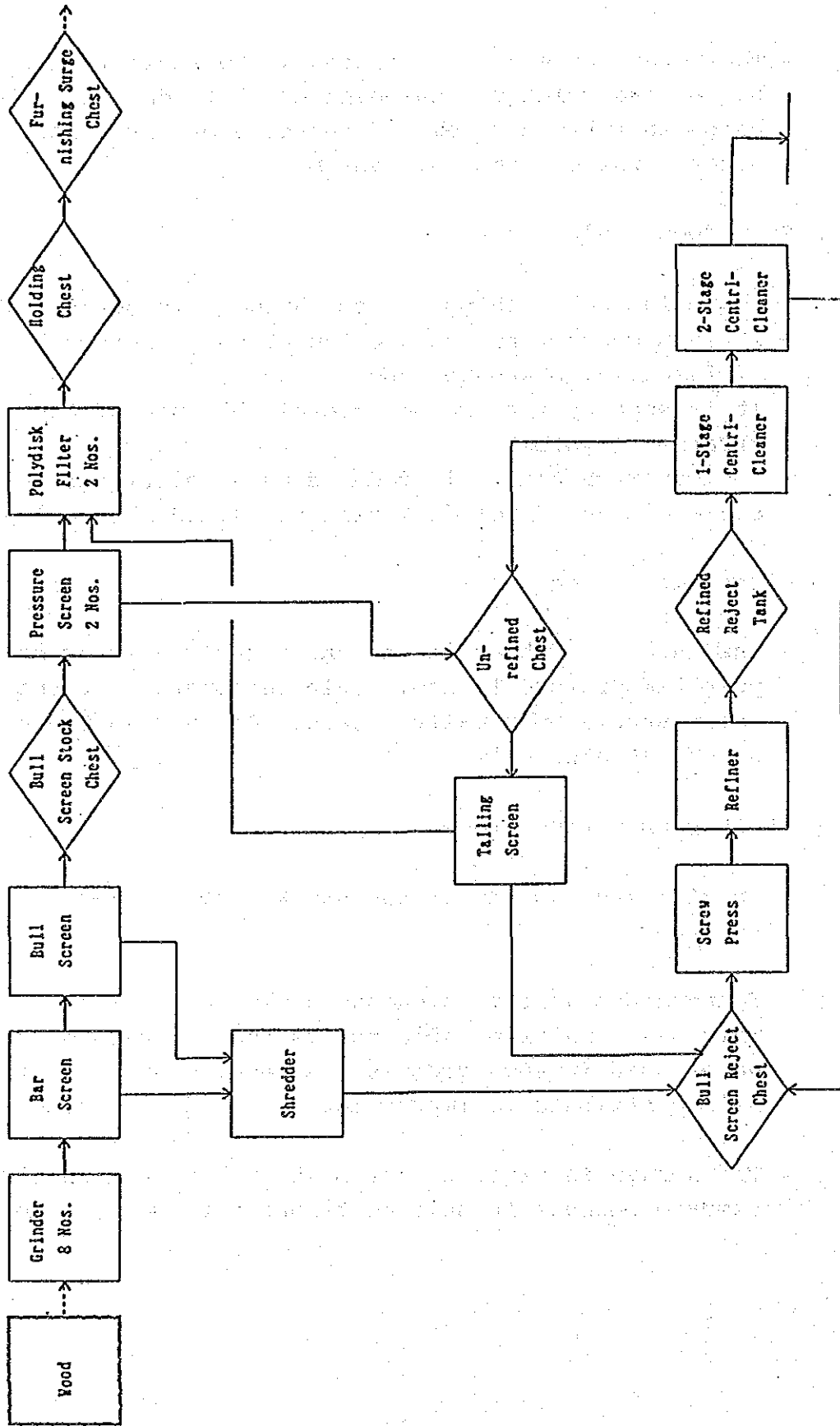
3.2.3 Dissolving Process

- The largest problem in the BKP dissolving process is that pulp temperature is low. Pulp temperature at the stock inlet should be usually between 40°C and 45°C but it is 33.5°C at Aksu mill.

3.2.4 Stock Preparation Process

- Insufficient volume of the stock drum thickener for broke recovery
- Temperature at the thickened broke chest is low (30°C). This may be attributable to low temperatures of clear water used in each process. Effective use of white water will contribute to improvement and energy saving.
- The Jordan in front of the machine head box should be removed because it only contributes to waste of energy.

FIG. III-2 WOOD GRINDING FLOW SHEET (EXISTING MILL)



3.2.5 Papermaking Process

- (1) The equipment is in good condition without corrosion in the components, on the whole. Sufficient maintenance could have prevented partial functional deterioration.
- (2) It was not possible to know whether the existing equipment was strong enough to meet increased production after renovation.
- (3) Generally impediments to production in paper machine operations include sheet break, inferior quality, change in raw material, machine trouble, and unskilled machine operation. It is possible to some extent to predict causes of these impediments, based on data accumulated over a long period of operations. In Aksu mill, however, insufficient maintenance of the measuring instruments pose a problem in data accumulation.

Improved technique is needed for clearing up causes of these impediments, based on accumulated data. A system of clearing up causes should be organized, if possible.

Improvement would be necessary at Aksu mill on the whole in operational skills and management techniques, including increased knowledge of the equipment, preparation of operation manuals, and strengthened system of cooperation between divisions.

(4) Sheet break

Sheet break is the largest impediment to production. The following causes may be pointed out.

FIG. III-3 PAPERMAKING PROCESS FLOW SHEET (EXISTING MILL)

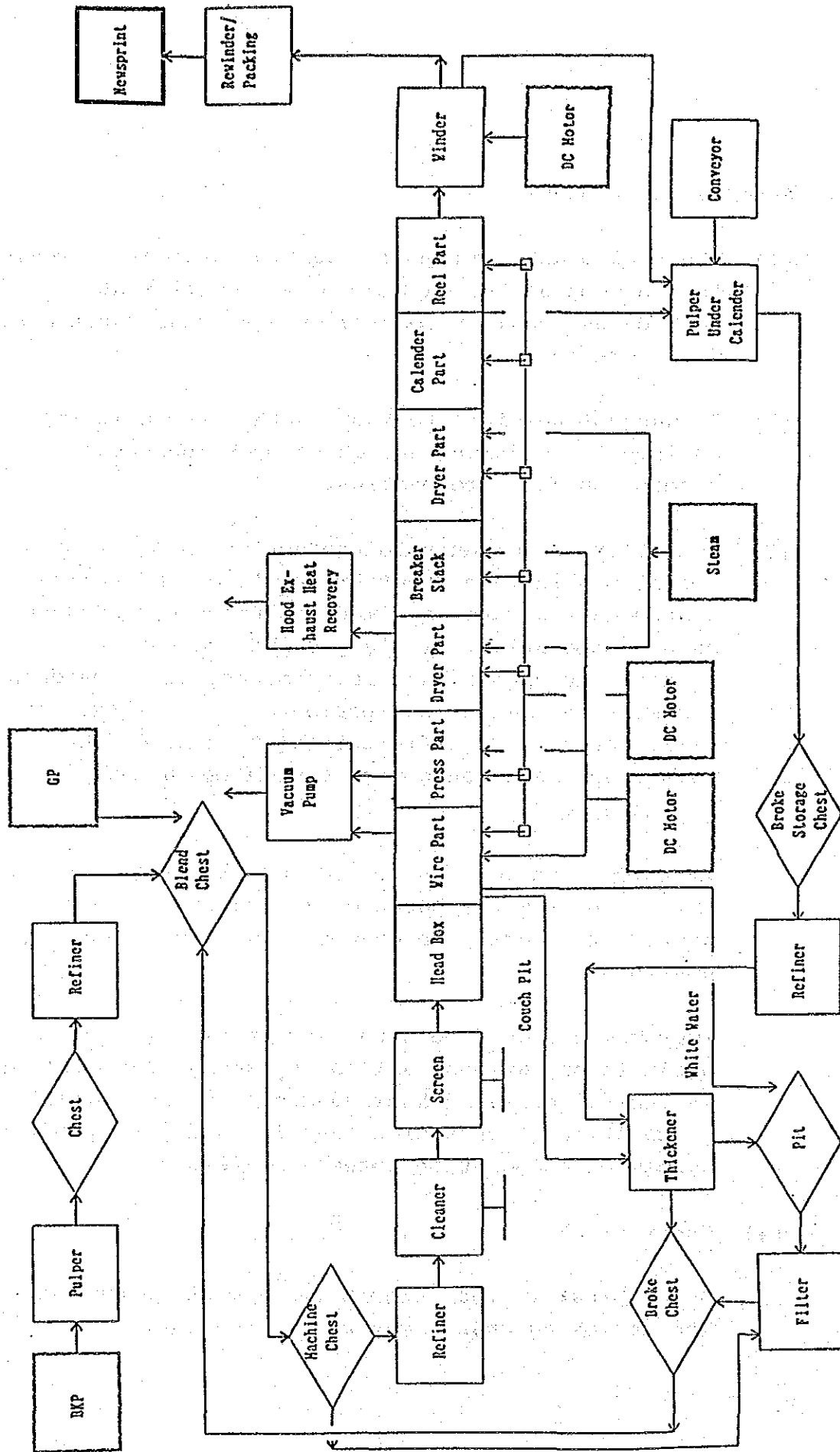
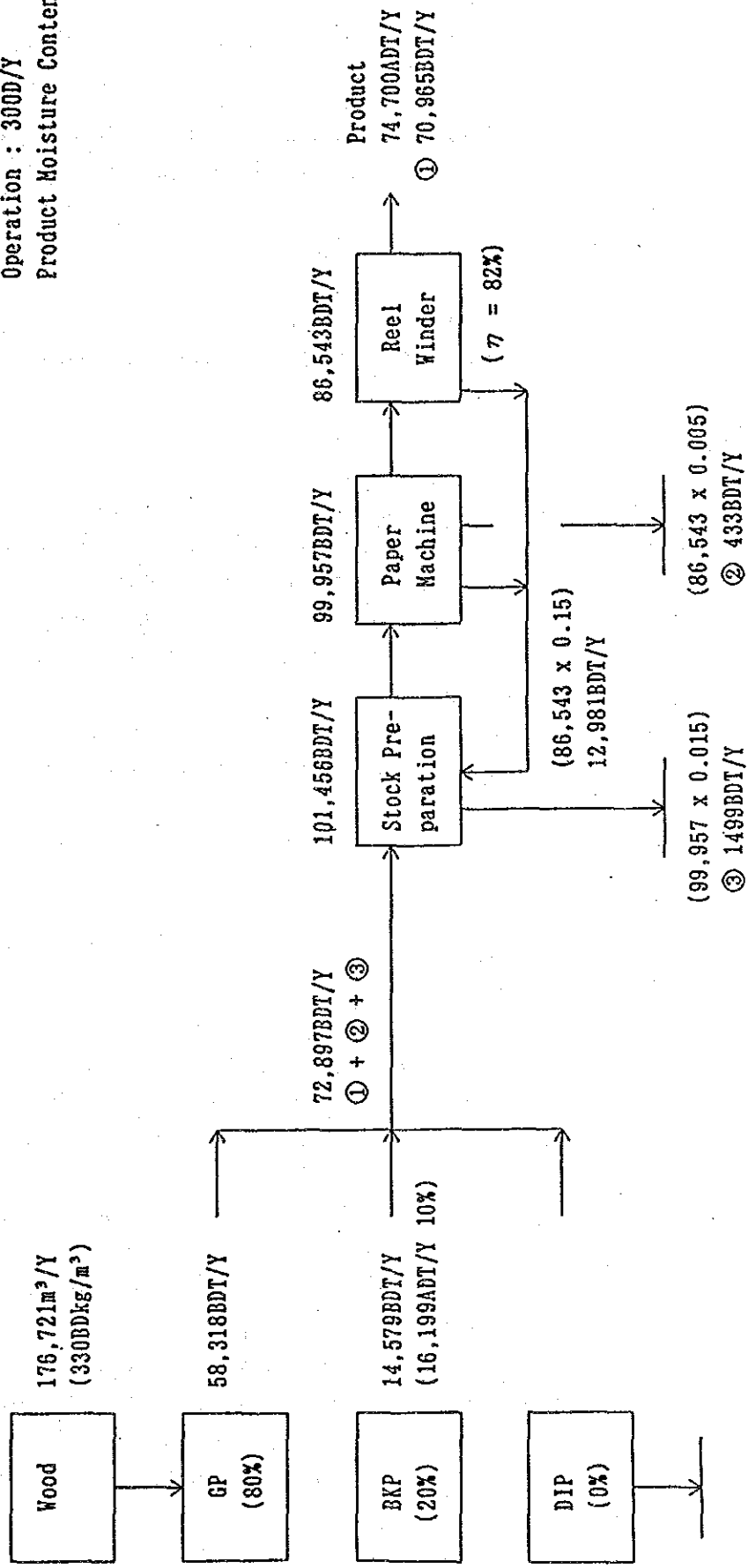


FIG. III-4 MATERIAL BALANCE (W/O CASE 74,700T/Y)

74,700ADT/Y

Operation : 300D/Y
 Product Moisture Content : 5%



- Partially lowered sheet strength due to shives
- Partially lowered sheet strength due to dirt or slippage
- Rough surface of rolls
- Dull trim jet
- Sheet break due to cockles
- Insufficient draw control, uneven draw

(5) Quality and productivity

In view of the quality of paper currently made, the capacity of the winder would not be able to cope with increased production on the reel by heightened papermaking efficiency. It is necessary therefore the winder be operated, given some allowance, at double the speed of the paper machine. To this end, indispensable are the raising of paper quality to meet the speed as well as skill in operations.

(6) Improvement in quality and operation by the existing equipment

1) Recommendations on improving basis weight and formation

- Adjustment of the stock inlet lip
- Restriction of shower water in the stock inlet
- Control of gland seal water for the rectifier roll
- Adjustment of flow on either side of the stock inlet
- Landing adjustment at the tip of the foaming board and the inlet jet
- Restriction of breast roll shower
- Improvement in stock freeness and temperature conditions
- Adjustment of the wire table arrangement

2) Improvement in moisture profile

- Measurement of press moisture profile and correction of the roll nip crown
- Felt management and the standard number of days of use
- Introduction of a steam box
- Management of press shower
- Management of drier drainage
- Ventilation in the drier
- Equipping the drier with an auxiliary drier and selection of canvas

3) Improvement in caliper and paper dust

A. Improvement in caliper

- Strengthened press
- Introduction of a breaker stack

B. Improvement of paper dust

- Stock review -- reduced shives -- strengthened screen
- Higher stock temperature
- Strengthened press
- Raised rate of moisture content

4) Roll wrapping, handling, loading

A. Wrapping: the packaging machine is not used but edge folding is done by hand. This will pose a problem after production increase.

B. Slat conveyor: insufficient maintenance of the slat conveyor may cause defective rolls.

- C. Lifter: insufficiently maintained, the lifter is partially deformed. There is the possibility of products being damaged.
- D. Rolling: conveyance of products by rolling them on the floor may cause defective rolls.
- E. Loading onto trucks: the edges of rolls are jimmied with an iron rod for locating them on the truck. This may cause defective rolls.

5) Improvement in operations

Improvements in operations in the papermaking process are as follows.

- A. Skill in the starting procedure on papermaking (procedure of operations, inspection, etc.)
- B. Skill in the stopping procedure of papermaking (temporary stoppage, long-time stoppage, etc.)
- C. Cleaning of the stock system piping (prevention of sheet break and defective paper)
- D. Brushing and high pressure shower cleaning of the inside and outside of the silo and the save-all
- E. Shower pipe flushing of the wire part and the press part
- F. Prevention of full load of the wet and dry broke pits (review of the agitator, pump and shower)
- G. Improvement in sheet run operations

H. Review of the clear water and white water filters

(7) Improvement of major apparatuses

The following are the apparatuses that need improvement.

- a. Renewal of the cleaner
- b. Renewal of the screen
- c. Replacement of the driving motor for No.2 fan pump by a D.C. motor
- d. Renewal of the stock inlet
- e. Renewal of piping pertaining to b. and d. above
- f. Press remodeling
- g. Equipment for moisture profile improvement
- h. Remodeling for resuming the use of the breaker stack
- i. Machine drive remodeling
- j. Replacement of the caliper control equipment
- k. Renewal of the packaging machine
- l. Apparatus improvement for better operability, raised papermaking efficiency, and stable quality

3.2.6 Utility Facilities

(1) Boiler

The boiler, whose design capacity is 65 tons/hour, is usually operated at about 40 tons/hour. There is no problem with the equipment. The boiler is fed with fuel oil.

(2) Steam turbine generator

The steam turbine generator, producing an output of 3,700 kW, is operated at low load, as in the case of the boiler. There is no particular problem with the apparatus.

(3) Feed water facilities

Feed water is taken from deep wells at an intake of 850 cubic meters per hour on the average.

(4) Industrial waste water

Currently no treatment is given to waste water, which is discharged directly to the Aksu River. However, disposal facilities are planned in accordance with the environmental regulations by the Government. Great improvement is expected in waste water treatment. Details will be described in Chapter IV.

(5) Power receiving system

Purchased electric power amounts to 22 MW on the average, which is transmitted through two 20 MW systems. In the past, purchased power was unstable in quality and power failures were frequent. This situation has been improved since December 1989.

3.2.7 Aksu Mill's Buildings and Related Facilities

(1) Mill building

There are a lot of broken panes, which allow insects and pigeons to come in and out. About 1,000 panes need repairing.

(2) Access road, mill roads

Damage in access road from the national road is considerable. Repairs are needed. Some portions of the the mill roads also need repairs.

(3) Vehicles

Thirteen vehicles belonging to the mill undergo repairs at the mill. There is no particular problem.

4. Raw Material and Auxiliary Material Supply System

4.1 Forest Resources and Lumber Industry in the Republic of Turkey

4.1.1 Forest Resources of the Republic of Turkey

The forest resources of the Republic of Turkey are distributed in regions along the Mediterranean, the Aegean, and the Black Sea. Major species include conifers such as firs, spruces and pines and broadleaf trees such as beeches.

4.1.2 Lumber Industry in the Republic of Turkey

Forestry production in the Republic of Turkey is low, reflecting the fact that forest resources are not abundant in the country. The structure of the demand for wood in 1989 is shown in Table III-3. Wood for fuel accounts for about 70% of the demand and wood for industrial use accounts for about 30%, of which only 4.5% is used for pulp wood.

4.2 Log Supply to Aksu Mill

4.2.1 Lumber Production in the Forest Districts around Aksu

- (1) Logs are currently supplied to Aksu mill from five Forest Districts, namely Giresun, Artvin, Trabzon, Erzurum and Amasuya.

Conifers include pines, spruces and firs, while beeches predominate in broadleaf trees. Table III-4 shows the 1989 actual output of lumber for industrial use classified by kinds of trees.

Table III-3 USE AND DEMAND OF WOOD IN TURKEY IN 1989

	DEMAND		SHARE	
	QUANTITY	VALUE	QUANTITY	VALUE
	(1000 M3)	(MILL. TL)	(%)	(%)
PRODUCTION				
Industrial Wood	10800	1182158	31.3	60.7
-Log	6250	888928	18.1	45.7
-Wooden Pole	180	21060	0.5	1.1
-Mine Poles	570	51300	1.6	2.6
-Pulp Log	1550	109250	4.5	5.6
-Wood Chip	1480	57720	4.3	3.0
-Others	770	53900	2.2	2.8
Fire Wood	23750	617500	68.7	31.7
Other NW Product	N.A.	146421	0.0	7.5
Total	34550	1946079	100.0	100.0
EXPORT				
Industrial Wood	47	11984	100.0	25.3
Other NW Product	N.A.	35412	0.0	74.7
Total	47	47396	100.0	100.0
IMPORT				
Industrial Wood	1250	191228	100.0	61.6
Other NW Product	N.A.	119326	0.0	38.4
Total	1250	310554	100.0	100.0
NET DEMAND				
Industrial Wood	12003	1361402	33.6	61.6
Fire Wood	23750	617500	66.4	28.0
Other NW Product	N.A.	230335	0.0	10.4
Total	35753	2209237	100.0	100.0

Table III-4 INDUSTRIAL WOOD PRODUCTION IN 1989

(Unit:m3)

	AMASYA	ARTVIN	ERZURUM	GIRESUN	TRABZON	TOTAL
SOFT WOOD						
Cedar	0	0	0	0	0	0
Juniper	0	0	0	0	0	0
Redpine	10900	0	0	0	0	10900
Other Pines	206400	18400	103000	12600	16000	356400
Spruce	0	87600	1000	44700	47100	180400
Fir	11800	47500	0	1700	6000	67000
TOTAL	229100	153500	104000	59000	69100	614700
HARD WOOD						
Oak	700	400	10000	200	0	11300
Hornbeam	0	0	0	1000	0	1000
Beech	96000	47900	0	54900	7800	206600
Poplar	3600	0	0	200	0	3800
Alder	0	2800	0	6000	4800	13600
Others	2600	45400	13000	28700	21300	111000
TOTAL	102900	96500	23000	91000	33900	347300
GRAND TOTAL	332000	250000	127000	150000	103000	962000
SHARE (%)	34.5	26.0	13.2	15.6	10.7	100.0

- (2) Actual production of pulp wood in the five Forest Districts is shown in Table III-5. Pulp wood is not produced in the Erzurum District. Only conifers are used for pulp wood, and spruces predominate, followed by pines and then firs.

4.2.2 Prospects for Log Supply

As shown in Table III-5, pulp wood supply from the districts around Aksu decreased year after year during the past five years. It will not be long before pulp wood supply drops below 160,000 cubic meters.

Upon the Team's inquiry about prospects for log supply to Aksu mill, the Ministry of Agriculture and Forestry revealed that it had a plan of 220,000 cubic meters, as shown in the lower sections of Table III-6. A supply plan presented by SEKA is shown in Table III-7. SEKA says it can supply 180,000 cubic meters by firs and spruces alone and that a further supply of as much as 90,000 cubic meters is possible by pines. Either prospect is optimistic.

On the other hand, past data show it will be difficult to maintain the supply level of the 150,000 cubic meters. It would be necessary to get a Government's strict promise for long-term supply, taking the potential availability of pine wood into consideration. Further investigation is needed in this respect.

Utilization of waste paper is an effective measure for copying with unstable log supply as well as for energy saving.

The following should additionally be reviewed.

- a. Stepped-up afforestation
- b. Utilization of broadleaf trees (TMP etc.)

TABLE III-5 PULPWOOD PRODUCTION BY SPECIES IN GIRESUN AREA

(Unit:m3)

	1985	1986	1987	1988	1989	TOTAL	Share(%)
Red Pine		1000	4400	4400	6000	15800	1.6
Other Pine	49700	51000	49500	45800	44100	240100	24.9
Spruce	166700	118500	97200	90800	83600	556800	57.7
Fir	38600	32500	26500	27400	27300	152300	15.8
Total	255000	203000	177600	168400	161000	965000	100.0
Share (%)	26.4	21.0	18.4	17.5	16.7	100.0	

TABLE III-6

PULPWOOD SUPPLY IN GIRESUN AREA

(Unit:m3)

	ANASYA	ARTVIN	ERZURUM	GIRESUN	TRABZON	TOTAL
1985	30000	80000	0	86000	59000	255000
1986	38000	45000	0	70000	50000	203000
1987	48000	40400	0	45600	40000	174000
1988	42400	45000	0	46000	35000	168400
1989	46000	50000	0	40000	25000	161000
1990	64889	50667	0	65450	39370	220376
1991	64889	50667	0	65450	39370	220376
1992	64889	50667	0	65450	39370	220376
1993	64889	50667	0	65450	39370	220376
1994	64889	50667	0	65450	39370	220376

TABLE III-7 RAW MATERIAL SUPPLY ESTIMATION BY SEKA

	Spruce/Fir (cu.m)	Spruce/Fir (Additional) (cu.m)	Pine (1) Silvestris (cu.m)	Pine (2) Nigra (cu.m)	Pine (3) Martima (cu.m)	Pine Total (cu.m)	Log Total (cu.m)	Waste Paper (MT)
1994	180,000	0	60,000	30,000	10,000	100,000	280,000	35,000
1995	180,000	0	60,000	30,000	10,000	100,000	280,000	35,000
1996	180,000	0	60,000	30,000	10,000	100,000	280,000	35,000
1997	180,000	0	60,000	30,000	10,000	100,000	280,000	35,000
1998	180,000	0	60,000	30,000	10,000	100,000	280,000	35,000
1999	180,000	60,000	60,000	30,000	10,000	100,000	340,000	35,000
2000	180,000	60,000	60,000	30,000	10,000	100,000	340,000	35,000
2001	180,000	60,000	60,000	30,000	10,000	100,000	340,000	35,000
2002	180,000	60,000	60,000	30,000	10,000	100,000	340,000	35,000
2003	180,000	60,000	60,000	30,000	10,000	100,000	340,000	35,000
2004	180,000	60,000	60,000	30,000	10,000	100,000	340,000	35,000
2005	180,000	60,000	60,000	30,000	10,000	100,000	340,000	35,000
2006	180,000	60,000	60,000	30,000	10,000	100,000	340,000	35,000
2007	180,000	60,000	60,000	30,000	10,000	100,000	340,000	35,000
2008	180,000	60,000	60,000	30,000	10,000	100,000	340,000	35,000

NOTE : The additional spruce and fir would be supplied only when the Izmit Pulp Mill would be shutdown.

The resource of Pine (3) (i.e. Pinus Maritima) is preferably preserved and not used for the project unless wood supply is critical.

4.3 Auxiliary Raw Material and Auxiliary Material Supply System

4.3.1 Present Conditions and Problems in BKP Supply

- (1) The use of homemade pulp has been discontinued on account of its inferior quality and imported BKP has been used since 1988.
- (2) As of the end of 1989, BKP inventory reached a supply for 11 months, resulting in excessive inventory. The pulp yard became full and a considerable amount of pulp that cannot be stored in the yard is placed outdoors causing deterioration in quality.
- (3) As BKP is expensive, efforts should be made to use homemade low-priced pulp.
- (4) Conditions for pulp purchases need improvement from the viewpoint of inventory adjustment and expenses to be borne.

4.3.2 Present Situation of Chemicals Supply

(1) Alum

Inventory is too large. Inventory should be reduced as much as possible because alum, domestically made, can be obtained in a short period.

(2) Dyestuffs

Inventory is too large. This seems to be attributable to the fact that an order is placed only once a year. Inventory should be reduced by improvement in purchase because dyestuffs are domestically produced and purchased in small lots.

(3) Slime control agent and other chemicals

Inventory is too large. There is enough room for improvement in lot conditions and delivery of slime control agent imports. Other chemicals have the same problem, which should be solved.

4.3.3 Wrapping Material

- (1) Kraft paper is used. It is supplied from SEKA's Ismit mill.

Excessive inventory is a problem.

IV. ALTERNATIVE IN PLANNED RENOVATION

1. Preconditions for Renovation Planning

1.1 Equipment and Production Conditions

(1) Alternatives

Case 1: Capacity: 100,000 tons/year
Case 2: Capacity: 130,000 tons/year

(2) Product quality

- Goal of quality: quality that satisfies the demand in the international market
- Goal of basis weight: 45 grams/sq. m

(3) Raw material

- A consumption of 100 BDT/day of imported waste paper Logs are limited to 180,000 m³/year spruces and firs. Shortage is to be covered by pine logs (limited to 90,000 m³/year).
- Imported BKP should be used.

(4) Environmental measures

- Waste water should be treated at the planned facilities. DIP should be treated at separate facilities in view of special characteristics of contaminants in it.
- Sediment of waste water and other wastes should be incinerated.

(5) Execution schedule

October 1990 : F/S completed
January 1992 : Government's approval
February 1992-: Preparation for execution, financing
January to August 1993: Preparation for bidding,
bidding, appraisal of bids
October 1993 : Conclusion of a construction contract
November 1993-: Commencement of construction
October 1995 : Start of production in Case 1
May 1996 : Start of production in Case 2

(6) Capacity of the existing equipment

Capacity of the existing equipment is estimated at
74,700 tons/year.

1.2 Management and Operational Technology

In order to attain planned renovation and produce products that have international competitiveness, improvement of equipment is not sufficient. Improvement in managerial and operational technologies is indispensable.

The planned renovation therefore is based on simultaneous execution of equipment improvement and managerial and operational technology improvement.

2. Renovation Execution Schedule

2.1 Major Renovations

2.1.1 Logs and Processing Process (common to Case 1 and Case 2)

- Improvement in the log acceptance plan (inventory adjustment)
- Improvement in yard utilization (adherence to FIFO)
- Storage classified by kinds of trees (for uniformity of raw material)
- Addition of showers at the log pond (moisture control)
- Improvement of the rotary screen for treating waste water from the drum barker room (for improved waste water)

2.1.2 Equipment Improvement in the Grinding Process

The planned equipment improvement in the grinding process is mainly aimed at improvement in pulp quality. There is no particular problem with capacity in both Cases.

- Improvement of the grinder stone (disusing 46 mesh stones)
- Remodeling of the shredder system (remodeling of the bull screen plate)
- Renewal of the primary pressure screen (introduction of a differential pressure type screen)
- Improvement of the reject treatment system (expansion of the refiner system, renewal and improvement of the screen system, addition of cleaners)
- Installation of another centri-cleaner
- Installation of another polydisk filter (Case 2 only)

Improvement in quality and operations

- Equipment of measuring instruments
- Preparation and maintenance of current material flow and a material balance sheet

FIG. IV-1 WOOD GRINDING FLOW SHEET (CASE-1 100,000T/Y)

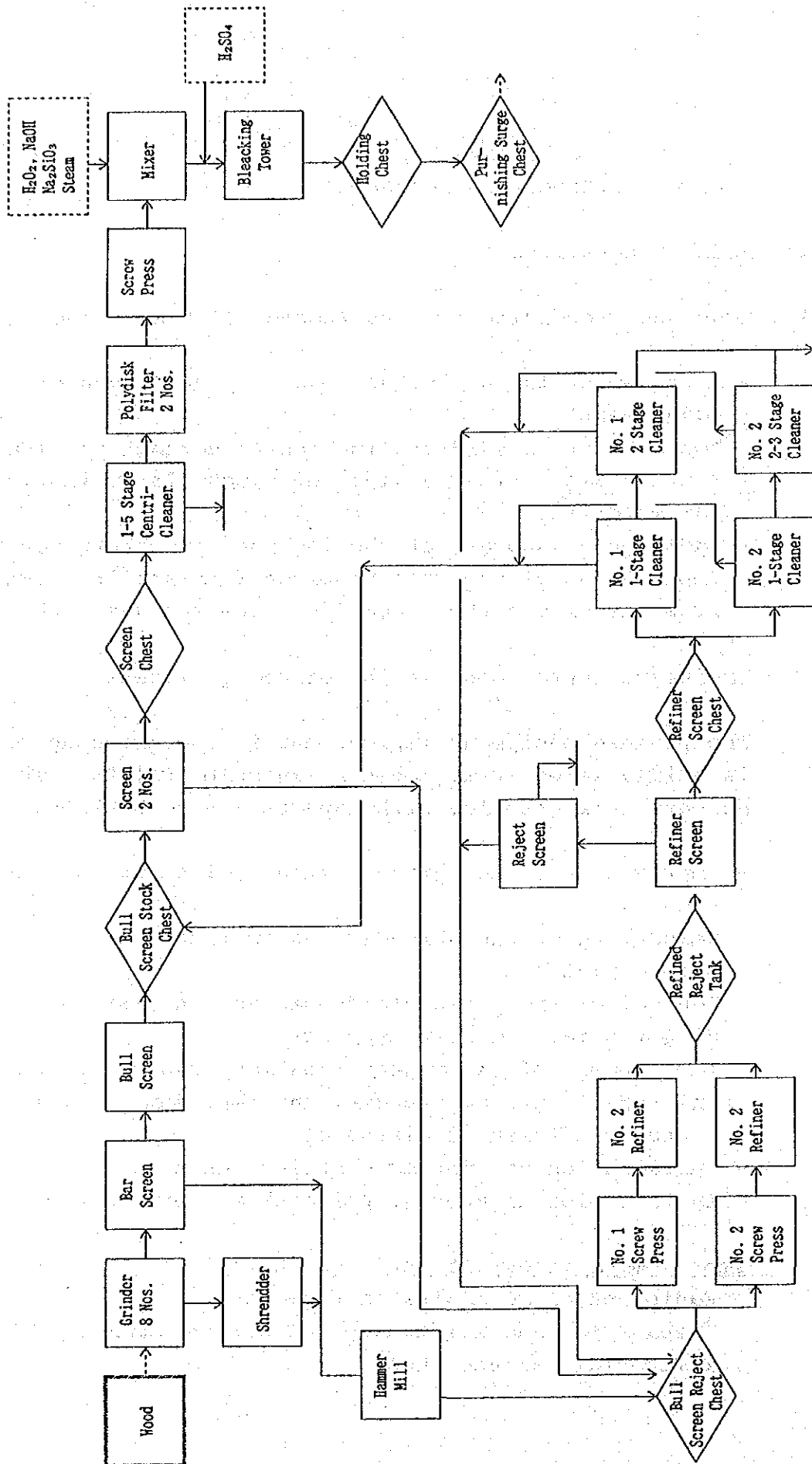
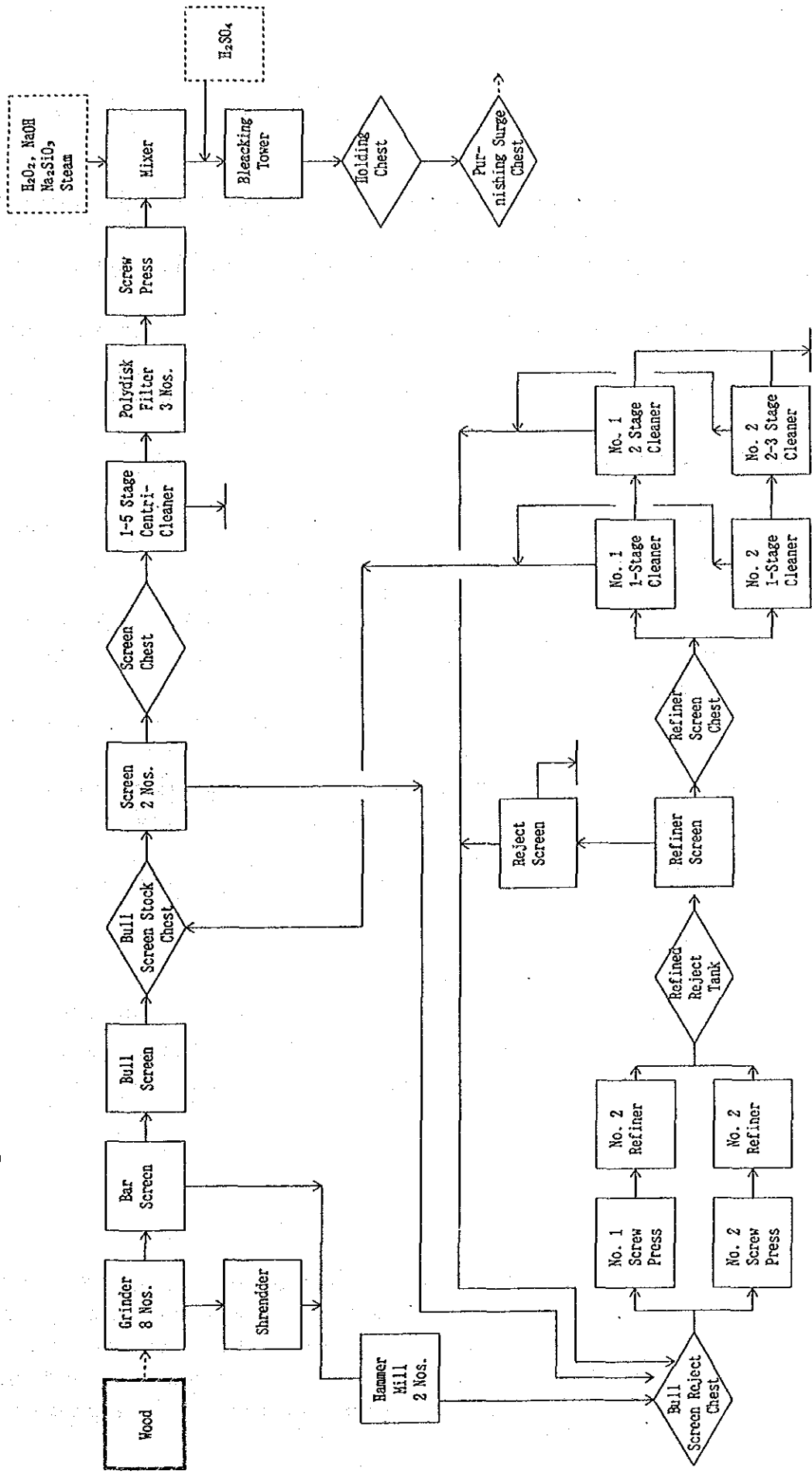


FIG. IV-2 WOOD GRINDING FLOW SHEET (CASE-2 130,000T/Y)



- Shortened intervals of grinder burring and improvement in unit power requirement
- Improvement in grinder showering and utilization of white water
- Improvement in conveyance technique in the refiner treatment system
- Improvement in freeness control of GP finishing stock

2.1.3 Preparation Process

- Separation and remodeling of the dry bark and wet bark processing systems
- New installation of a WB accepting chest
- Change and remodeling of the white water recovery medium
- Replacement of diluting water by white water for pulp consistency control
- Installation of measuring instruments pertaining to new installation of DIP
- Removal of the Jordan in front of the machine head box
- Introduction of CRT in the control system of the preparation room
- Remodeling for raising temperature of BKP dissolved pulp

2.1.4 Papermaking Process

Renovation in the papermaking process is the nucleus of the planned renovation. It is aimed at improved product quality as well as expanded production capacity.

(1) Outline of the plan

Case 1: 100,000 tons/year

Renovation is aimed at equipment improvement that will not become old-fashioned in the future in operability, maintenance and productivity, by utilizing the existing equipment as much as possible based on diagnosis and by making the most of the charac-

teristics of the Fourdrinier machine. Renovation has been planned with a view to improving product quality, reducing investment cost, reducing loss from suspended operation for renovations by shortening the period of stoppage, and attaining the goal of producing super light-weight paper of 45 grams/square meter at a papermaking speed of 760 meters/minute.

Case 2: 130,000 tons/year

Renovation is aimed at satisfying the increasing demand for newspaper in Turkey. In Case 2, where a papermaking speed of 1,000 meters/minute is required, the existing equipment is insufficient in strength, as a result of diagnosis. New apparatuses are needed except the drier, cylinder, gear, and gear case. Renovation has been planned based on the twin former type paper machine, which is most popular in high speed production of super light-weight paper.

(2) Planned production

See Table IV-1 as follow:

Table IV-1 Planned Output in Renovation

	Cur.equipment	Case 1	Case 2
a. Prod. cap.	74,700 t/y	100,000 t/y	130,000 t/y
b. Op. days	300 days	330 days	330 days
c. Basis wt.	49 g/sq.m	45 g/sq.m	45 g/sq.m
d. Output (at winder)	249 t/d	303 t/d	A. 394 t/d B. 408 t/d
e. Theoret. efficiency	100% (304 t/d)	100% (344 t/d)	100% A. (438 t/d) B. (454 t/d)
f. Efficiency at reel	88% (268 t/d)	93% (326 t/d)	95% A. (416 t/d) B. (431 t/d)

g. Product efficiency	82% (249 t/d)	88% (303 t/d)	90% A. (394 t/d) B. (408 t/d)
h. Material balance	304 ADT/d 282 BDT/d	334 ADT/d 320 BDT/d	A. 438 ADT/d B. 454 ADT/d A. 407 BDT/d B. 422 BDT/d

Note) A: average operation speed
 B: max. operation speed (1000 m/min)
 ADT: moisture content 7%
 BDT: moisture content 0%

(3) Specifications of machine remodeling

See Table IV-2 as follow:

Table IV-2 Specifications of Machine Remodeling

	Cur. equipment	Case 1	Case 2
a. Machine type	Fourdrinier	On top wire	Twin wire
b. Wire width	7,520 mm	7,520 mm	7,700 mm
c. Paper width			
Reel	7,000 mm	7,000 mm	7,000 mm
Winder	6,900 mm	6,900 mm	6,900 mm
d. Op. speed	m/min	760 m/min	1,100 m/min
e. Max.design speed	760 m/min	760 m/min	1,100 m/min
f. Roll balance		760 m/min	1,100 m/min
g. Winder design			max.2,500 m/min

(4) Details of renovation in Case 1

1) Dust cleaner and degasser

- Installation of a cleaner (fourth) and a screen (third)

- Renewal of the fan pump motor
- Installation of cleaners and screen pumps (5 units)
- Relocation of the stack box
- Installation of a pulsating attenuator

2) Replacement of the head box (hydraulic type)

Head box proper, recirculation valve, warm water feeding device, operation panel

3) Wire part remodeling

- Attachment of a top former
- Other remodeling:

Installation of a filter in the roll shower system, improvement of the sheet knock off shower and trim knock off shower, improvement in feed water for the trimming jet nozzle cutter, relocation of the nozzle cutter, recovery equipment for dehydrated white water in the suction couch roll

4) Press part remodeling

- Remodeling of major rolls (No. 2 press top roll, No. 3 press bottom roll, suction felt roll)
- Relocation of the felt roll
- Relocation of the paper roll
- Installation of another felt suction box
- Installation of a steam box
- Equipment pertaining to No. 2 and No. 3 press remodeling
- Other remodeling: improvement of the broke shoot shower, installation of a doctor shower for the center roll and 3P top roll, repairs of the doctor sliding device for them

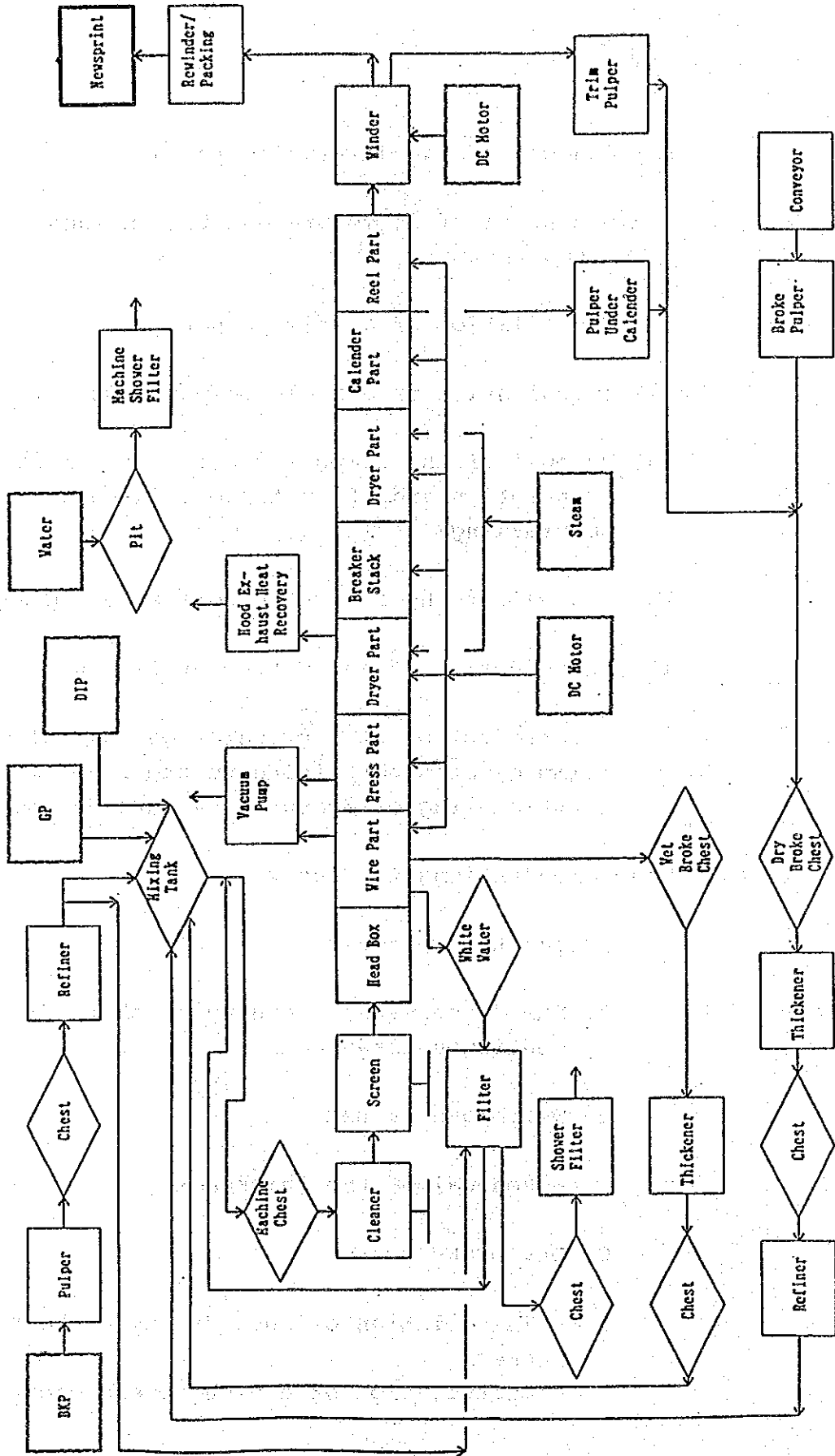
- 5) Increase and remodeling of vacuum pumps
- 6) Drier part remodeling
 - Installation of a pocket ventilation
 - Attachment of a drain diffusion bar
 - Improvement of the steam blower
 - Change of the paper drier of Group 1 to canvas, installation of another doctor
 - Installation of a sheet transfer box
 - Renewal of the tail cutter
 - Remodeling of the lubrication piping of the drier
 - Improvement in the drainage system
 - Improvement of the calender
- 7) Renewal of the drier hood and the complete unit of the exhaust heat recovery system
- 8) Reuse of the breaker stack
- 9) Remodeling of the calender
- 10) Improvement in broke processing at the calender pit
- 11) Winder improvement
 - Installation of a paper tension controlling device
 - Installation of a roll hardness controlling device
 - Installation of a roll length indicator

- 12) Renewal of the driving equipment
 - Renewal of 24 motors and the incidental equipment
- 13) Installation of a trim pulper
- 14) Installation of a broke pulper downstairs
- 15) Renewal of the pumps (12 units pertaining to preparation and 16 units pertaining to papermaking)
- 16) Renewal of the automatic roll wrapping machine
- 17) Introduction of an instrumentation system
 - Introduction of a preparation control system
 - Improvement pertaining to the paper machine (remodeling of Measurex -- introduction of CRT)

(5) Major renovations in Case 2

- 1) Preparation process
 - A. BKP dissolving: changing batch feeding into continuous feeding
 - B. Wet broke system
 - Renewal of the thickener
 - C. Dry broke system
 - Installation of another dry broke receiving chest
 - Installation of a high consistency cleaner

FIG. IV-3 PAPERMAKING PROCESS FLOW SHEET (CASE-1 100,000T/Y)



- Installation of a break machine exclusively for dry broke

D. White water recovery system

- Installation of another polydisk filter

2) Paper machine equipment

A. Dust cleaner and degasser

- Installation of a cleaner (fourth) and screen (third)
- Renewal of the fan pump motor
- Installation of pumps (5 units) for the cleaners and screens
- Relocation of the stack box
- Installation of a pulsating attenuator

B. Replacement of the head box (hydraulic type)

Head box proper, recirculation valve, warm water feeding device, operation panel

C. Wire part

Total change into gap former type

E. Press part

Renewal of the whole part

F. Lubrication system (centralized lubrication system)

Newly installed for the wet end main bearing, to cope with high speed operation.

G. Addition and remodeling of vacuum pumps

H. Drier part

- Installation of a pocket ventilation
- Attachment of a drain diffusion bar
- Total renewal of the canvas roll
- Drier cylinder balance control
- Replacement of the steam blower
- Change of the paper drier of Group 1 into canvas
- Installation of a sheet transfer box
- Renewal of the tail cutter
- Remodeling of the drier lubrication piping
- Remodeling of the drainage system

I. Renewal of the drier hood and the complete unit of the heat recovery system

J. Reuse of the breaker stack

K. Remodeling of the calender

Renewal of the complete unit except the bottom roll

L. Reel

Change into a surface reel equipped with a full automatic spool changing device

M. Improvement in broke processing at the calender pit

N. Addition and renewal of winders

- Addition of one 2-drum winder
- Renewal of the control system of the existing winder

O. Renewal of the driving equipment

- Renewal of 9 motors and the incidental equipment

P. Installation of a trim pulper

Q. Installation of a broke pulper downstairs

S. Renewal of the pumps (15 units for preparation and 20 units for papermaking)

T. Renewal of the roll wrapping machine

Process flow for the preparation and paper making processes is as shown in Fig. IV-4.

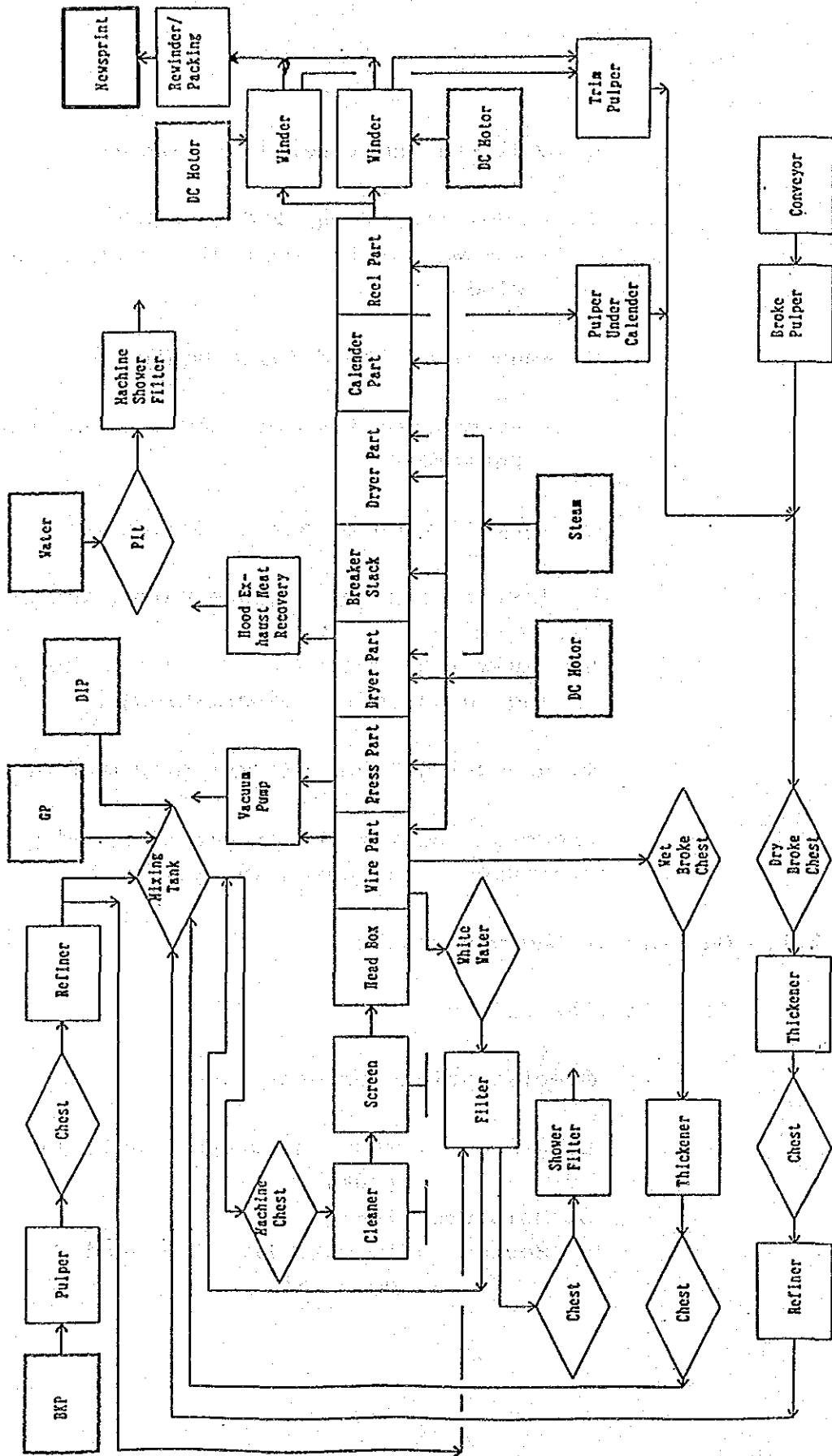
2.1.5 Outline of the DIP Process

(1) Outline of the plan

1) Specifications of waste paper

- a. Grade : waste newspaper (80%) and magazines (20%)
- b. Moisture: 10%
- c. Source : imports from U.S. and European countries

FIG. IV-4 PAPERMAKING PROCESS FLOW SHEET (CASE-2 130,000T/Y)



2) Production capacity conditions

- a. Amount of waste paper for processing:
100 BDT/day
- b. DIP output:
85 BDT/day

3) Product quality

Brightness : Hunter 55°

4) Location for installation

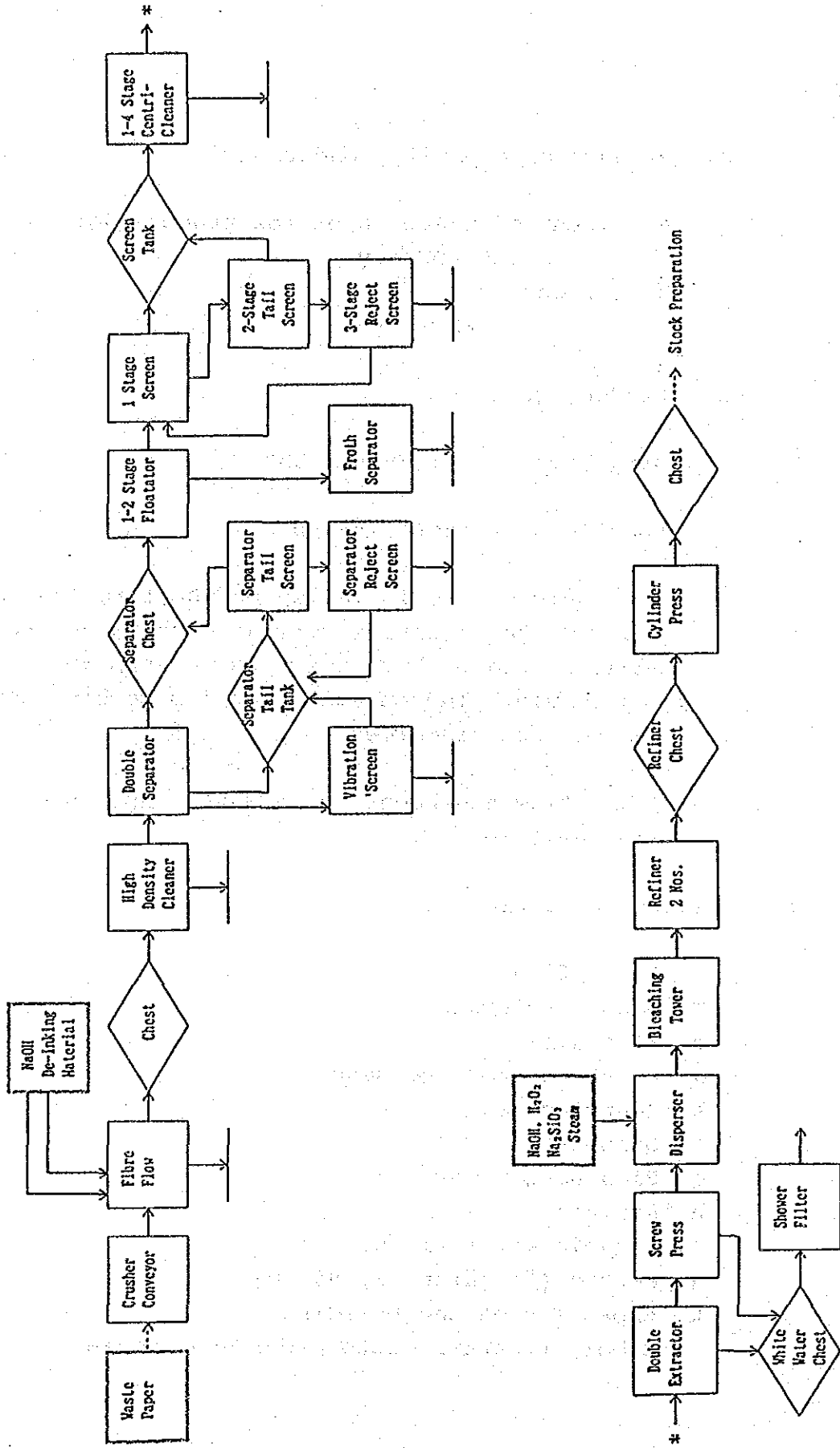
The equipment is installed on the first and second floor of the existing wet lap machine and the adjacent place where there was a supplies storehouse. The existing wet lap machine is removed and discarded.

Fiber flow equipment and a waste paper storehouse are built outdoors.

(2) Major apparatuses

- a. Fiber flow
- b. Double separator
- c. Flow data
- d. First to third screens
- e. Centri-cleaner
- f. Disperser
- g. Bleaching tower
- h. Refiner
- i. Recycle water filter
- j. Motors (91 units, 2,486 kW)
- k. Expansion of the building
- l. Steel structure waste paper storehouse

FIG. IV-5 DIP FLOW SHEET



2.1.6 Auxiliaries

(1) Utility equipment

1) Boiler

Current capacity of the boilers is sufficient for planned renovation, in which rationalization and energy saving are promoted.

	<u>Present</u>	<u>Case 1</u>	<u>Case 2</u>
Steam consumption	48.3 t/h	45.1 t/h	49.1 t/h
Boiler load	46.6 t/h	43.5 t/h	47.3 t/h

2) Electricity

Power consumption after renovation is as follows. Expansion of the existing receiving equipment is unnecessary.

	<u>Present</u>	<u>Case 1</u>	<u>Case 2</u>
Power consumption	20,234 kWh	19,673 kWh	27,601 kWh
In-plant generation	3,479	3,252	3,536
Purchased electricity	16,755	16,421	24,065

3) Feed water

Water saving by utilization of white water and recycle of cooling water in the process will reduce unit water requirement to a large extent. Expansion of the water intake facilities is not needed.

	<u>Present</u>	<u>Case 1</u>	<u>Case 2</u>
Water consumption	850.0 t/h	747.7 t/h	977.7 t/h

(2) Waste water treatment equipment

1) Measures by SEKA

Currently waste water treatment is not conducted at Aksu mill. However, installation of waste water treatment equipment is planned to cope with the regulations by the Government. The equipment is expected to be completed at the end of 1992. The equipment, based on the gravity settling method, is for one-stage treatment. Treated water is discharged to the depths of the sea (the Black Sea) through a pipe.

As the installation is to be completed before the execution of renovations, measures are taken into consideration only if waste water exceeds the planned amount for treatment--860 cubic meters/hour, or if there are changes in quality of waste water. Water quality planned at Aksu mill and the stipulated values are shown in the following table.

<u>Item</u>	<u>Unit</u>	<u>Present</u>	<u>Goal at Aksu mill</u>	<u>Reg. val. to deep sea</u>	<u>Reg. val. to rivers</u>
pH		6.5-7.7	6 - 7	6 - 9	6 - 9
Temp.	°C	27 - 29	25 - 30	35	35
SS	mg/lit	690	20	350	-
BOD 5	mg/lit	270	170	250	35
COD	mg/lit	700	350	400	100

2) Waste water treatment of the DIP plant

As waste water from the DIP plant contains solutes in quantities, showing a high BOD value, effective treatment cannot be expected from the waste water treatment equipment now planned in Aksu mill. In planned renovation, waste water from the DIP plant is separated, given physical and biochemical treatment and then discharged to the river.

3) Waste water treatment in the bleaching process at GP plant

The increment in waste water treatment load in the bleaching process to be added in the GP plant will be treated with the equipment to be installed by SEKA.

4) Waste matter treatment

Waste matter from the DIP plant, sludge from the waste water treatment equipment and bark are burned in an incinerator, and ashes are used for land reclamation. As the incinerator is fed with waste matter that contains a great deal of water, steam cannot be recovered.

The present state of feed water, white water, waste water and water material and the balance flow after implementation of the waste water treatment plan for Case 1 and 2 are as shown in Figs. IV-6, IV-7, IV-8 and IV-9 respectively.

Fig. IV-6 OVER ALL FLOW DIAGRAM OF MILL WATER, WHITE WATER, WASTE WATER AND INDUSTRIAL WASTES
Existing Scheme-1 (without SEKA's Plan)

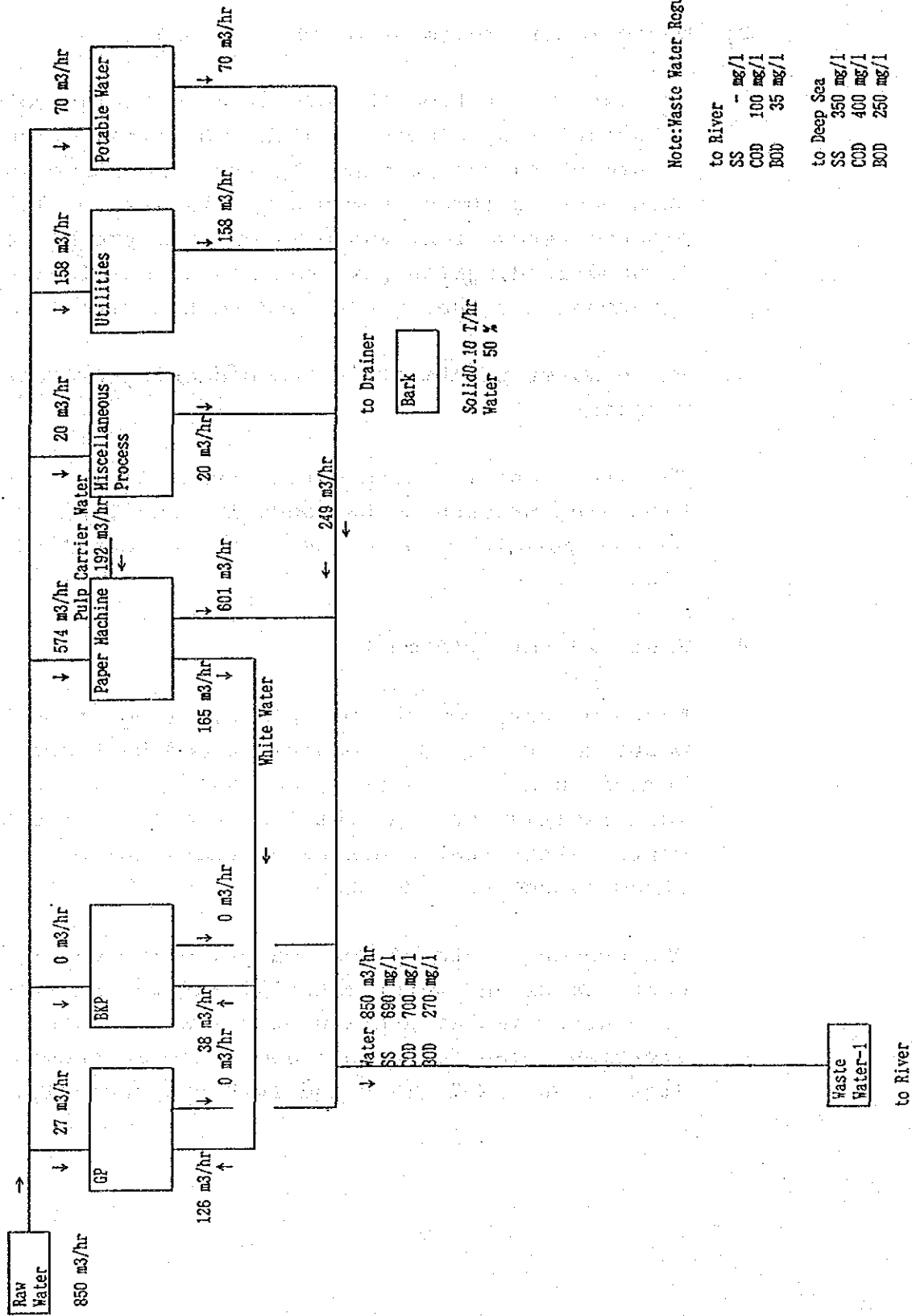


Fig. IV-7 OVER ALL FLOW DIAGRAM OF HILL WATER, WHITE WATER, WASTE WATER AND INDUSTRIAL WASTES
Existing Scheme-2 (with SEKA's Plan)

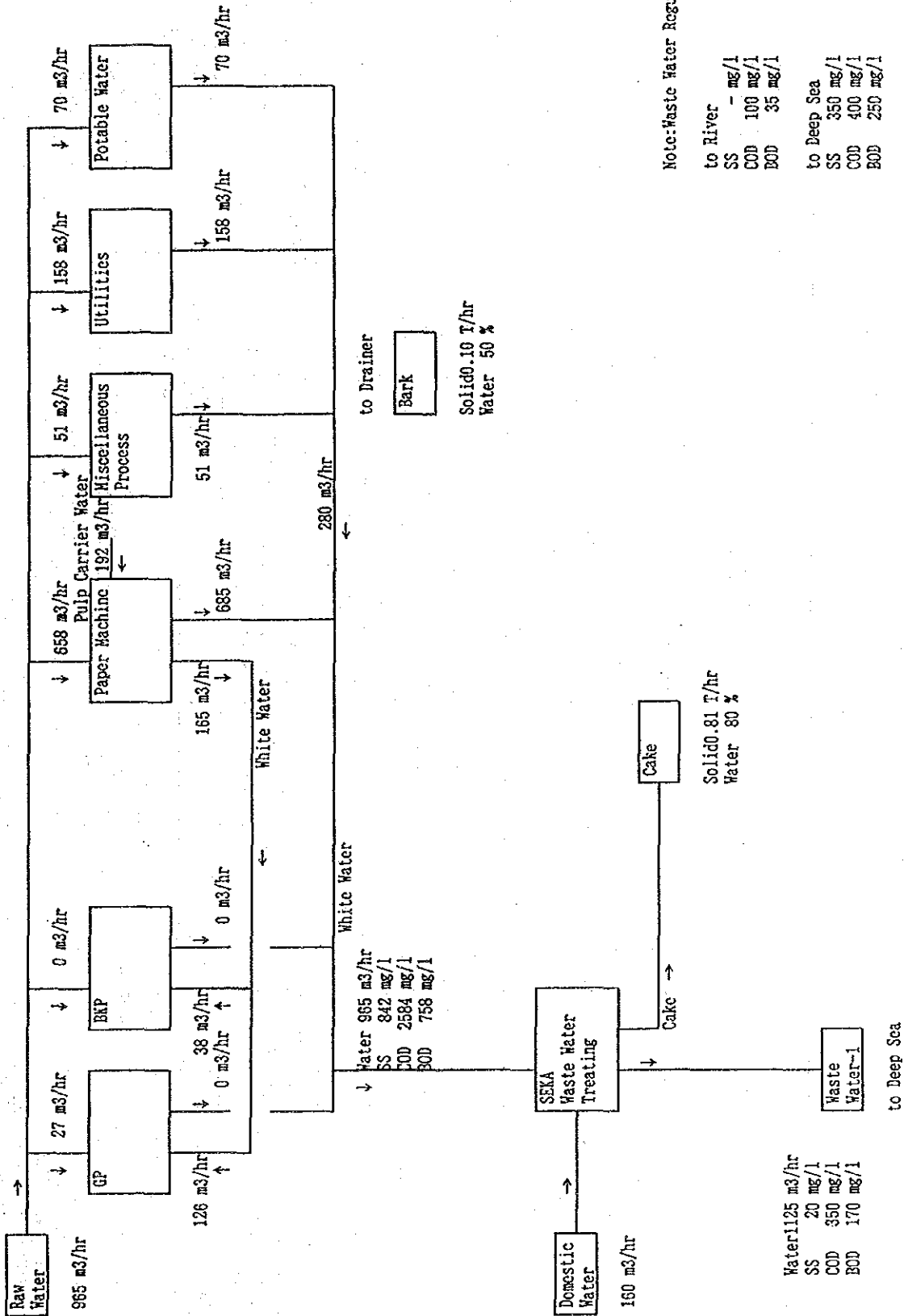


Fig. IV-8 OVER ALL FLOW DIAGRAM OF MILL WATER, WHITE WATER, WASTE WATER AND INDUSTRIAL WASTES
Case-1

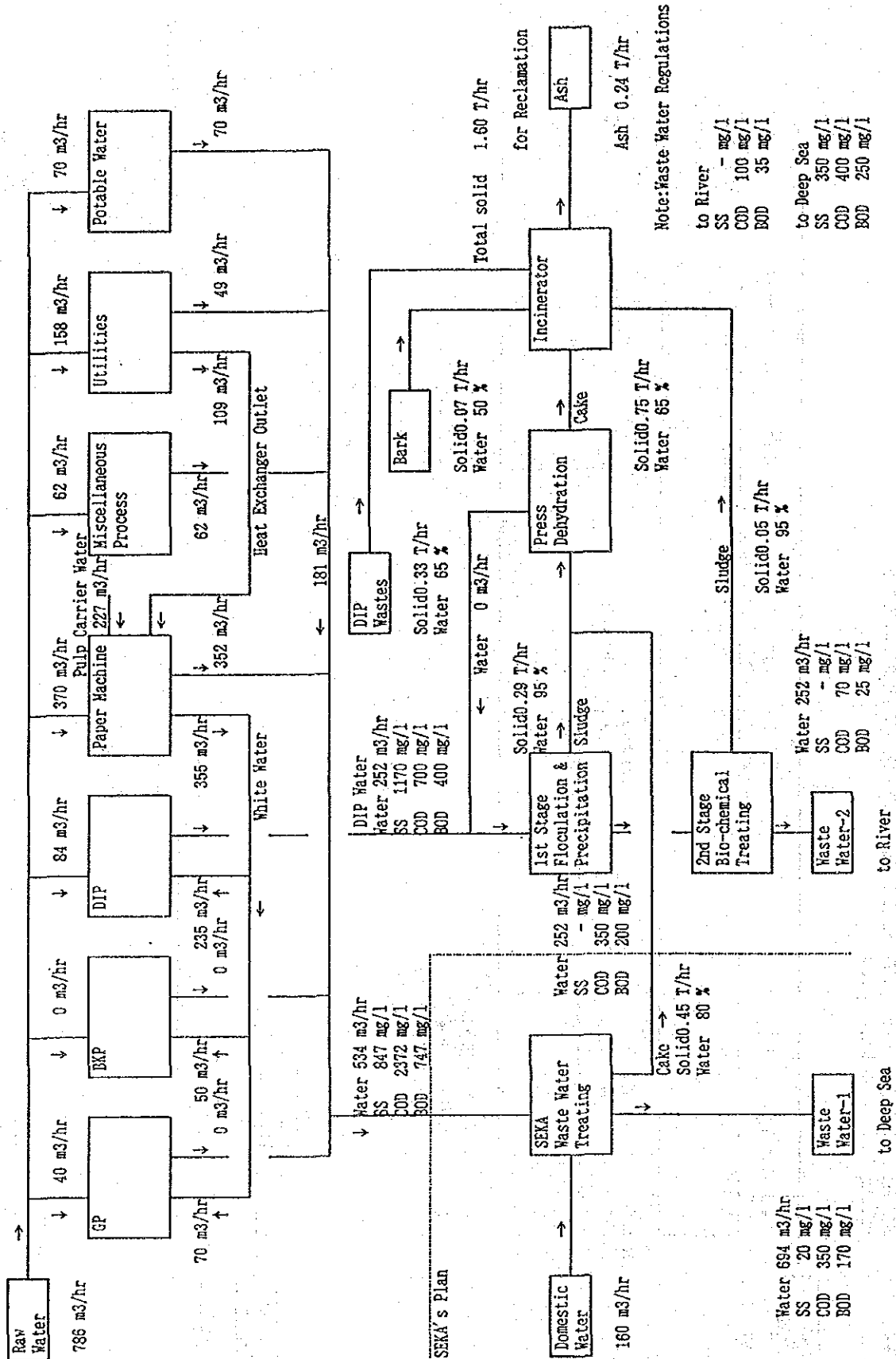
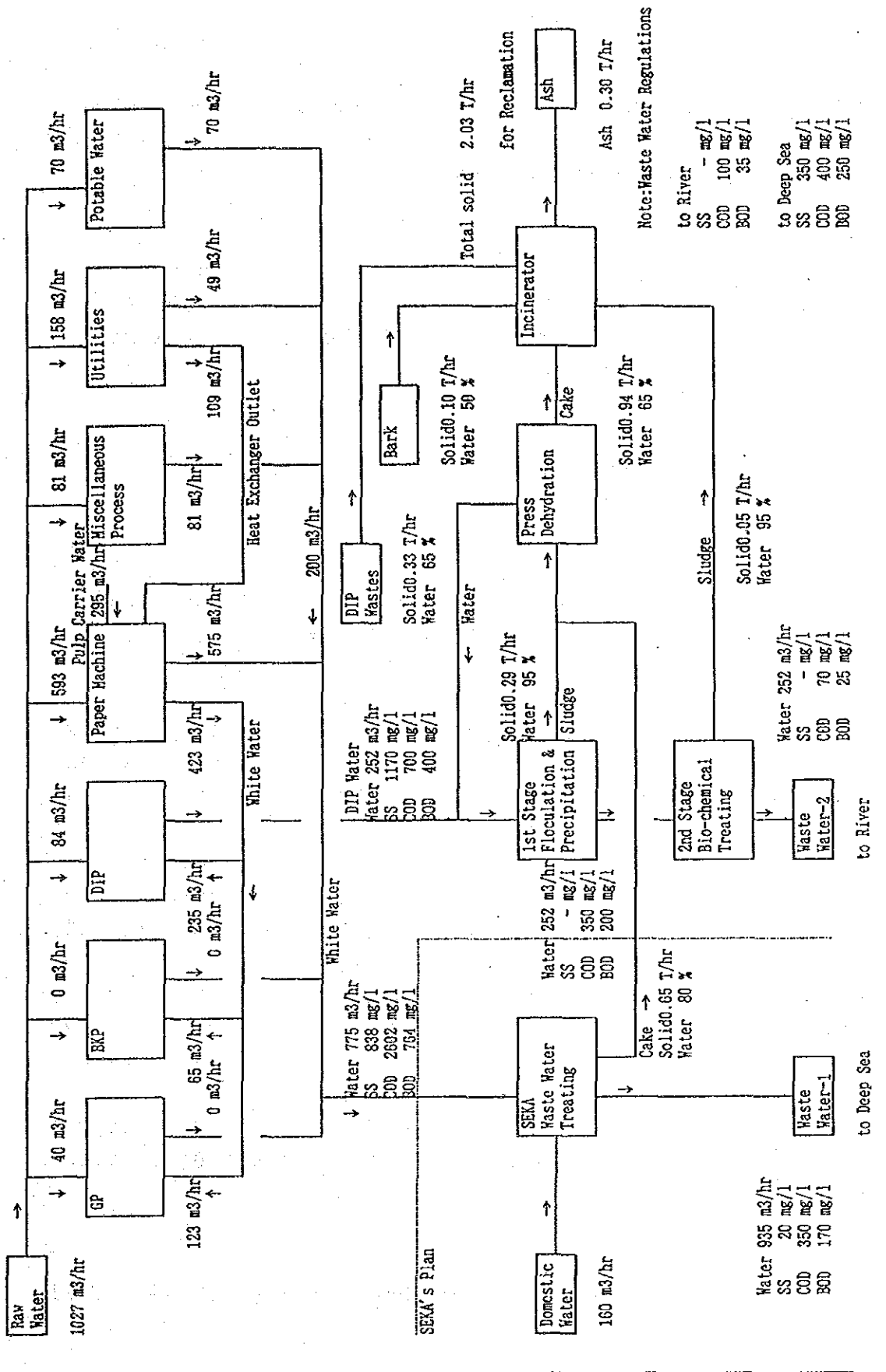


Fig. IV-9 OVER ALL FLOW DIAGRAM OF HILL WATER, WHITE WATER, WASTE WATER AND INDUSTRIAL WASTES
Case-2



2.2 Improvement in Unit Requirements after Renovation

2.2.1 Unit Utility Requirement

<u>Utility</u>	<u>Present</u>	<u>Case 1</u>	<u>Case 2</u>
Steam	4.66 t/t	3.57 t/t	2.99 t/t
Power	1,950 kWh/t	1,558 kWh/t	1,681 kWh/t
Feed water	81.9 t/t	59.2 t/t	59.6 t/t

2.3 Process Flow, Layout

2.3.1 Material Balance

The following table shows material balance. Major conditions are shown in the table.

		Present	Case 1	Case 2
Annual output	ADT/Y	74,700	100,000	130,000
Finishing efficiency	%	82	88	90
Stock loss at P/M	%	0.5	0.54	0.345
Other stock loss	%	1.5	0.8	0.8
Circulation rate at P/M	%	15	18.4	24.9
Total qty. of stock	BDT/Y	72,828	94,575	123,028
BKP ratio	%	20	20	25
BKP amount	BDT/Y	14,566	18,915	30,757
DIP ratio	%	-	30	23
DIP amount	BDT/Y	-	28,050	28,050
GP ratio	%	80	50	52
GP amount	BDT/Y	58,262	47,610	64,221
Qty. of logs	cub.m/Y	176,551	144,270	194,609
Pine consumption	%	5 - 10	0	10

Material balance flow is shown in Fig. IV-10, IV-11.

FIG. IV-10 MATERIAL BALANCE (CASE-1 100,000T/Y)

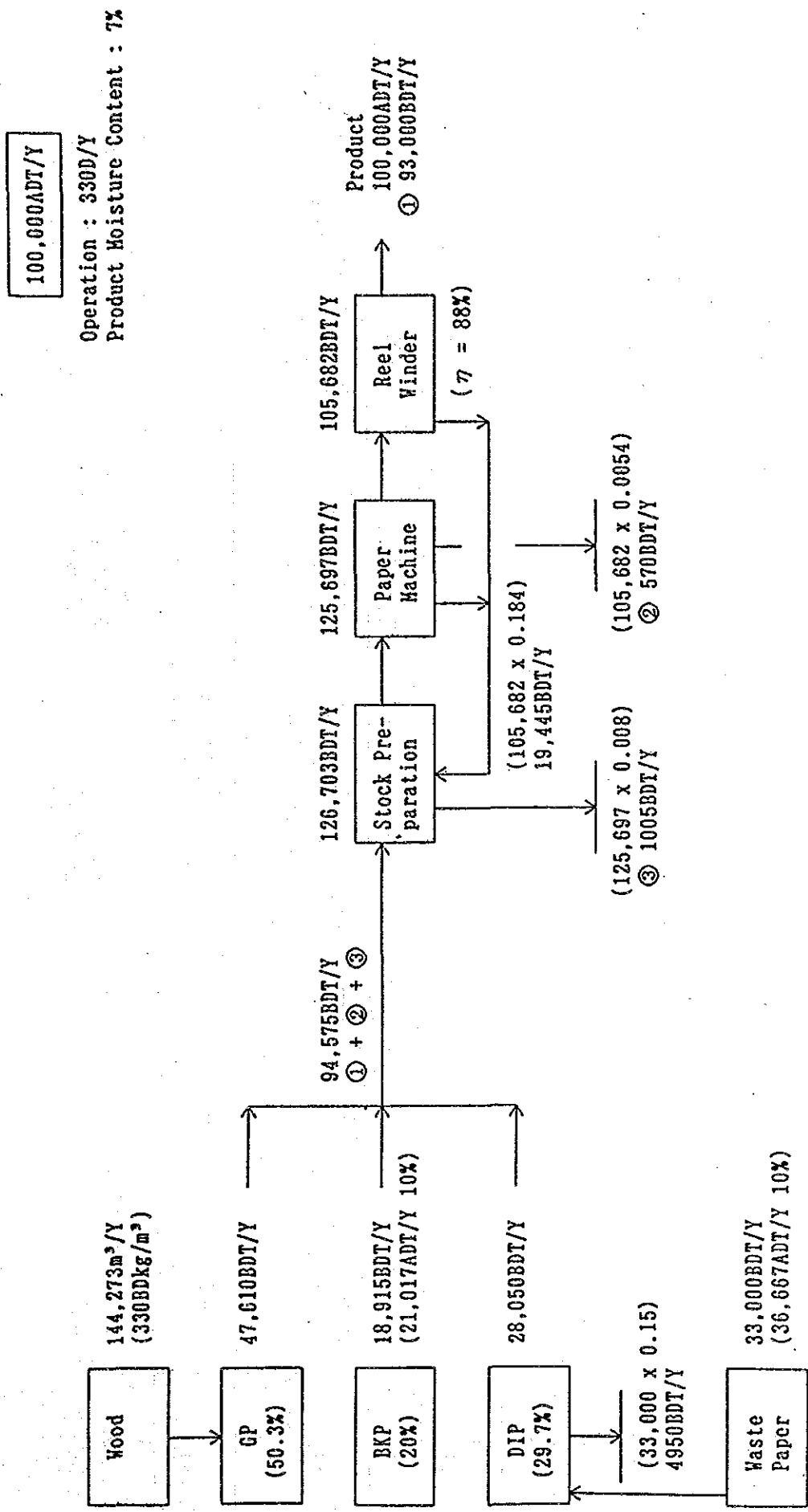
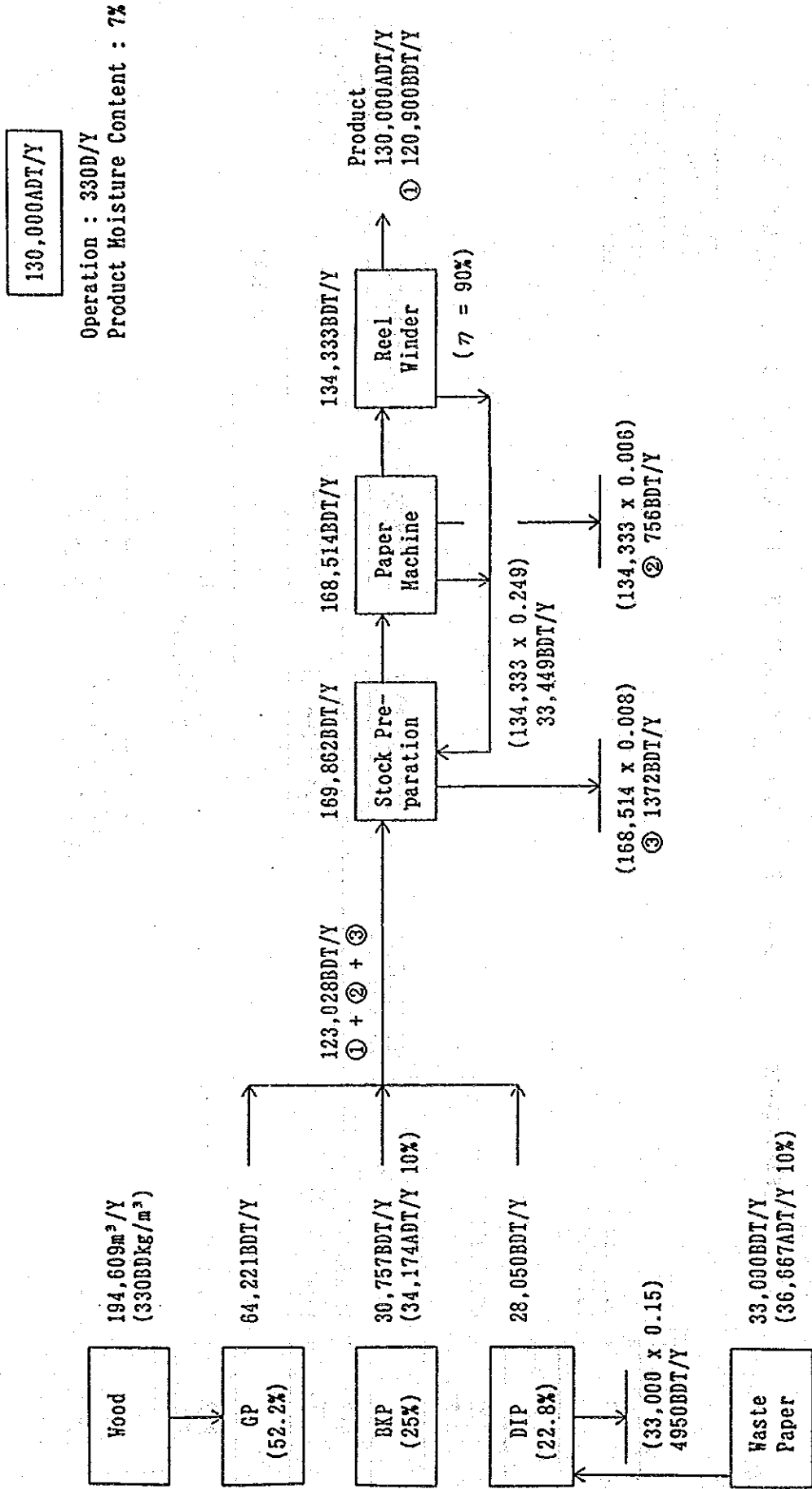


FIG. IV-11 MATERIAL BALANCE (CASE-2 130,000T/Y)



2.4 Estimated Cost for Renovation

Estimated construction costs of the renovation project alternatives are as shown in Table IV-3 and Table IV-4.

Conditions for the above estimates are as follows.

- a. The above estimated costs are the base estimates as of February 28, 1990, and no price contingencies is included.
- b. No physical contingencies is also included.

2.5 Procurement of Equipment and Type of Contract

(1) Taking the following conditions into consideration, a "lump sum contract" was assumed to be applied for the project.

- There are few examples of paper plant construction project with "turn-key lump-sum contract".
- No American or European contractors will offer the tender for the project with the "turn-key lump sum" contract.
- It is emphasized to choose experienced and capable contractor because of complicated nature of the renovation project.
- For the project economy, special skills, knowledge and experience in the similar project will be required to shorten the plant shut-down period caused due to renovation work.

TABLE I V - 3 ESTIMATE OF INVESTMENT COSTS (CASE-1 100,000 T/Y)

[USD 1,000]

	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
1. Site Preparation & Development	0	0	0
2. Plant Direct Cost	38,867	9,441	48,308
(a) Plant Equipment & Materials	35,778	2,000	37,778
(1) Wood Handling Section	0	6	6
(2) GWP Section	4,382	242	4,624
(3) DIP Section	5,544	303	5,847
(4) Stock Preparation	590	50	640
(5) Paper Machine	21,467	1,198	22,665
(6) Finishing Section	2,192	65	2,257
(7) Utility Facilities	0	38	38
(8) Auxiliary Facilities	1,603	98	1,701
(b) Spare Parts	3,089	0	3,089
(c) Dismounting Works	0	317	317
(d) Erection & Installation Works	0	4,037	4,037
(e) Civil & Building Works	0	3,087	3,087
3. Ocean Freight & Insurance	2,661	373	3,034
4. Local Handling & Inland Transportation	0	307	307
5. Construction Equipment	0	1,406	1,406
6. Indirect Field Expenses	212	887	1,099
7. General Contractor's Services	7,203	828	8,031

TABLE I V - 4 ESTIMATE OF INVESTMENT COSTS (CASE-2 130,000 T/Y)

[USD 1,000]

	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
1. Site Preparation & Development	0	0	0
2. Plant Direct Cost	70,893	14,250	85,143
(a) Plant Equipment & Materials	62,526	3,328	65,854
(1) Wood Handling Section	0	6	6
(2) GWP Section	5,999	298	6,297
(3) DIP Section	5,544	303	5,847
(4) Stock Preparation	1,440	85	1,525
(5) Paper Machine	45,438	2,391	47,829
(6) Finishing Section	2,502	72	2,574
(7) Utility Facilities	0	75	75
(8) Auxiliary Facilities	1,603	98	1,701
(b) Spare Parts	8,367	0	8,367
(c) Dismounting Works	0	837	837
(d) Erection & Installation Works	0	6,290	6,290
(e) Civil & Building Works	0	3,795	3,795
3. Ocean Freight & Insurance	5,263	742	6,005
4. Local Handling & Inland Transportation	0	610	610
5. Construction Equipment	0	2,289	2,289
6. Indirect Field Expenses	376	1,302	1,678
7. General Contractor's Services	13,347	1,679	15,026

(2) Assumed types of procurement and contract are as follows

1) General contractor

- Scope of General Contractor's Responsibility: Whole design and engineering services including the one for civil and building work, purchase and supply of complete equipment, construction supervision, test run, guarantee run, operation guidance
- Contract type : Fixed lump-sum contract
- Procurement of equipment: under international competitive bid under the Owner's approval

2) Local contractor

- Scope of Contractor's Responsibility: Dismounting, erection and installation of equipment
- Contract type : Fixed lump-sum contract

3) Local civil contractor

- Scope of Contractor's Responsibility: To provide construction equipment for the service, civil and building work
- Contract type : Fixed lump-sum contract

4) Operation Advisor

- Scope of advisors' responsibility: pre-operational training, test run advisory, operation advisory
- Contract type: Fixed lump-sum contract

2.6 Renovation Schedule

See Figs. IV-12, IV-13 and IV-14

2.7 Technology Transfer Program

2.7.1 Organization of Specialists

The team consists of seven (7) specialists including Project Manager, DIP Specialist, Stock Preparation Specialist, Paper Machine Specialists (2 person) and Maintenance Specialist

2.7.2 Subjects for Technical Instructions

(1) Management

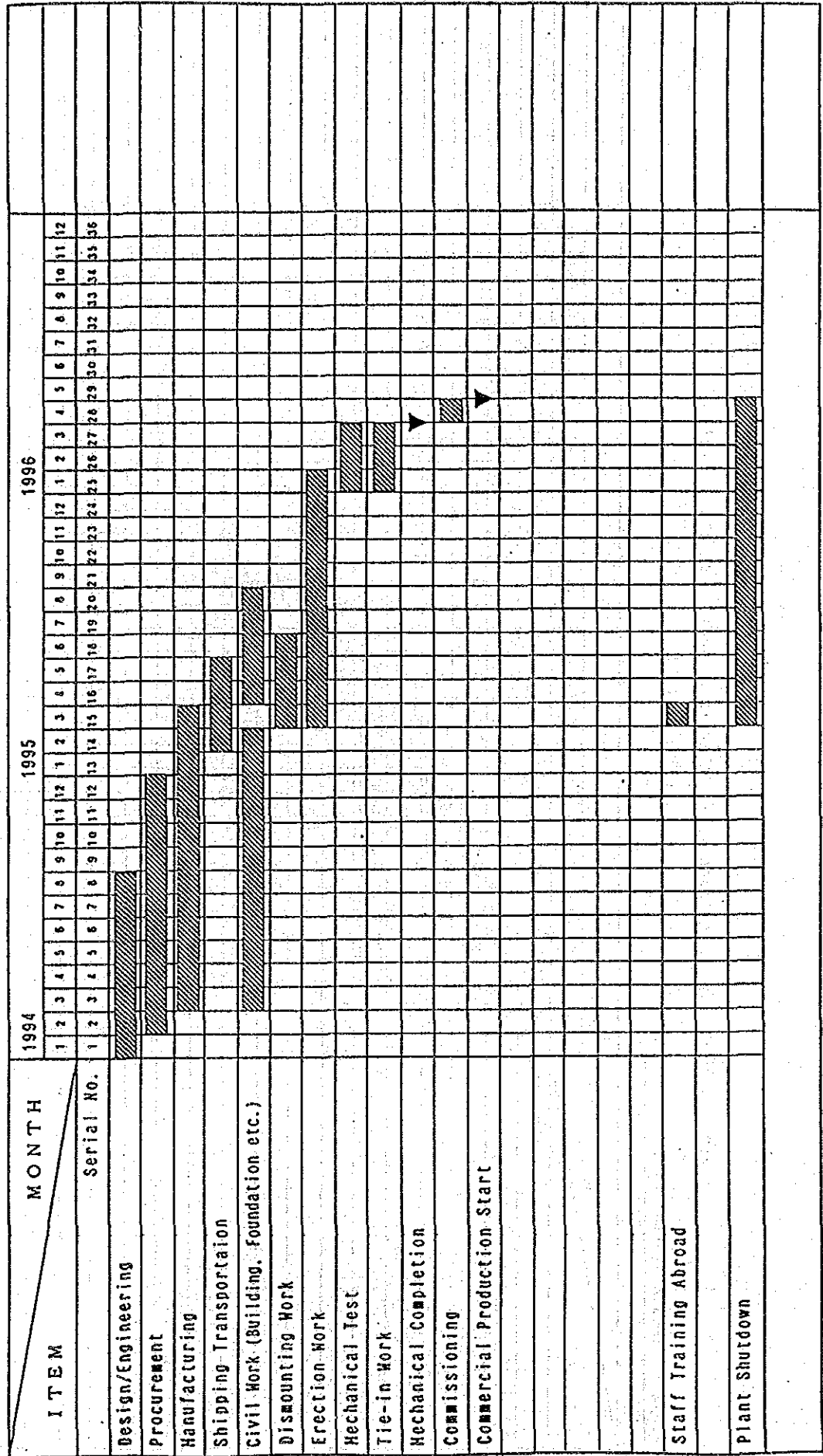
- Instructions for preparation and improvement of various management systems and manuals
- Instructions for preparation and improvement of educational and training systems and manuals

(2) Logs and Pulp

- Instruction for preparation and improvement of system and manuals for wood stock control
- Instruction for preparation and improvement of systems and manuals for pulp quality control and operation technology
- Instruction for operation of DIP plant

FIG. IV - 1 4 Implementation Schedule (Case-2 130,000 T/Y Case)
(1994 Onward)

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(3) Preparation, Paper Making and Finishing

- Instruction and preparation and improvement of QC systems and manuals for preparation section
- Instruction and preparation and improvement of QC systems and manuals for paper machine section
- Instruction and training for operation technology of preparation and paper machine process
- Instruction and training of control and management technology for finishing and product handling

(4) Maintenance

- Instruction for preparation and improvement of maintenance systems and manuals
- Instruction and training for environmental control technologies

2.7.3 Schedule of Technical Instructions

See Fig. IV-15.

3. Examination of Main Applicable Technologies

3.1 Measures against Pitch Trouble

3.1.1 Prospect of Pine Logs Utilization

As per SEKA's projection, if available volume of spruce and fir for the project is limited to 180,000 cubic meters per annum, estimated utilization volume of the pine logs will be as follows;

	Log Requirement	Spruce/Fir	Pine Requirement
Case 1	144,270 m ³	180,000 m ³	no
Case 2	194,610 m ³	180,000 m ³	14,610 m ³

As described in III 4-2, however, availability of the spruce and fir is not always reassuring. Therefore, in consideration of the future situation where substantial volumes of pine logs must be utilized in the mill, it is emphasized to establish technical measures for it.

3.1.2 Measures against Pitch Trouble

There are no specific measures against pitch trouble. However, we believe that the most suitable measures could be taken by means of the following methods.

(1) Seasoning Pine Logs

To purchase pine logs after one-year seasoning at log stock in the place of felling.