Table II-5-1 (1) HISTORICAL GLOBAL WASTE PAPER COLLECTION BY COUNTRY

(1,000T)

Region / Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%) 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
Gremany 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	676	639	698	736	768	862	879	912	1,013	1,119	5.0	6.7
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

Table II-5-1 (2) HISTORICAL GLOBAL WASTE PAPER COLLECTION BY COUNTRY

(1,000T)

Region / Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%)	
											79-84	84-88
Japan	7,732	8,079	8,039	8,358	8,996	9,635	10,152	10,511	11,198	11,957	4.5	5.5
South Korea	594	593	508	553	684	729	817	990	1,180	1,421	4.2	18.2
China	700	720	770	1,012	1,287	1,442	1,724	2,145	2,600	2,700	15.6	17.0
Taiwan	600	691	890	895	900	900	901	1,219	1,140	1,294	8.4	9.5
Indonesia	70	80	90	100	100	100	110	110	123	123	7.4	5.3
Malaysia	46	65	63	75	77	80	98	118	135	130	11.7	12.9
Thailand	100	99	100	120	120	120	120	200	300	300	3.7	25.7
Philippine	70	78	67	54	55	41	45	40	40	40	-10.1	-0.6
S.E.ASIA Sub total	286	322	320	349	352	341	373	468	598	593	3.6	14.8
India	300	295	300	350	420	400	500	600	900	900	5.9	22.5
Hong Kong	400	415	420	430	430	440	440	450	450	450	1.9	0.6
Other	91	91	102	111	116	116	116	116	119	119	5.0	0.6
ASIA TOTAL	10,303	10,791	10,929	11,628	12,755	13,563	14,583	16,049	17,735	18,984	5.7	8.8
Australia	540	554	596	606	590	494	557	600	686	690	-1.8	8.7
New Zealand	62	86	81	66	70	74	81	79	90	98	3.6	7.3
OCEANIA TOTAL	602	640	677	672	660	568	638	679	776	788	-1.2	8.5
Argentine	260	268	267	283	312	342	284	317	370	360	5.6	1.3
Brazil	1,300	1,320	1,350	1,400	1,420	1,440	1,450	1,460	1,468	1,475	2.1	0.6
Chile	41	51	56	55	60	73	88	107	115	120	12.2	13.2
Colombia	128	149	150	163	170	180	194	202	228	248	7.1	8.3
Mexico	780	779	808	920	891	919	978	950	950	947	3.3	0.8
Peru	40	41	42	45	48	50	55	60	64	77	4.6	11.4
Other	235	242	250	262	242	268	315	348	367	377	2.7	8.9
SOUTH & CENTRAL AMERICA	2,784	2,850	2,923	3,128	3,143	3,272	3,364	3,444	3,562	3,604	3.3	2.4
Egypt	0	0	0	0	0	0	0	0	0	0	-	-
Nigeria	0	0	0	0	0	0	0	23	25	25	-	-
South Africa	224	223	302	362	233	293	326	335	310	250	5.5	-3.9
Other	107	120	104	120	125	132	135	136	142	145	4.3	2.4
AFRICA TOTAL	331	343	406	482	358	425	461	494	477	420	5.1	-0.3
WORLD TOTAL	46,132	48,217	49,474	49,864	53,083	57,266	58,911	64,196	69,026	73,657	4.4	6.5

Table II-5-2 (1) HISTORICAL GLOBAL WASTE PAPER CONSUMPTION BY COUNTRY

(1,000T)

Region / Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%) 79-84	84-88
Canada	1,100	1,192	1,210	1,148	1,331	1,463	1,442	1,595	1,695	1,811	5.9	5.5
USA	12,955	13,537	13,641	13,094	14,187	15,172	14,852	16,271	16,959	17,745	3.2	4.0
NORTH AMERICA TOTAL	14,055	14,729	14,851	14,242	15,518	16,635	16,294	17,866	18,654	19,556	3.4	4.1
Finland	202	214	263	261	268	281	277	280	306	351	6.8	5.7
Norway	96	105	96	96	99	112	120	124	142	157	3.1	8.8
Sweden	643	673	655	617	664	731	759	748	782	859	2.6	4.1
Scandinavia Sub total	941	992	1,014	974	1,031	1,124	1,156	1,152	1,230	1,367	3.6	5.0
Belgium	234	241	271	211	212	219	225	236	260	262	-1.3	4.6
Denmark	123	154	166	172	196	240	223	244	250	264	14.3	2.4
France	1,863	1,906	1,925	1,958	2,052	2,200	2,209	2,288	2,460	2,812	3.4	6.3
Gremany Fed. Rep.	3,198	3,168	3,289	3,289	3,492	3,986	3,991	4,084	4,316	4,537	4.5	3.3
Greece	95	120	120	115	117	135	142	164	176	110	7.3	-5.0
Italy	2,096	2,200	2,258	2,074	1,898	2,038	2,015	2,046	2,055	2,399	-0.6	4.2
Netherlands	886	857	935	976	1,024	1,107	1,158	1,228	1,477	1,640	4.6	10.3
Portugal	170	168	195	216	210	220	235	223	262	305	5.3	8.5
Spain	1,190	1,203	1,210	1,355	1,442	1,579	1,669	1,860	1,901	2,099	5.8	7.4
United Kingdom	2,184	2,009	1,932	1,854	1,827	2,003	2,067	2,147	2,310	2,417	-1.7	4.8
EEC Sub total	12,039	12,026	12,301	12,220	12,470	13,727	13,934	14,520	15,467	16,845	2.7	5.3
Austria	458	542	563	603	635	701	804	866	933	1,004	8.9	9.4
Switzerland	315	320	332	345	398	431	449	465	486	565	6.5	7.0
Other Sub total	773	862	895	948	1,033	1,132	1,253	1,331	1,419	1,569	7.9	8.5
WESTERN EUROPE TOTAL	13,753	13,880	14,210	14,142	14,534	15,983	16,343	17,003	18,116	19,781	3.1	5.5
Bulgaria	30	35	40	40	40	50	80	80	80	80	10.8	12.5
Czechoslovakia	313	333	342	383	388	390	396	410	410	428	4.5	2.4
German. Dem. Rep.	565	574	605	605	603	643	664	659	675	674	2.6	1.2
Hungary	160	219	230	233	254	288	292	276	304	323	12.5	2.9
Poland	443	450	411	411	376	418	297	462	463	503	-1.2	4.7
Romania	45	50	60	65	70	80	90	90	100	100	12.2	5.7
U S S R	1,300	1,300	1,400	1,500	1,720	1,970	2,260	2,585	2,855	2,887	8.7	10.0
Yugoslavia	400	436	475	482	515	560	567	560	560	480	7.0	-3.8
EASTERN EUROPE	3,256	3,397	3,563	3,719	3,966	4,399	4,646	5,122	5,447	5,475	6.2	5.6
Turkey	156	164	171	170	190	230	263	242	330	393	8.1	14.3
Iran	40	40	40	40	40	40	40	40	40	50	0.0	5.7
Israel	55	60	65	54	68	75	75	92	100	110	6.4	10.0
Other	64	70	76	87	102	106	118	125	126	126	10.6	4.4
MIDDLE EAST TOTAL	315	334	352	351	400	451	496	499	596	679	7.4	10.8

Table II-5-2 (2) HISTORICAL GLOBAL WASTE PAPER CONSUMPTION BY COUNTRY

(1,000T)

Region / Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%)	
											79-84	84-88
Japan	7,830	7,857	7,920	8,472	9,110	9,700	10,442	10,730	11,755	12,539	4.4	6.6
South Korea	1,197	1,160	1,172	1,118	1,259	1,410	1,518	1,783	2,311	2,747	3.3	18.1
China	700	720	770	1,012	1,287	1,442	1,724	2,145	2,896	3,084	15.6	20.9
Taiwan	1,050	1,247	1,438	1,575	1,710	1,840	1,860	2,485	2,383	2,550	11.9	8.5
Indonesia	100	110	120	125	138	153	170	190	250	137	8.9	-2.7
Malaysia	56	75	75	79	80	83	100	110	114	113	8.2	8.0
Thailand	169	189	200	223	250	275	310	340	380	380	10.2	8.4
Philippine	110	125	127	111	112	124	137	151	159	185	2.4	10.5
S.E.ASIA Sub Total	435	499	522	538	580	635	717	791	903	815	7.9	6.4
India	300	295	350	350	470	650	700	800	1,050	1,050	16.7	12.7
Hong Kong	15	18	15	15	15	15	15	15	15	17	0.0	3.2
Other	72	80	88	89	89	93	94	94	98	98	5.3	1.3
ASIA TOTAL	11,527	11,796	12,187	13,080	14,431	15,692	16,976	18,749	21,313	22,802	6.4	9.8
Australia	550	560	563	603	564	476	523	575	605	610	-2.8	6.4
New Zealand	57	63	63	63	66	66	68	68	68	68	3.0	0.7
OCEANIA TOTAL	607	623	626	666	630	542	591	643	673	678	-2.2	5.8
Argentine	264	274	270	287	312	342	371	331	384	348	5.3	0.4
Brazil	1,300	1,320	1,350	1,400	1,420	1,440	1,450	1,431	1,492	1,500	2.1	1.0
Chile	41	52	56	55	60	73	88	100	115	120	12.2	13.2
Colombia	137	149	157	163	170	180	203	217	238	261	5.6	9.7
Mexico	1,017	1,150	1,200	1,233	1,330	1,453	1,533	1,577	1,719	1,768	7.4	5.0
Peru	41	41	48	45	48	50	55	59	69	100	4.0	18.9
Other	346	351	353	375	390	456	491	469	487	487	5.7	1.7
SOUTH & CENTRAL AMERICA	3,146	3,337	3,434	3,558	3,730	3,994	4,191	4,184	4,504	4,584	4.9	3.5
Egypt	0	0	0	0	0	0	0	0	0	0	-	-
Nigeria	0	0	0	0	0	0	0	23	25	25	-	-
South Africa	224	223	302	362	233	293	326	335	310	250	5.5	-3.9
Other	113	140	125	133	143	151	161	169	174	177	6.0	4.1
AFRICA TOTAL	337	363	427	495	376	444	487	527	509	452	5.7	0.4
WORLD TOTAL	46,996	48,459	49,650	50,253	53,585	58,140	60,024	64,593	69,812	74,007	4.3	6.2

Table II-5-3 (1) HISTORICAL GLOBAL WASTE PAPER IMPORTS BY COUNTRY

(1,000T)

Region / Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%) 79-84	84-88
Canada	628	510	489	416	533	605	520	634	729	550	-0.7	1.4
USA	71	79	72	64	91	100	79	91	115	146	7.1	16.6
NORTH AMERICA TOTAL	699	589	561	480	624	705	599	725	844	696	0.2	3.8
Finland	2	1	6	8	9	34	23	27	37	53	76.2	23.2
Norway	18	15	22	31	25	32	32	26	27	45	12.2	8.9
Sweden	163	205	176	110	136	125	180	134	117	166	-5.2	-2.0
Scandinavia Sub total	183	221	204	149	170	191	235	187	181	264	0.9	3.0
Belgium	72	110	86	62	62	66	85	79	73	105	-1.7	5.4
Denmark	9	23	24	13	19	37	32	34	24	38	32.7	4.4
France	164	196	167	180	217	1	284	423	411	646	-63.9	22.8
Gremany Fed. Rep.	611	606	680	660	634	721	722	761	596	679	3.4	-1.5
Greece	10	14	16	7	7	15	12	14	10	10	8.4	-4.5
Italy	757	650	567	535	504	646	702	667	682	774	-3.1	2.5
Netherlands	242	247	301	328	334	451	463	461	538	685	13.3	10.3
Portugal	0	0	7	8	2	5	17	3	8	37	-	21.5
Spain	182	229	236	258	245	370	395	413	452	509	15.2	6.5
United Kingdom	50	32	27	39	27	85	92	40	55	60	11.2	-10.1
EEC Sub total	2,097	2,107	4,201	4,141	4,448	5,201	5,699	2,895	2,849	3,543	19.9	-11.2
Auatria	228	317	336	373	381	402	491	516	522	563	12.0	3.5
Switzerland	81	86	78	72	81	102	107	112	105	124	4.7	3.8
Other Sub total	309	403	414	445	462	504	598	628	627	687	10.3	3.5
WESTERN EUROPE TOTAL	2,589	2,731	4,819	4,735	5,080	5,896	6,532	3,710	3,657	4,494	17.9	-8.9
Bulgaria	0	0	0	0	0	0	0	0	0	0	-	-
Czechoslovakia	0	0	0	0	0	0	0	0	0	0	-	-
German. Dem. Rep.	0	0	5	8	5	9	22	12	7	8	-	-22.3
Hungary	0	0	0	0	0	0	0	0	0	25	-	-
Poland	0	0	0	0	0	0	0	0	0	0	-	-
Romania	0	0	0	0	0	0	0	0	0	0	-	-
U S S R	0	0	0	0	0	0	0	0	0	0	-	-
Yugoslavia	90	112	132	111	145	135	137	116	85	70	8.4	-15.5
EASTERN EUROPE	90	112	137	119	150	144	159	128	92	103	9.9	-10.3
Turkey	4	0	0	0	2	12	22	4	41	55	24.9	25.1
Iran	0	0	0	0	0	0	0	0	0	0	-	-
Israel	0	0	5	3	1	2	3	1	1	13	-	44.3
Other	0	1	1	0	0	0	2	1	2	2	-	-
MIDDLE EAST TOTAL	4	1	6	3	3	14	27	6	44	70	28.8	26.3

Table II-5-3 (2) HISTORICAL GLOBAL WASTE PAPER IMPORTS BY COUNTRY

(1,000T)

Region / Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%) 79-84	84-88
Japan	131	224	81	94	277	312	300	352	616	588	19.0	18.3
South Korea	598	598	664	565	574	681	701	930	1,131	1,326	2.6	17.3
China	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	296	384	-	-
Taiwan	2	3	1	0	0	0	0	0	0	0	-	-
Indonesia	30	30	30	25	38	53	70	63	225	234	18.5	38.8
Malaysia	10	10	12	7	10	6	5	2	1	2	-12.9	0.0
Thailand	69	89	100	103	105	105	100	90	80	80	7.7	-2.9
Philippine	40	53	57	57	47	79	92	111	119	145	14.6	12.0
S.E.ASIA Sub total	149	182	391	392	443	510	533	691	425	461	27.9	-3.6
India	-	3	-	-	50	250	200	200	150	150	-	-6.9
Hong Kong	2	3	1	0	0	0	0	0	0	0	-	-
Other	5	9	11	8	7	7	8	8	9	9	7.0	3.0
ASIA TOTAL	887	1,022	1,149	1,059	1,351	1,760	1,742	2,181	2,627	2,918	14.7	13.8
Australia	20	11	60	5	5	1	1	1	1	0		
New Zealand	0	0	0	0	0	0	0	0	0	0	-	-
OCEANIA TOTAL	20	11	60	5	5	1	1	1	1	0	-45.1	-
Argentine	4	4	4	4	4	4	4	4	4	4	-	-
Brazil	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-	-
Chile	0	0	0	0	0	0	0	0	0	0	-	-
Colombia	0	0	0	0	0	0	0	0	0	0	-	-
Mexico	95	95	95	95	95	95	95	95	95	95	0.0	0.0
Peru	0	0	0	0	0	0	0	0	0	0	-	-
Other	104	106	107	122	148	186	176	122	120	120	12.3	-9.1
SOUTH AND CENTRAL AMERICA	203	205	206	221	247	285	275	221	219	219	7.0	-5.5
Egypt	69	69	69	69	69	69	69	69	69	69	0.0	0.0
Nigeria	-	-	-	-	-	-	-	-	-	-	-	-
South Africa	0	0	0	0	0	0	0	0	0	0	-	-
Other	18	20	21	24	18	19	22	30	32	32	1.1	9.8
AFRICA TOTAL	87	89	90	93	87	88	91	99	101	101	0.2	2.6
WORLD TOTAL	4,579	4,760	7,028	6,715	7,547	8,893	9,426	7,071	7,585	8,601	14.2	-2.3

Table II-5-4 (1) HISTORICAL GLOBAL WASTE PAPER EXPORTS BY COUNTRY

(1,000T)

Region / Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%) 79-84	84-88
Canada	105	113	116	150	156	161	190	233	261	164	8.9	0.5
USA	2,026	2,417	2,008	1,960	2,335	2,934	2,982	3,401	4,012	5,117	7.7	14.9
NORTH AMERICA TOTAL	2,131	2,530	2,124	2,110	2,491	3,095	3,172	3,634	4,273	5,281	7.7	14.3
Finland	6	6	22	15	17	65	85	83	62	87	69.9	7.6
Norway	45	33	45	35	36	40	42	43	41	38	-2.3	-1.3
Sweden	80	83	83	100	106	149	130	136	138	163	13.2	2.3
Scandinavia Sub total	131	272	300	309	413	511	519	262	241	288	31.3	-13.4
Belgium	268	260	286	309	317	373	390	366	425	548	6.8	10.1
Denmark	79	73	64	67	71	72	100	100	119	117	-1.8	12.9
France	-	-	-	-	-	256	255	476	512	546	-	20.8
Gremany Fed. Rep.	503	527	603	570	610	767	911	949	1,014	1,165	8.8	11.0
Greece	0	0	0	0	0	0	0	0	0	1	-	-
Italy	1	1	1	1	1	1	1	1	2	2	0.0	18.9
Netherlands	335	340	320	330	352	491	443	372	459	584	7.9	4.4
Portugal	0	0	0	0	0	0	0	0	11	12	-	-
Spain	14	18	18	34	18	16	17	15	13	15	2.7	-1.6
United Kingdom	117	210	157	125	193	256	196	248	348	424	17.0	13.4
EEC Sub total	1,317	1,429	1,449	1,436	1,562	2,232	2,313	2,527	2,903	3,414	11.1	11.2
Auatria	41	39	60	66	54	70	53	44	50	65	11.3	-1.8
Switzerland	81	142	142	167	144	165	161	145	172	172	15.3	1.0
Otcher Sub total	122	181	202	233	198	235	214	189	222	237	14.0	0.2
WESTERN EUROPE TOTAL	1,570	1,882	1,951	1,978	2,173	2,978	3,046	2,978	3,366	3,939	13.7	7.2
Bulgaria	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0	0	-	-
Czechoslovakia	80	78	93	135	146	146	141	140	140	145	12.8	-0.2
German. Dem. Rep.	30	15	10	13	19	13	10	7	0	0	-15.4	-100.0
Hungary	0	5	0	0	0	0	0	0	0	0	-	-
Poland	19	10	10	28	65	68	30	34	21	20	29.0	-26.4
Romania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0	0	-	-
U S S R	200	200	200	200	200	200	200	100	112	113	0.0	-13.3
Yugoslavia	0	0	0	0	0	0	0	0	2	0	-	-
EASTERN EUROPE	329	308	313	376	430	427	381	281	275	278	5.4	-10.2
Turkey	0	0	0	0	0	0	0	0	0	0	-	-
Iran	0	0	0	0	0	0	0	0	0	0	-	-
Israel	0	0	0	0	0	0	0	0	0	0	-	-
Other	50	48	50	53	40	40	40	0	0	0	-	-
MIDDLE EAST TOTAL	50	48	50	53	40	40	40	0	0	0	-	-

Table II-5-4 (2) HISTORICAL GLOBAL WASTE PAPER EXPORTS BY COUNTRY

(1,000T)

Region / Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	Average Annual Growth Rate (%) 79-84	84-88
Japan	33	20	83	26	2	8	18	127	59	6	-24.7	-6.9
South Korea	0	0	0	0	0	0	0	0	0	0	-	-
China	0	0	0	0	0	0	0	0	0	0	-	-
Taiwan	0	0	0	0	0	0	0	0	0	0	-	-
Indonesia	0	0	0	0	0	0	0	8	0	0	-	-
Malaysia	0	0	3	3	3	3	3	3	22	21	-	62.7
Thailand	0	0	0	0	0	0	0	0	0	0	-	-
Philippine	0	0	0	0	0	0	0	0	0	0	-	-
S.E.ASIA Sub total	0	0	3	3	3	3	3	11	22	21	-	-
India	0	0	0	0	0	0	0	0	0	0	-	-
Hong Kong	387	400	406	415	435	435	400	435	435	435	2.4	0.0
Other	20	20	25	25	30	30	30	30	30	30	8.4	0.0
ASIA TOTAL	440	440	517	469	470	476	451	603	546	492	1.6	0.8
Australia	2	5	7	8	8	23	35	35	55	55	63.0	24.4
New Zealand	5	5	8	2	4	8	13	11	22	30	9.9	39.2
OCEANIA TOTAL	7	10	15	10	12	31	48	46	77	85	34.7	28.7
Argentine	0	0	0	0	0	0	0	0	0	0	-	-
Brazil	0	0	0	0	0	3	3	3	1	0	-	-
Chile	0	1	0	0	0	0	0	7	0	0	-	-
Colombia	0	0	0	0	0	0	0	0	0	0	-	-
Mexico	0	0	0	0	0	0	0	4	0	0	-	-
Peru	0	0	0	2	0	0	0	0	0	0	-	-
Other	0	0	0	0	0	0	0	0	0	0	-	-
SOUTH AND CENTRAL AMERICA	0	1	0	2	0	3	3	14	1	0	-	-
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	0	0	0	0	0	0	0	0	0	0	-	-
AFRICA TOTAL	0	0	0	0	0	0	0	0	0	0	-	-
WORLD TOTAL	4,107	4,799	4,478	4,554	5,176	6,604	6,720	6,983	8,022	9,613	10.0	9.8

Table II-5-5 (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
Gremany 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-5-5 (2) HISTORICAL GLOBAL WASTE PAPER COLLECTION/CONSUMPTION BALANCE BY COUNTRY

(1,000T)

Region / Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
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
Argentine	-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

Table II-5-6 HISTORICAL WASTE PAPER PRICE IN WEST GERMANY AND U.K.

Year	Quarter		West Germany A6 DM/T	West Germany B1 DM/T	United Kingdom A6 Pound/T	United Kingdom B1 Pound/T	West Germany A6 US$/T	West Germany B1 US$/T	United Kingdom A6 US$/T	United Kingdom B1 US$/T	Exchange Rate DM/US$	Exchange Rate Pound/US$
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

Fig. II-1-1 PROJECTED DEMAND FOR NEWSPRINT

['000 T]

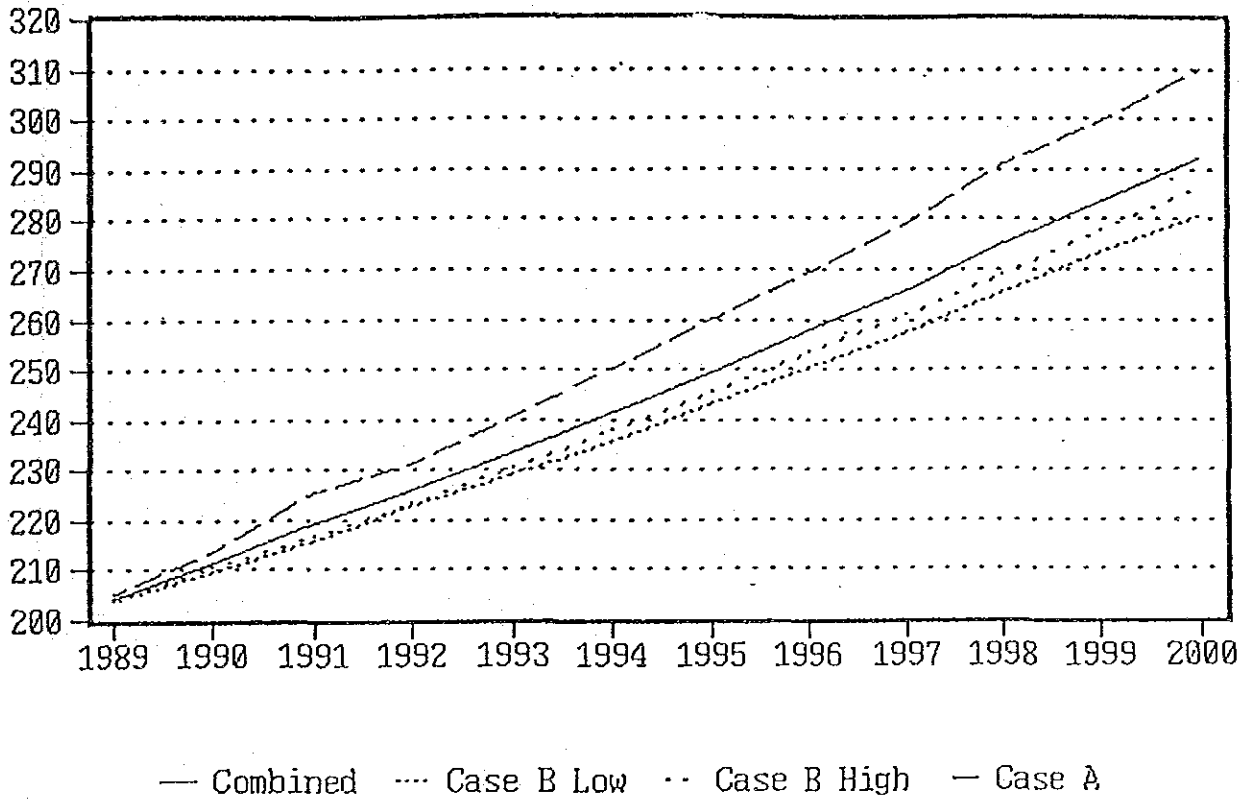
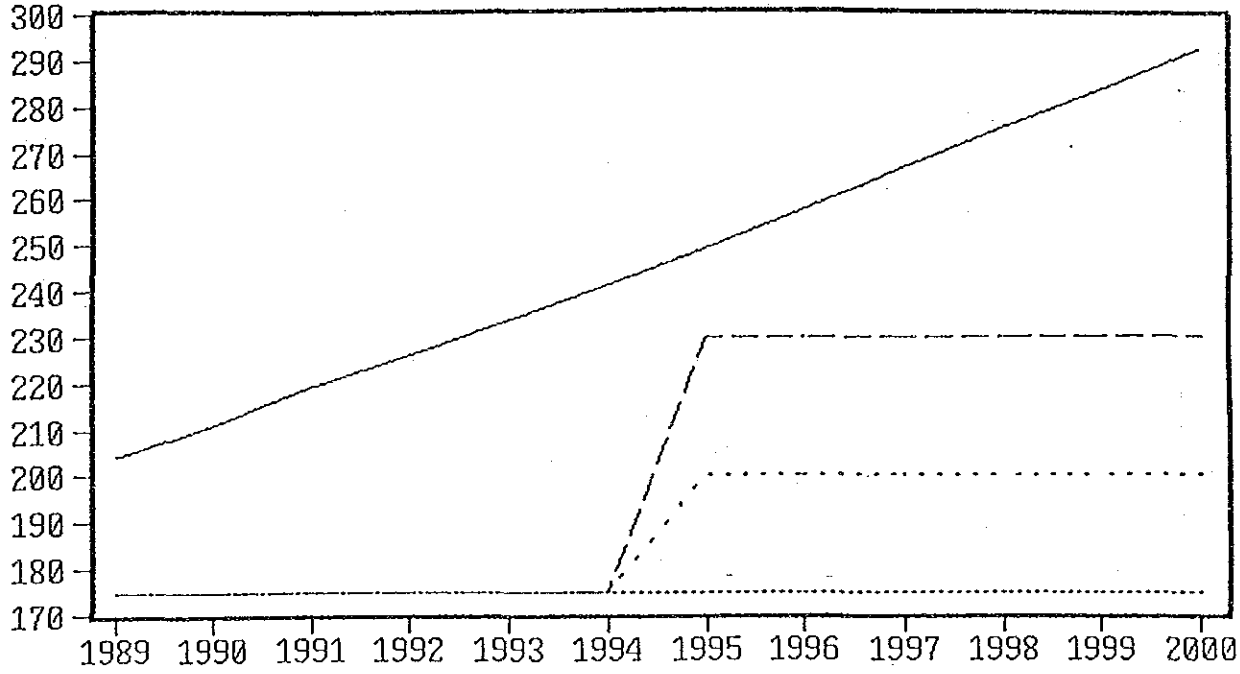


Fig. II-1-2 PROJECTED CAPACITY AND DEMAND
FOR NEWSPRINT ('000 T)



— DEMAND ···· EXISTING CAPACITY ·· PLAN No.1 — PLAN NO.2

CHAPTER III
TECHNOLOGICAL DIAGNOSIS ON AKSU MILL

CHAPTER III TECHNOLOGICAL DIAGNOSIS ON 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 newsprint mill. Details ranging from construction to start of operations were 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 the city of Giresun, which is 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-1-1.

(1) Capacity

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

(2) Major equipment

1) Wood processing process: timber yard, slasher, stacker, timber pond, drum barker

2) Pulp process: complete process of groundwood pulp and imported KP pulping, wet pulp machine (whose operation is now suspended)

3) Stock preparation process: complete process

4) Papermaking, finishing process:

Fourdrinier paper machine	7,520 mm (wire width)
Maximum papermaking speed	700 m/min
Trim on winder	6,900 mm
Trim on cutter	2,100 mm
Roll wrapping machine	

5) Utility equipment: boiler, turbine generator, receiving and transforming equipment, water intake, BFW treatment equipment

6) Auxiliary facilities: products storehouse, fuel tank, auxiliary material storehouse, repair shop, office building, analysis and test facilities, spare stock storehouse, corporate houses for employees

(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 over the past decade is as shown below.

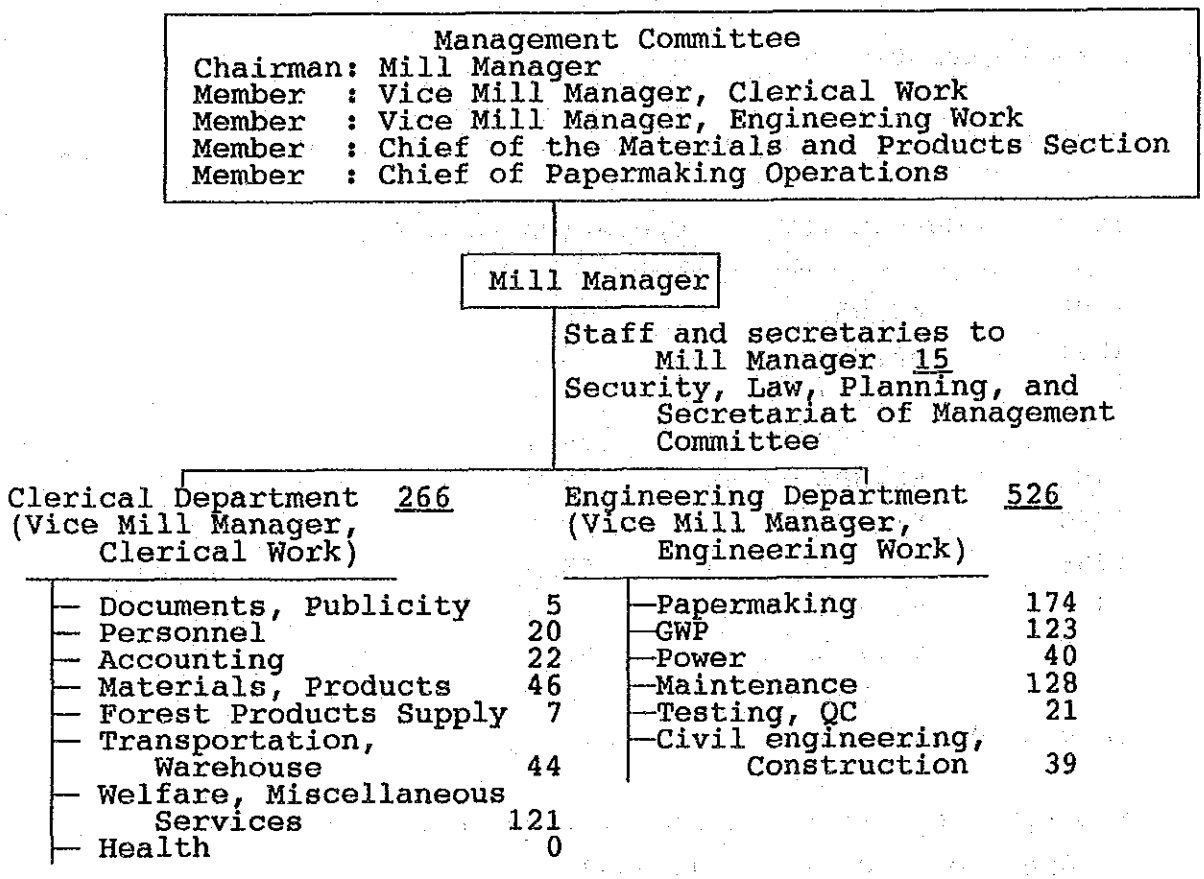
Year	Output (MT)	Operation rate (%)
1980	63,063	76.4
1981	63,086	76.5
1982	61,434	74.5
1983	61,100	74.1
1984	60,325	73.1
1985	51,171	62.0
1986	54,301	65.8
1987	65,484	79.4
1988	*49,742	60.3
1989	57,888	70.2
(Average)	(58,759)	(71.2)

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

2. Diagnosis on Organization and Management System

2.1 Organization

The following chart shows the organization of Aksu mill.



(Note) The underlined figures show the number of employees including the Heads.

2.2 Organizational Problems

(1) It seems that the organization and staffing of Aksu mill have been established in the historical context of the Republic of Turkey as well as on the special conditions in the region where Aksu mill is situated. There is therefore no scope for discussion on the

organization and staffing of the mill.

However, it seems necessary for SEKA to establish a system, in its policies, that has sufficient competitiveness to imported newsprint, and hence it is necessary to reduce the number of employees from that point of view.

(2) For example, in Japan one paper machine is manned with seven to nine persons per shift, including those engaged in winder operations, in the papermaking division of newsprint mills.

Furthermore, two paper machines standing opposite to each other are often manned with a team consisting of 14 to 16 persons in practice.

(3) Aksu mill has a system in which employees are given certain qualifications according to occupational categories, which system is often seen in Western factories. But important is technical standards of these employees. It seems necessary to heighten effects of education and training given to them.

(4) Though linguistic ability is not directly connected with industrial technology, it is important to establish an organization for improving linguistic ability constantly to absorb advanced technology, in view of the fact that papermaking in Turkey mostly depends on facilities imported from Western industrialized countries.

(5) It is said that there are only four persons who are in charge of clothing replacing of the paper machine. We propose that the number be increased in order to shorten the time required for clothing replacing and thereby to improve productivity.

(6) There are lots of service jobs and miscellaneous jobs within the mill, seemingly reflecting special conditions in Turkey. In order to improve productivity and strengthen price competitiveness, such jobs need to be reduced, even if it is difficult to do so in view of the long historical process that the country has followed.

The following table shows the current allocation of employees to each department in the Aksu mill.

Total number of employees: 808

Occupational category	Total number of employees	Mill Manager	Manager	Head	Acting Head	Engineer	Clerk	Technician	Master	Qualified worker	Worker
Mill Manager	1	1	—	—	—	—	—	—	—	—	—
Engineering Department	526	—	1	6	4	9	9	12	338	108	39
Papermaking	174	—	—	1	1	3	1	3	58	76	31
GWP	123	—	—	1	—	3	1	1	105	12	—
Power	40	—	—	1	1	—	2	1	33	1	1
Maintenance	128	—	—	1	2	1	4	5	100	15	—
Testing, QC	21	—	—	1	—	2	1	1	16	—	—
Civil Engineering, Construction	39	—	—	1	—	—	—	1	26	4	7
Clerical Department	266	—	1	6	13	—	74	—	57	25	90
Document, Publicity	5	—	—	1	—	—	4	—	—	—	—
Personnel	20	—	—	1	2	—	13	—	—	4	—
Accounting	22	—	—	1	3	—	18	—	—	—	—
Materials, Products	46	—	—	1	2	—	16	—	15	—	12
Forest Products Supply	7	—	—	1	—	—	5	—	—	1	—
Transportation, Warehouse	44	—	—	1	3	—	12	—	12	—	16
Welfare, Miscellaneous Jobs	121	—	—	—	3	—	6	—	30	20	62
Health Room	0	—	—	—	—	—	—	—	—	—	—
Staff to the Mill Manager	15	—	—	4	—	4	6	—	1	—	—
Secretary	2	—	—	—	—	—	2	—	—	—	—
Security	2	—	—	1	—	—	1	—	—	—	—
Law	2	—	—	1	—	—	1	—	—	—	—
Planning	7	—	—	1	—	4	1	—	1	—	—
Secretariat of the Management Committee	2	—	—	1	—	—	1	—	—	—	—
Total	808	1	2	16	17	13	89	12	396	133	129

2.3 Quality Control

2.3.1 Attitude toward Quality Control

The most important attitude toward quality control may be represented by the idea of managing the whole process by laying emphasis on product quality. It is a matter of course that quality control characteristic values should be grasped at each process of the mill and that appropriate measures should be taken.

The current quality control system of Aksu mill is not so constructed as to feed back quality appraisal by customers to the system. It is very important to reflect customers' opinions in product quality. Improvement is necessary in this respect.

2.3.2 Standardization

The basis of quality control is standardization. To ensure cooperated work of a number of employees, it is necessary to maintain written standards. Quality goals and characteristic values need to be specified in documents on quality standards, in order for any person concerned to ascertain them easily whenever necessary. Also, the necessary number of operation manuals need to be kept for each process. Detailed explanatory manuals should be prepared, in order to explain the reason that each operational procedure is required.

In Aksu mill, those employees who were interviewed by the Study Team did not seem to have a sufficient knowledge of equipment in their job sites. This is partly attributable to a lack of written standards.

The only materials that a number of employees can refer to are English manuals prepared by Mitsubishi Heavy Industries, Ltd., a machinery supplier, 20 years ago.

Manuals should be developed independently, with the situation and characteristics of Aksu mill taken into consideration.

Operation manuals in Turkish easy for the people of Turkey to understand and use must be a necessity now.

2.3.3 Quality Control of Materials to be Accepted

(1) BKP testing

BKP used in Aksu mill consists of imported bleached pulp and semi-bleached pulp of domestic make. Testing standards are as follows.

Requirement : 100% coniferous BKP
Beating conditions: The following are tested with a laboratory test beater.

Goal freeness	32SR (CSF ca. 400cc)
Beating time	30 to 35 minutes

Test Items and Standard Values by Hand-made Paper

Test item	Standard
Burst factor (gf/sq.cm)	60 and over
Tear factor (100gf/sq.m/g)	120
Breaking length (m)	8,000
Brightness (%)	BKP 86 SBKP 65
Ash (%)	0.5 and below
Foreign substances (ppm)	5 and below

(2) Log testing

Only the weight of logs is tested with a truck scale. Logs of different diameters and lengths are mechanically accepted. The standard of logs to be accepted should be set, because they have the greatest influence on GP quality.

2.3.4 Pulp Testing in Processes

A system of quality testing in the processes on a 24-hour, three-shift basis has been established to ensure product quality, by setting quality goals for each process.

(1) Testing in the GWP and Pulp Process

Test item	Place of sampling	Frequency
Pulp consistency (%)	Each grinder pit	3 times/shift
Freeness (deg. SR)	Bull screen chest	Ditto
Breaking length (m)	Polydisk filter outlet	Ditto
Temperature (deg. C.)	Refiner outlet	Ditto
Burst factor(gf/sq.cm)	Polydisk filter outlet	once/shift
Tear factor (100gt/sq.m/g)	Ditto	
Classification	Ditto	

The results are immediately notified, by phone, by those who are in charge of testing to those who are in charge of operations. The data are reported in the form of weekly and monthly reports to the divisions concerned and the head office.

(2) Other tests

Type of pulp	Place of sampling	Frequency
BKP before beating	BKP damp tank	Every 2 hours
BKP after beating	Prior to blending chest	Ditto
GWP	Ditto	Ditto
Broke after break	Ditto	Ditto
Blending pulp	Machine chest	Ditto
Finishing stock	Head box	Ditto
Inlet stock	Flow box	Ditto

The results are notified in the same manner as those in testing in the GWP and pulp process mentioned above.

(3) Proposals for testing

It is desirable to install a shive analyzer, an instrument for measuring large fibers and shives. Shive measurement will be effective because products of Aksu mill include a large quantity of shives, which fact adversely affects products of the mill.

The Schopper-Riegler method is currently adopted in freeness measurement. It is recommended that a Canadian standard freeness tester (CSF) be introduced, which has various strong points. The introduction of a CSF will heighten accuracy of measurement and make it possible to compare test results with those of other companies. (Attachment III-2-1)

2.3.5 Product Testing

(1) Quality testing (currently implemented)

Those who are in charge of testing in the laboratory make sampling by dividing paper of overall reel width into five equal parts at every reel handling, and implement the following physical tests without adjusting humidity.

1) Basis weight: Samples taken from five equal parts are further halved, and ten conversion values of basis weight (grams/square meter) are measured over overall width. The mean basis weight and dispersion in measured values of basis weight are reported.

2) Thickness: Thicknesses of samples from five equal parts are measured (mm/100).

3) Breaking length: Tensile strength is measured lengthwise and crosswise for each sample from five equal parts (kg). Value of breaking length (km) is calculated, corrected with basis weight, and reported.

4) Moisture: Moisture content is measured for each sample from five equal parts.

5) Porosity: Benzene-method porosity is measured (ml/min) and the mean over the overall width is calculated.

6) Burst strength (kg/square meter): The mean over the overall width is calculated.

7) Smoothness (Sec): The mean over the overall width is calculated.

8) Elongation (machine direction) (%): The mean over the overall width is calculated.

9) Tearing strength (g): The mean over the overall width is calculated lengthwise and crosswise each.

(2) Problems in product testing

Problems found in Aksu mill and measures to be taken to correct them are described below.

1) Problems

A. A process of product testing has seemingly not been established.

B. Products having greatly different cores are delivered as they are, which causes trouble when used in newsprint printing.

C. The only tests implemented are measurement of weight after packaging and putting a label, in which the measured weight is entered, on roll paper.

D. Products are loaded onto trucks, jimmied with a lever and thereby thickly disfigured, which causes a great deal of waste paper prior to press at newspaper companies.

E. The problems mentioned in b. and d. above constitute a subject of the global negotiations on product prices between SEKA and customers, directly causing disadvantage to SEKA. This causal relation does not seem to be well recognized.

2) Measures to be taken

Standards for testing roll paper products need to be established. Those products which do not satisfy the standards should not be delivered.

(Example) roll diameter, slight differences, core differences, preliminary roll conditions, roll paper gloss judgment, craters, slight defects, caught by blades, gapping, roll weight, roll length, joint mark, paper spew

3) Core

Delivery standards should be established also for cores, as in the case of pulp. That is, outside diameters and measurements of cores need to be strictly controlled.

Dispersion in outside diameters and measurements of cores should be within 1 mm, after they are sufficiently dried and seasoned.

4) Transportation of roll paper products

Quality control also includes product management ranging from loading at the mill or its local warehouses onto trucks to delivery to customers.

A great deal of waste paper prior to press is said to be disposed of as waste paper at newspaper companies, which must have brought a great economic loss to Aksu mill. Slight defects in roll paper cause sheet break at newspaper companies.

The best way of product management should be selected, including loading products onto trucks and unloading them for customers, upon discussions between transport companies, customers (i.e., newsprint companies), and the manufacturer.

(3) Quality evaluation

Products of Aksu mill were tested at a Japanese laboratory, for comparison with products of other mills. Six typical newsprint samples comprising imported base paper (from Canada, Norway and France) that is favorably accepted in newspaper companies in Turkey, Balikesir mill product in Turkey and Japanese newsprint were tested.

The following findings were obtained from the comparative tests.

1) Products of Aksu mill showed extremely low density, which was common to products of both Aksu mill and Balikesir mill.

2) Surface strength was very poor.

3) Porosity was high.
These three tests, resulting in low values all alike, revealed that products of Aksu mill had coarse texture and were not sufficiently pressurized on the paper machine.

4) Brightness was low.
To give the products international competitiveness, brightness of at least more than 52% is necessary.

Quality evaluation mentioned above is based on physical tests. The newspaper companies are entirely dissatisfied with the following items, and improvement of them is therefore urgently needed.

5) Hue
Products of Aksu mill are characterized by a bluish hue, which, together with low brightness, as newspaper companies say, results in poor coloring in color printing.

6) Roll joint
Tape splicing is entirely incomplete, which fact often causes sheet break. The Study Team has already recommended that the method of heating a splicing iron be improved.

7) Paper core deformation
Paper core deformation is classified into axial plus or minus and crush, which constitute a cause of sheet break.

8) Defective roll wrapping frequently occurs.
The border of a roll is often thickly broken and a great deal of waste paper prior to press is generated, as a result. The generation of such waste paper in quantities is attributable to shifting rolls by jimmying them with a crowbar when loading them onto trucks at Aksu mill.

The results of the tests conducted in Japan are shown in Tables III-2-1, 2, 3 and 4.

2.3.6 Recommendations on the Quality Control System

(1) Quality control system

The Study Team is of the opinion that what we call market information (appraisal given to products of Aksu mill on the market) is neither sufficiently noticed nor utilized in quality designing. Although they regularly conduct product testing, in accordance with established quality standards and manufacturing conditions, they seemingly do not examine their products systematically by analyzing test data and taking market appraisal into consideration. In a word, a quality control system has yet to be established.

Establishing a quality control system requires not only the setting of quality standards and manufacturing conditions but also participation of the whole organization in it. Cost reduction, production increase, and expansion of production facilities have to be considered on the basis of product quality. The manufacturing division, facilities division, materials division, sales division, personnel division (because increase or decrease of employees is inevitable), administrative division (in charge of cost accounting), energy division, etc. have to be involved in establishing a quality control system.

At Aksu mill, only the manufacturing division and the research laboratory pay attention to product quality, with all the other divisions taking little interest in it. It is not too much to say that there is no wheel of quality circle activity turning there. It is strongly hoped that the mill will start pursuing the basic process of P-D-C-A (Plan, Do, Check and Action).

1) Plan
2) Do
3) Check
4) Action
5) Deciding on objectives
6) Deciding on methods
7) Implementing education and training
8) Causing education and training to be implemented
9) Checking
10) Taking corrective steps
11) Checking results of corrective steps taken

The wheel of quality control does not start turning on its own. It requires energy such as electric power and a driving gear such as a motor to begin turning.

In Japan, top management has charged the wheel with energy, executives, as the driving gear, have given turning power to it, managerial officers have played a role of a flywheel, making their own efforts, and workers have faithfully performed their duties with ingenuity to maintain smooth running of the wheel. This is the reason that products of Japanese make are highly relied upon today, contributing to economic development of the country.

Quality control systems in Japan have not been established in a day. The concept of quality control was introduced around 1955, and gradually became popular among top management during the following decade, and at last the wheel began turning. It was around 1970 that the wheel began turning in the most part of the pulp and paper industry.

The spread of emphasis laid by top management on product quality and the recognition of it by managerial officers led to technical improvement, which augmented reliability of products and reduced production costs, and thereby ensured stability of businesses.

(2) Organizational quality control

When the concept of quality control was first introduced, it was interpreted as "human relations", whose meaning was hardly understandable. Today productivity consciousness has been heightened in businesses through organizational activities including activities of the smallest units of QC circles, under top management laying emphasis on quality control. In such a situation, united intention of the employees is regarded as the very human relations.

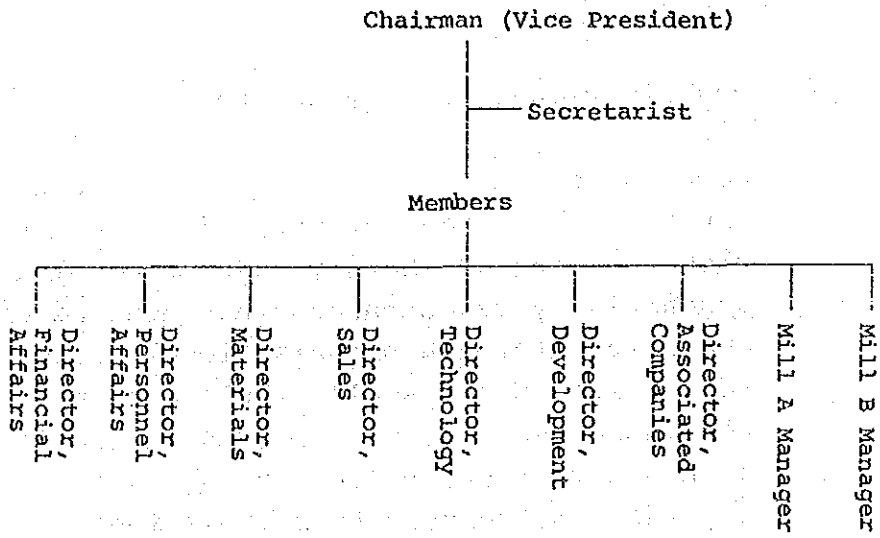
As SEKA has both statistical procedures established for quality control and a number of experts who have received training in QC circle management, it is to be hoped that a management system for utilizing these resources will be established.

The quality control system of Japan may not be applied as it is at SEKA, but a typical quality control system in the pulp and paper industry of Japan is illustrated below.

(3) Example of organizational quality control

1) Corporate Quality Control Committee

A. Organization



B. Subjects of Discussion

Subject	Frequency of meeting
1. Setting priority goals of quality control and a slogan (company-wide)	Once/year, before a new business year
2. Setting quality standards Goal for quality Standards of quality Goal for stock blending conditions	Twice/year, before a new business year and at the end of the first half of a business year
3. Planning a general meeting of the QC circles company-wide	Once/year
4. Capital investment for quality improvement	Twice/year
5. Reporting on quality information Market appraisal Information on complaints Conditions of other companies' products	Once/month, an executive meeting is held at the same time

C. Secretariat

Director: Vice Manager, Technical Headquarters

Members : Manager, Finance Department
Manager, Personnel Department
Manager, Materials Department
Manager, Sales Department
Manager, Technical Department
Manager, Development Department
Chief, Quality Section, Technical Department
Chief, Planning Section
Chief, Sales Section

Secretariat jobs

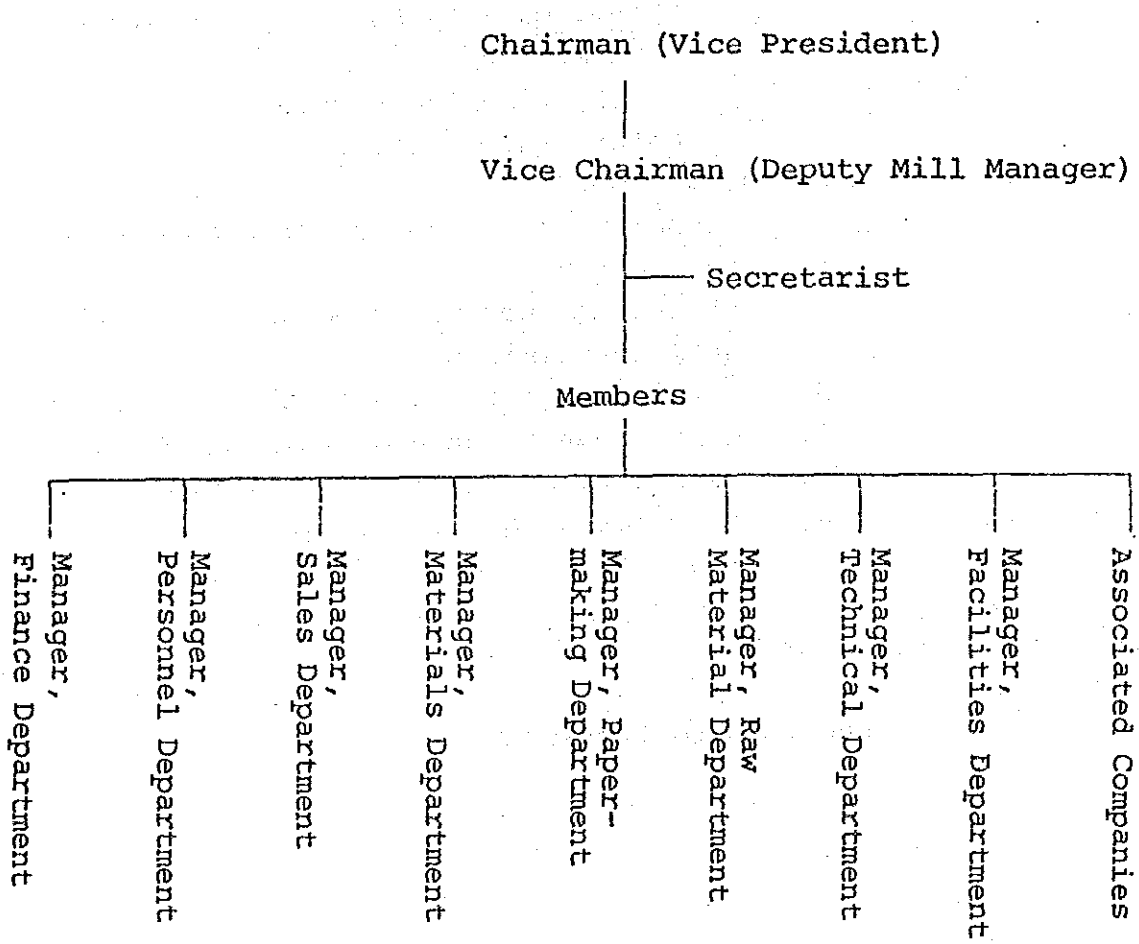
1. Preparing subjects for discussions at the meeting
2. Reviewing subjects pending at the mill quality committee
3. Setting quality standards
4. Making education and training plans
5. Reviewing QC circle promotion plans
6. Stipulating quality committee regulations

D. Reporting

Chairman to President

2) Mill Quality Committee

A. Organization



B. Subjects of Discussion

Subject	Frequency of meeting
1. Setting priority goals of mill quality control and a mill slogan (Setting concrete foals based on corporate goals)	Once/year, new business year (after the meeting of the corporate committee)
2. Setting proposed quality standards Quality goals Quality standards Goals for blending conditions	Twice/year, before the meeting of the corporate committee
3. Planning a mill-wide QC circle meeting QC circle activities	Twice/year
4. Proposing capital investment for quality improvement	Twice/year
5. Reporting on quality information Market appraisal Information on complaints and measures for them Condition of product quality of other companies	Once/month

C. Secretariat

Director: Manager, Technical Department
Members : Chief, Quality Section
Chief, Finance Section
Chief, Personnel Section
Chief, Materials Section
Chief, Products Section

Chief, Raw Materials Section
Chief, Papermaking Section
Chief, Finishing Section
Chief, Design Section
Chief, Power Section
Chief, Electricity Section
Chief in charge of quality control

Secretariat jobs

1. Preparing subjects of discussion by the committee
2. Drafting quality standards
3. Working out mill education and training plans
4. Working out mill-wide QC circle activity promotion plans
5. Quality information and analysis of it

3) QC Circle

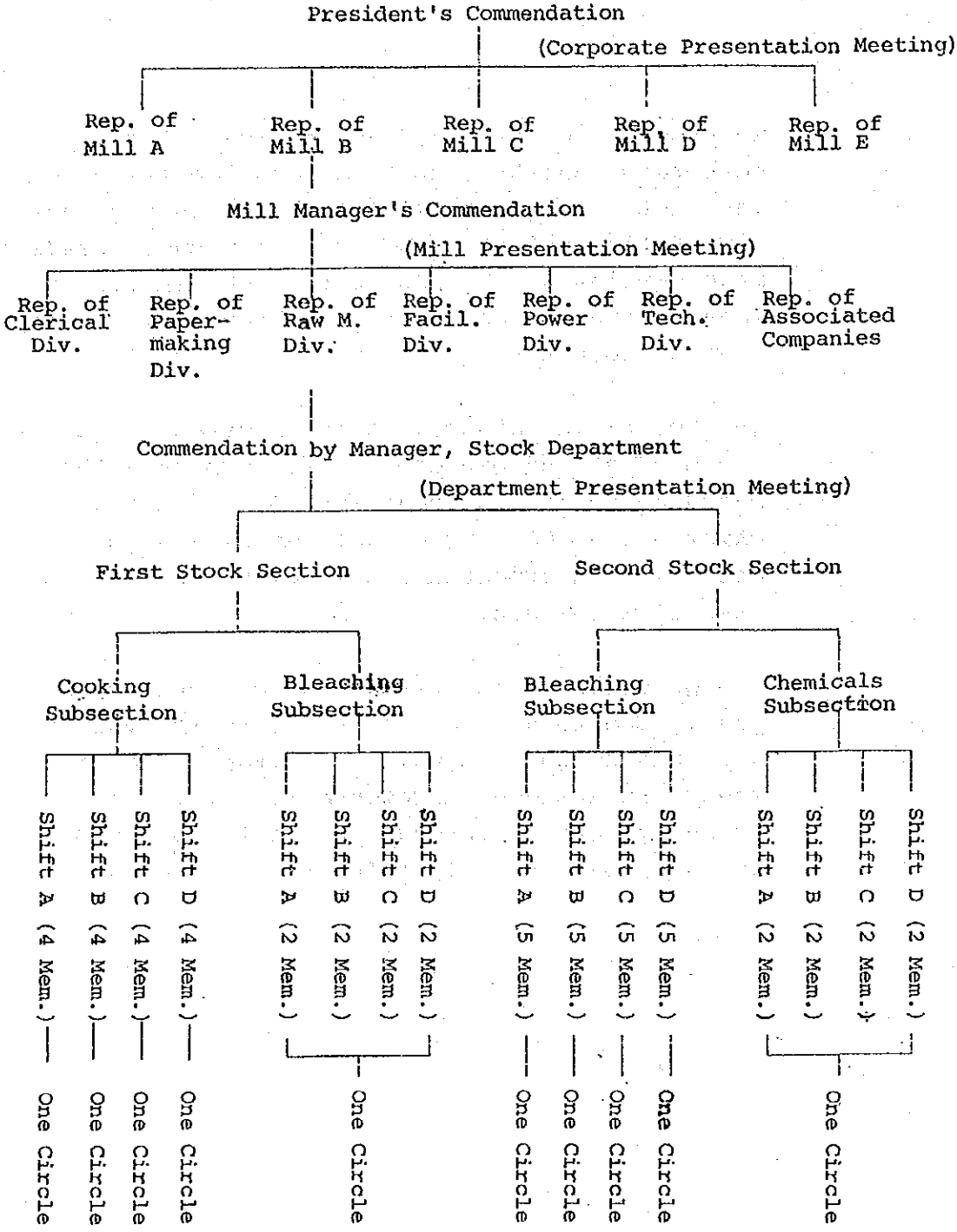
A QC circle is a group of voluntary activity, in which the mill personnel participate, including personnel of the clerical division, manufacturing division, facilities division, utility division, and associated companies such as warehouse and transportation companies. A QC circle is organized voluntarily by those persons who are engaged in the same job in a job site. They choose a theme and continuously promote quality management and improvement by their united efforts, utilizing the concept of QC. The following basic principles underlie it.

a. Contributing to the company's qualitative improvement and development
b. Making job sites worth working by respecting human dignity
c. Giving full play to employees' abilities and developing their potential.

To promote QC circles, the chairman of the corporate quality committee needs actively to give instructions to each mill to heighten employees' competitive spirit, and the mill manager needs to make continuous approaches to each department manager and the secretariat of the mill quality control committee.

In the initial stages, it is important that the secretariat and managerial officers take the lead, based on their own scenario. After several experiences, QC circles will develop higher ability than expected, from which the management itself will learn.

One QC circle deals with three or four themes in a year. The results of its activity is evaluated at a presentation meeting, and a trophy and prize money are awarded. Presentation of circle activity results is made in the following manner in the paper and pulp industry of Japan.


President's Commendation
(Corporate Presentation Meeting)
Rep. of Mill A
Rep. of Mill B
Rep. of Mill C
Rep. of Mill D
Rep. of Mill E
Mill Manager's Commendation
(Mill Presentation Meeting)
Rep. of Clerical Div.
Rep. of Paper-making Div.
Rep. of Raw M. Div.
Rep. of Facil. Div.
Rep. of Power Div.
Rep. of Tech. Div.
Rep. of Associated Companies
Commendation by Manager, Stock Department
(Department Presentation Meeting)
First Stock Section
Second Stock Section
Cooking Subsection
Bleaching Subsection
Bleaching Subsection
Chemicals Subsection
Shift A (4 Mem.)
Shift B (4 Mem.)
Shift C (4 Mem.)
Shift D (4 Mem.)
Shift A (2 Mem.)
Shift B (2 Mem.)
Shift C (2 Mem.)
Shift D (2 Mem.)
Shift A (5 Mem.)
Shift B (5 Mem.)
Shift C (5 Mem.)
Shift D (5 Mem.)
Shift A (2 Mem.)
Shift B (2 Mem.)
Shift C (2 Mem.)
Shift D (2 Mem.)
One Circle
One Circle
One Circle
One Circle
One Circle
One Circle
One Circle
One Circle
One Circle

2.4 Production and Cost Management

2.4.1 General

The Study Team received the impression that the Aksu mill management's approaches were very negative.

(1) Emphasis should be laid on regular patrols by managerial officers.

Passageways, which could easily be passed through for patrols at the time of trial run in 1971, were occupied with employees' temporary seats or windbreak curtains. It was difficult to go along these passageways, as a result.

It seems patrols are prohibited because the inclined conveyor that carries logs from the drum barker is dangerous. This prohibition should be lifted.

The pulp and paper industry is classified as a process industry, but it greatly differs from the petrochemical and other chemical industries in that it requires a great deal of monitoring by sight and appropriate measures to be taken.

The most important is, therefore, to point out problems and take immediate measures through patrols by managerial officers.

(2) It is necessary to keep everything in good order on the premises of the mill.

Logs that account for 80% of the raw materials were not properly managed. They lay scattered in quantities, even after they had been cut for GP material, around the wood room, the seasoning pond, behind the drum barker, around the intermediate

scaffolding of the inclined conveyor, and so forth. Though they might have been scattered for some good reason, they should be kept in order from the point of view of discipline in the mill.

(3) Repair materials were left especially outside the eastern part of the main building.

Repairs are not complete until materials are cleared away and the place is restored to the status quo. The supervisor should be strict in this respect.

(4) Damage in plant roads was considerable.

The plant roads urgently require repairs. Damage in the unpaved road east of the main building was also considerable.

Needless to say, it is important that heavy materials be conveyed safely and quickly through plant roads.

2.4.2 Wood Processing

(1) Adjustment of log acceptance and backlog

Log backlog that was caused during the four-month strike brought about in the fall of 1988 had been carried over. Backlog adjustment is said to be difficult because logs are supplied by a Government Agency, but inventory should be on the optimum level from the standpoint of cost reduction. The inventory ceiling of the mill is 95,000 cubic meters.

(2) The accumulated logs consist of 30,000 cubic meters of logs cut for GP material and 65,000 cubic meters of piled logs. It is necessary to make FIFO of logs possible from the viewpoint of quality control. Deterioration of 30,000 cubic meter logs cut and piled up is also a matter of concern.

(3) Poplars are carried in to make up for the log shortage, which practice should be abolished because they are not suitable for GP logs. Poplars have short fibers and insufficient strength and cause trouble in operations, as they become sunken logs in the seasoning pond.

The ratio of poplar logs is said to have sharply increased to 2.7% in 1989.

(4) Deteriorated logs are often found in thick logs when band-sawed. Bad logs including thick ones should be disposed of rather than being left on the ground for a long time.

Spruces are said to begin going bad in two or three years and pines are said to become bad in four years, which periods seem too long. It is necessary to grasp accurately secular changes in moisture content and the degree of decaying.

It is preferable to handle logs as fresh as possible because the longer storage time results in over-drying of logs and deterioration of texture which leads to a poor GP quality.

For pines, however, a period of seasoning is necessary in view of pitch problem countermeasure.

(5) Rotary screen for the drum barker draining

The apparatus was out of order and its operation was discontinued. Insufficient removal of bark and suberin of the endodermis will cause unnecessary load on the waste water disposal equipment.

2.4.3 Pulp Process

(1) Groundwood pulp process

1) Operation of the grinders

Seven grinders were regularly operated under the electricity demand contract system (max. 22 MW). During 15 days between 12 and 26 February 1990,

Total GP stoppage:	10 to 18 hours	three days
	2 to 4 hours	seven days

Though it may be inevitable as a result of paper machine stoppage causing full of stock chest, it is desirable to reduce frequency and time of total GP stoppages, by which overflow of recycle feed water into the drainage as well as lowering of stock temperature can be prevented. Big changes such as starting and stopping of the system have the worst influence on pulp quality.

2) Burring of the grinder stones

According to the result for February, the grinder stones underwent burring every seven days on the average (in terms of continuous operation), with 16-day intervals at the maximum and 3.7-day intervals at the minimum. This seems the greatest cause of unevenness in GP quality.

The yardstick is freeness before and after burring, but large errors are unavoidable. Though a combination with energy management is desirable, it is difficult to control energy for each stone because two grinders are driven by one motor at the mill. Some measures are needed.

3) Quality of Norton's Alundum stones

The Team could not find good reason in the use of a 46-mesh stone for thick log treatment and a 60-mesh stone for other logs. In actual operations, thick logs were also fed to other grinders. Grain sizes should be made uniform.

4) Showering of the stones

The stones underwent washing by cleaning shower, intermittently unloaded. This way of washing is not desirable from the viewpoint of production efficiency. Improvement is necessary.

5) Primary pressure screen

The manometers at the stock inlet and outlet were left out of order. The point of screens of this type is operation at prescribed differential pressure. Blind operation should be avoided.

The screen plate had perforations of 1.6 mmø, which let any shive or large fiber go by force of pressure. This type of screen plate is not desirable.

6) Reject processing system

The Study Team was informed that Mitsubishi Virti-finer, the original design, had been replaced by Sprout-Waldron disk refiner, because unit electricity requirement of the former was too large.

Improvement is necessary in consistency after screw press, freeness, stability of the system, and so forth.

The reject processing system including the screen needs to be reviewed, especially with a view to reducing shives, because load on the system greatly increases when the reject ratio of the screen is raised.

7) Heating of grinder recycle feed water

Polydisk clear water was steam-heated and reused as grinder shower water.

This may be done in special cases such as papermaking in winter, but raising recycle water temperature by heating should be avoided in normal operation.

The Team wondered whether heating recycle feed water was beneficial to quality and production.

As of 1989, the consumption of 0.81T/BDT was considered large.

8) Unit power requirement

Unit power requirement of the grinders is 20% to 30% higher than that in Japan. Though this may be

attributable to the difference in the type of grinder, review is needed for improved unit power requirement.

As the quantity of the tail system is small, load on the refiner system is very small. However, unit power requirement is still high, when viewed from the whole GP.

9) Stoppages of GP operations (as of 1989)

Calendar days	365 days	100%
Operation days	222.5 days	61%
Total GP stoppages	142.5 days	39%
Breakdown:	Stoppage due to full of stock	64.6 days
	Planned stoppage	38.9 days
	GP machine trouble	ca. 20 hours

In addition, there were stoppages due to restricted power supply, which should be controlled in comparison between quality and costs.

The Team found no records on the paper machine stoppages due to mechanical trouble in the GP equipment.

The Team was informed of no stoppages of the paper machine due to trouble in the wood processing equipment.

2.4.4 Preparation Process

The machine stopped almost every day during the Team's stay at Aksu mill, and surveys made by the Team were not satisfactory, as a result. The following were the findings of the surveys.

(1) Gauges and auxiliary instruments were left damaged, just as in the case of the paper machine. The purpose of processing is to feed the machine with raw materials and to collect broke and white water discharged from the machine, and hence the job site is full of pumps. It was a matter of course that the process became out of control because of damaged gauges of these pumps. Patrols in the job site should further be strengthened.

(2) Since paper is made from two kinds of pulp, that is, GP and purchased KP, in Aksu mill, there are no bleaching facilities installed. It is difficult for operations in the mill to make pulp bright, or to make paper bright, as a result.

Regarding GP, on the other hand, pulp brightness and hues are subject to change, depending on kinds of logs and storage periods. Nevertheless, dyestuffs were added based on the ratio of them to the quantity of pulp flow in preparation, which fact would inevitably make hues greatly different and in turn affect printing of newspaper.

Hue control is one of the most important items in operation. In Japan, hues are controlled both by paper sampling for every reel change, to examine hues by sight and by mechanically measuring them. In Aksu mill, however, hues were seemingly not controlled in that manner.

(3) In the report on machine stoppages during January and February 1990 and their causes, abnormal operation of the polydisk filter and a long-period stoppage for cleaning it were recorded in February. Abnormal filter operation seemed to have been caused by the runaway filter due to pulp not being caught by the

filter.

This case seemed to have been caused by clogged filter cloth resulting from insufficient maintenance of the polydisk filter and leading to an abnormally heightened revolution of it due to the fact that no sheet mat was formed because of pulp not caught by the filter.

Polydisk filters need no-load running for cleaning about two hours at least once per month, with the vat filled with alkali. Then, discharge dirty water and carefully clean the filter cloth with pressurized water to maintain the polydisk filter functions, or the functions of polydisk filters are lowered to the extent that they are effective no more.

Even if polydisk filters are managed in this way, frequent cleaning will be necessary, unless filter cloth is replaced by new one every two years, to prevent polydisk filter trouble.

This kind of trouble may be prevented by careful management of everyday operation.

2.4.5 Papermaking Process

Since this process plays the most important part in production at Aksu mill, the Team prepared a questionnaire (see Attachment III-2-2) at the beginning of its survey, answers to which are shown in Attachment III-2-3.

(1) Analysis of stoppages

The analysis data on machine stoppages between January 1 and February 28, 1990 is as shown in Table III-2-2.

1) Planned stoppages

There was a stoppage for seven and a half days to install foil to the wire part. Comparison between the estimated cost and the actual cost, review of the installation work, and measures to be taken in the future constitute valuable reference materials.

2) Clothing replacement

It took about three days to replace two bronze wires, three press felts, and one 3p roll.

It was quite natural that time requirement should be so long because only four persons were engaged in replacing these clothing. While they were working for replacement, the others were waiting. This system needs to be improved for increased productivity.

3) Cleaning

Planned cleaning was said to be implemented according to the supplier's recommendations that the circulation system should be cleaned every 24 hours even if stable production was being continued. However, improvement makes it possible to reduce stoppage hours for cleaning to a large extent.

4) Unexpected stoppages

Basic improvement is to closely review the causes of unexpected trouble case by case and to take appropriate measures, which have to be concrete and effective. No demonstration was possible during the present survey, because of restricted

time and problems in communication between them and the Team.

Trouble and its supposed causes and measures for them are outlined below.

A. Electrical trouble:

This may have been caused by superannuated equipment. There are some problems with the technical level of electrical engineers, also. The burnt-out motor seems to be attributable to wrong operation.

B. Stuck materials:

A full and basic knowledge and carefulness are necessary in cleaning the machine.

C. Winder trouble:

It is necessary to heighten the level of electrical and instrumentation maintenance technique.

D. Vacuum pump trouble:

There is a problem in the technical level of maintenance.

E. Poor consistency control:

Stoppages due to poor consistency control are rarely experienced in Japan. Installation of a spare consistency controller would solve the problem.

F. Carrier rope severance:

The rope may have been cut or detached by blowing broken sheets off the drier from the back to the front to avoid labor in collecting broken sheets blown off the drier to the back. The primary measure is to reduce sheet break in the drier.

G. Couch chest and pulper chest overflow:

This may have been caused by the overflowing couch chest or calender pit filled with stock, resulting from delayed paper thread through the press part and dry part. Forcible operations before paper run conditions are satisfied will cause overflow at these parts. Careful management should be continued because insufficient maintenance that may cause trouble can certainly occur in everyday maintenance, repairs, and cleaning of the machine and clothing.

5) Sheet break time

Sheet break can greatly be reduced, depending on the cleaning method of the circulation system.

Analysis is necessary for sheet break at the drier part, which occurs twice as often as that at the press part.

(2) Paper machine and the rate of operation

Assume that the current selling price of newsprint is TL1.3 million per ton, and sales are as follows with Aksu mill's current capacity of 240 tons per day.

Sales per hour	TL13 million
Sales per minute	ca. TL200 thousand
Sales per second	TL3,600

A management system that can develop cost consciousness should be established with the view of raising the operation rate of the machine.

For example, it is necessary to establish cooperation between those in charge of the winder and those in charge of the dry end, during wet part cleaning. It is also necessary to increase the number of cleaning rubber hoses of the wire part.

All operators should be made to participate in raising the rate of operation, through training and revision of employment contracts.

(3) Maintenance of measuring instruments was insufficient, which urgently requires improvement. As in the case of GP, the manometers were often left out of order. The important manometers for indicating inlet and outlet pressures of the machine screen were left out of order, with outlet pressure higher than inlet pressure. Most measuring instruments for the heat recovery and enclosed drier hood systems were not working. Some measuring instruments for the head box were left damaged, without any paper being fed.

(4) The BM meters were only used for measurement and recording. Introduction of correctable instruments should be considered. However, sufficient training should be given in correctly handling high-precision adjustable instruments that require a full knowledge of them and quick operations for adjustment and maintenance.

(5) Paper having poor cross profile will cause difficulty in winder operations, resulting in heaps of parent rolls between the winder and the reel. In most cases this is attributable to poor production management of the paper machine proper.

It is important for every operator of the dry end to try to make high quality paper of good cross profile, paying attention to winder operations and always correcting his manner of operation. Cooperation of all operators is desired to deal with accumulated parent rolls before the winder, as is necessary in wet end operations.

(6) Inspection and cleaning of the paper machine by a planned stoppage on March 1, 1990

The Study Team requested to implement a planned stoppage on March 1 from 9:00 to 17:00, according to the inspection items, which were mentioned in Attachment.

The machine, started again at 21:30, experienced two days of no sheet break, for one week after the inspection.

To the Team's regret, insufficient cleaning at the time the machine was started again causing the plastic wire to be perforated, which had to be replaced in six days.

This must have proved a close relation between sheet break and cleaning of the circulation system of paper machines.

Complete removal of stuck dirt made it clear that the stainless steel surface had been preserved without corrosion. The degree of corrosion turned out to be very low in the whole system.

Details of inspection during this planned stoppage are shown in Attachment III-2-4.

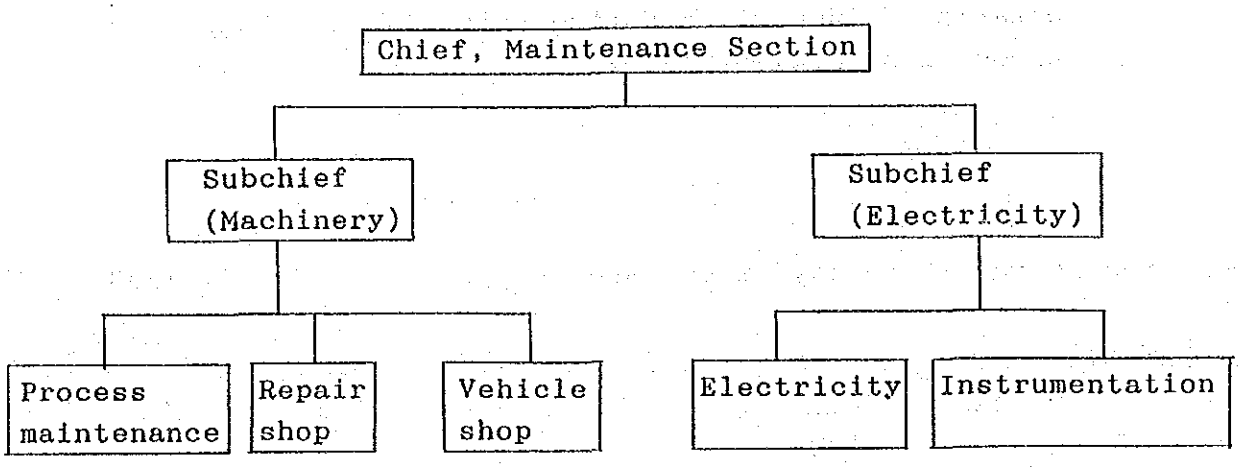
Machine Stoppages

Operation hours 59 days from January 1 to February 28, 1990

Total	84,960 min.	100%
Total planned stoppage	16,305 min.	19.2%
Wire part remodeling	10,800	
Clothing replacement	3,840	
Cleaning	1,665	
Total unexpected stoppage	7,995 min.	9.4%
Electrical trouble	1,920	
Stuck material releasing & cleaning	1,455	
Winder trouble	1,125	
Vacuum pump related trouble	615	
Consistency out or control	390	
Carrier rope severance	255	
Overflow at pulper couch chest	240	
Other trouble	1,995	
Total sheet break time	4,410 min.	5.2%
Press part	1,465	
Drier part	2,665	
Calender reel	280	
Net operation time	56,250 min.	66.2%

2.4.6 Management of Repair and Maintenance System

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



It is impossible to judge whether or not this system works because it depends on the level of workers' technique and experience. It seems to be well organized.

	Output (t)	Sales (m.Tl)	Act.rep.expenses (m.Tl)	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 repair costs, only annual results were shown. The Team could obtain no information on comparison between estimated repair costs and actual repair costs or on measures for superannuated equipment.

The ratio of repair costs to sales seemed to have developed with a management goal of 3% except for 1985, which did not constitute an item for evaluation, as a matter or course.

The following are descriptions of the maintenance system and management conditions, based on the Team's observation.

(1) Pigeons were flying about within the main building of Aksu mill.

Pigeons were nesting in the machine room and the boiler room where the temperature rises. There was the possibility of this causing trouble in papermaking. Pigeons came in and out at the window, most of whose panes were broken, above the crane rail girder of the machine room. The window, located more than 10 meters high, cannot be easily broken from carelessness during operation. Meanwhile, most instruments for the enclosed drier hood system of the machine room stayed out of order and stopped, without fulfilling their designed functions of not only fine control of paper drying but also ventilation and humidity control in the machine room.

As it was unbearable to work without ventilating facilities functioning in summer, workers seemed to have broken the window for natural ventilation in an attempt to improving working environment.

Quick measures should be taken against the stopped instruments for the drier hood system and ventilating facilities.

Even in the steam room and turbine room, which were the most stable job sites in a paper mill, natural ventilation and pigeon invasions were observed, just as in the machine room.

These cases point to the necessity of basic technical training.

(2) Fixing patrol routes

As mentioned earlier, maintenance requires preventive measures before trouble occurs. In Aksu mill, however, there was neither overall inspection routes nor regular patrol routes between processes. Passing was especially difficult around the deculator tank in the machine room, the vacuum pump on the first floor, and the drier oiling apparatus, all of which were important sections. It is necessary to fix and improve patrol routes.

2.4.7 Education and Training System

(1) Present conditions

It is understood that the SEKA Head Office is in charge of working out annual education and training plans. The personnel of the Personnel Department and the Research and Development Department of the Head Office are cooperating in making plans. As education and training are going to be organized into an independent system, substantial education and training schemes are expected to be established.

The mill has no education plans of its own, and training is given in accordance with Head Office plans. In-house instructors who are regularly selected at the Head Office educate employees under

the education and training plan of the Head Office. The annual educational program lasts only one hour to two hours.

Trainees are new employees in most cases, who receive a general explanation on the company and the mill as well as safety. Since a plan to curtail the personnel is under way, without filling up vacancies from retirement, no education classes have been given to new employees.

Safety education is only given in a new employee class. Since 1989 no labor accident that requires absence has occurred.

All promoted employees receive reeducation or retraining from in-house or external instructors.

Newly recruited employees conclude a 25-year employment contract with the company. When this period of 25 years expires, the employee retires. Unlike former times, no retired employee has been reemployed since the plan for personnel curtailment was started.

(2) Desirable education and training

As observed by the Team, operators of the production system especially lacked knowledge of machines and instruments that they should manage. This may be attributable mainly to insufficient written standards of operation, which may be related to the stability of work force.

1) Setting operational standards

It is necessary to make written records of quality standards, operational standards, manuals on

starting procedures, manuals on stop procedures, operation manuals of machines and instruments, etc. which have been agreed upon by those concerned, in a manner most appropriate to Aksu mill. The first steps of education are to have employees fully understand these standards.

2) Standardization committee

If there exist no such standards as mentioned above, great efforts are required in preparing them from scratch. It is therefore desirable that a standardization committee be organized under the control of the Mill Manager. It is a matter of course that the committee consists of members engaged in operations and members in command of them, but new entry-level engineers should also be involved.

Standards should be original with SEKA and Aksu mill. If errors are found in them, the committee should correct them. If only inadequate technical explanations are possible, standards should have a description to the effect that no further technical explanation can be made for the time being.

3) Improvement proposal system

Complete standards and continuation of organized production activity alone do not satisfy those who are working there. Introduction of an improvement proposing system is desirable.

To activate such a system, a person in charge of work-site operations should be appointed Proposal Chairman, with two or three members from managerial officers, and a secretariat should be

established. The purpose of a proposal system consists not in whether good proposals are made or not but in making known that opportunities of speaking are given to every employee.

(3) Assistance in education and training

The Team recommends that education and training by foreign engineers and technicians should be planned, from which good results can be expected.

3. Diagnosis on Apparatuses and Equipment of Aksu Mill

3.1 Processes of Aksu Mill

3.1.1 Outline

The basic design of the existing mill is based on the following conditions.

(1) Type of the mill

Rolls for newsprint, writing and printing paper of newsprint quality, and GP wet pulp are produced from raw materials consisting of coniferous pulp logs (firs and spruces).

(2) Production capacity

Rolls for newsprint: 82,500 metric tons per year
GP wet pulp : ca. 80 metric tons per day
Packaged flat sheet: 33,000 metric tons per year

(3) Operation days per year 330 days

Main apparatuses and equipment of the mill are described below in order of process.

3.1.2 Log and Processing Process

a. Truck scale (40 tons): 1 unit

b. Log storage yard equipped with a crane: 1 set
3,000 cubic meters

c. Slasher: 1 set

A system equipped with six 1,525 mmø circular saws

d. Swing chain saw: 1 set

An apparatus that cuts long logs having a maximum diameter of 1 meter into logs 4 meters long.

e. Thick log processing equipment: 1 set

Equipment for processing 4 meter logs having a maximum diameter of 1 meter; a slasher equipped with two band saws and four circular saws

f. Circular saw and band saw setting apparatus: 1 set

g. Rotary stacker for log storage: 1 unit

Equipment that stacks 1 meter logs 30 meters high (max.) at a speed of 10 T/H.
Storage capacity 35,000 cubic meters

h. Log moisture adjusting pond: 1 unit

75 m (W) x 450 m (L) ca. 28,000 square meters
Storage of 7,000 cubic meters of logs 1 meter long is possible.

i. Wet drum barker:

3.6 mø x 13 m long 2 units
Driving motor 110kW 2 units

j. Rotary bar screen: 1 unit

1.5 mø x 4.25 m long

3.1.3 Groundwood Pulp Process

a. Log holder: 1 unit

11 m (W) x 16 m (L) x 8.5 m (H), made of concrete.
Logs for 9 hour GP production (min.) are stored.

b. Grinder: 8 units

Two pockets type Greatnorthern grinder
Stone size 1.7 m (Diameter) x 1.2 m (W)
Two grinders are connected to one driving motor.
Motor: 4 units
4,100 kW 250 R/M 6,300 V synchronous motor

c. Bar screen: 1 unit

Stainless steel scraper screen with a slab removing bar

d. Bull screen: 2 units

Jonnsson vibrating screen 2.23 m (W) x 2.23 m (L)
Stainless steel plate perforation diameter 8 mmø

e. Bull screen reject shredder: 1 unit

Re-chipper type processing capacity 10 tons per day

f. Dewatering device for the tail system:

i. Drainer: 1 unit
Rotary-drum stainless wire (operation suspended)

ii. Screw press: 1 unit

g. Refiner for the tail system

i. Virti-finer: 1 unit
Disk diameter 910 mmø 900 kW(operation suspended)

ii. Sprout-Waldron: 1 unit
Disk type 500 kW

h. Cleaner for the tail system

i. Primary cleaner: 6 pieces
Free vortex cyclone cleaner (operation suspended)
Secondary cleaner: 2 pieces
Free vortex cyclone cleaner (operation suspended)

ii. Primary cleaner: ALBIA 2 pieces
Secondary cleaner: ALBIA 1 piece

i. Pressure screen: 2 units

400 type Bird centri-sorter perforation diameter 1.6 mmø
95 kW motor

j. Tail screen: 1 unit

200 type Bird centri-sorter perforation diameter 1.6 mmø
45 kW motor

k. Decker: 2 units

Polydisk filter disk diameter 3,810 mmø 8 disks

l. Finishing chest: 1 unit

12.2 m (D) x 11.7 m (H), made of concrete

3.1.4 BKP Dissolving and Stock Preparation

a. Pulp bale intake roller conveyor: 1 unit

1 m (W) x 5 m (L)

b. Inclined bale conveyor: 1 unit

1.2 m (W) x 15 m (L) belt conveyor

c. Pulper

Concrete, tiled ca. 40 cubic meters: 1 unit
Stainless steel 1.12 m diameter pulper rotor: 1 set
with a 220 kW motor

d. Pulper discharging pump: 1 unit

8 cubic meters per minute, 10 m head, with a 30 kW motor, centrifugal pump

e. Damp chest: 1 unit

4.5 m x 4.5 m x 6.7 m, made of concrete

f. White water holder: 1 unit

3.5 m x 3.5 m x 3.5 m, made of welded steel plate, ca. 40 cubic meters

g. Clay slurry tank: 1 unit

2.2 m diameter, 2.48 m high steel tank equipped with an 11 kW agitator

h. Clay slurry holder: 1 unit

5 m diameter, 2.5 m high steel tank equipped with a basket type wire mesh strainer and a 15 kW agitator

i. Alum dissolver: 1 unit

1.9 m diameter, 1.85 m high, stainless steel equipped with an 11 kW agitator

j. Alum solution holder: 1 unit

3.5 m diameter, 2.5 m high, stainless steel

k. Dyestuff mixing tank: 2 units

1.5 m diameter, 1.75 m high, stainless steel each equipped with a 0.75 kW agitator

l. Dye solution holder: 2 units

1.69 m diameter, 2 m high, stainless steel

m. Rosin dissolver: 1 unit

2.5 m diameter, 3 m high, stainless steel equipped with a steam heating coil and a 2.2 kW agitator

n. Rosin paste holder: 1 unit

2.2 m diameter, 2.5 m high, made of steel plate equipped with a steam heater

o. Rosin emulsion holder: 1 unit

4.8 m diameter, 4.5 m high, made of carbon steel plate

p.	Slime control agent mixing tank:	2 units
	1.27 mø, 1.2 m high, made of stainless steel	
q.	Slime control agent holder:	2 units
	1.2 mø, 1.25 m high, made of stainless steel	
r.	GP surge chest:	1 unit
	5.4 m x 4.8 m x 6.7 m, made of concrete	
s.	Refiner for kraft pulp:	
	3126 type double disk refiner disk diameter 660 mm 245 kW driving motor each	2 units
t.	Machine blend chest:	1 unit
	5.4 m x 4.2 m x 6.7 m, made of concrete	
u.	Machine chest:	1 unit
	5.4 m x 5 m x 6.7 m, made of concrete	
v.	Finishing refiner:	1 unit
	Conical refiner equipped with a 300 kW motor	
w.	Pulp thickener:	1 unit
	1.27 m diameter, 2.85 m long drum thickener	
x.	Thickened broke chest:	1 unit
	4.3 m x 2.5 m x 6.7 m, made of concrete	

y. Refined broke chest: 1 unit

5.6 m x 5 m x 6.7 m, made of concrete

z. Broke refiner: 1 unit

equipped with a 75 kW motor

z'. Broke chest: 1 unit

7.5 m diameter, 15 m high, made of concrete

3.1.5 Paper Machine Approach

a. No. 1 fan pump: 1 unit

75 cub.m/min 43mH FC casing
equipped with a 700 kW synchronous motor

b. Primary cleaner:

Centrifugal cleaner (free vortex type): 38 pieces
Secondary cleaner:
Centrifugal cleaner (free vortex type): 8 pieces
Tertiary cleaner:
Centrifugal cleaner (free vortex type): 5 pieces

c. No. 2 fan pump: 1 unit

66 cub.m/min 23mH FC casing
equipped with a 320 kW synchronous motor

d. Pressure screen: 2 units

Bird 14B type, 30 kW motor driven, perforation diameter

Reject screen: 1 unit
Bird 6A type, 7.5 kW motor driven, perforation diameter

e. Disk type white water save-all: 1 unit

3.8 diameter, equipped with 15 disks

f. Vacuum pump

Nash CL6001, 170 cub.m/min	-250mmHg	560kW	2 units
Nash CL9001, 290 cub.m/min	-250mmHg	-	1 unit
Nash CL9002, 295 cub.m/min	-500mmHg	-	5 units
		750kW	2 units
for deculator, 22.2 cub.m/min	-660mmHg	60kW	1 unit

g. Dry broke pulper:

Concrete, tiled holder 1 unit
1,120 mmø pulper rotor unit 2 sets
equipped with a 220 kW motor

3.1.6 Paper Machine

a. Arrangement: The driving unit is on the right side, when viewed in the reel direction at the end of the breast roll.

b. Major dimensions:

Wire	7,520 mm (W) x ca. 41.2 m (L)
Slice width	7,370 pond side wall interval
Max. trim on the reel	6,980 mm
Max. trim on the winder	6,900 mm
Design driving speed	700 m/min
Balancing speed	760 m/min
Drying capacity	700 m/min

Max. diameter of the unwind roll	2,240 mm
Max. diameter of the rewind roll	1,270 mm
Max. design speed of the winder	2,130 m/min

c. Head box dimensions:

Rectifier roll	(2) 405 mm diameter (slice roll)
Rectifier roll	(2) 405 mm diameter (head vat roll)
Rectifier roll	(1) 445 mm diameter (throat roll)
Stream flow valve	500 mm diameter, elbow type
Air compressor	Nash type

d. Fourdrinier dimensions:

(remodeled into Fourdrinier between 8 and 15 January 1990)

Suction box	(7) box interval 380 mm
Suction box cover	(2) slotted, polyethylene
Suction box cover	(4) perforated, polyethylene
Deflector	(8) double flat top
Deflector	(8) single flat top
Doctor	(8) swing type
Breast roll	(1) 1,066 mm diameter, 7,620 mm face length
Table roll	(9) 432 mm diameter, 7,620 mm face length, slotted
Table roll	(9) 420 mm diameter, 7,620 mm face length, plain
Dandy roll	(1) 1,220 mm diameter, 7,670 mm face length, journal type
Suction couch	(1) 1,130 mm diameter, 7,570 mm face length, perforated Suction width 125 mm and 150 mm
Wire return roll	(3) 710 mm diameter, 7,620 mm face length

Wire return roll	(4)	610 mm diameter, 7,620 mm face length
Wire turning roll	(1)	1,066 mm diameter, 7,620 mm face length

e. Press dimensions:

Felt suction box	(3)	uhle type
Doctor	(5)	swing type
Suction pickup roll	(1)	915 mm diameter, 7,620 mm face length, perforated suction width 125 mm
Plain wringer roll	(1)	965 mm diameter, 7,620 mm face length
Primary suction press	(1)	1,175 mm diameter, 7,470 mm face length, perforated suction width 150 mm and 1,120 mm
Center roll	(1)	1,220 mm diameter, 7,620 mm face length
Secondary suction press	(1)	1,175 mm diameter, 7,470 mm face length, perforated suction width 150 mm
Tertiary suction press	(1)	1,175 mm diameter, 7,470 mm face length, perforated suction width 150 mm
Tertiary plain press	(1)	1,220 mm diameter, 7,620 mm face length

Press felt roll	(11)	470 mm diameter, 7,770 mm face length
Press felt roll	(6)	470 mm diameter, 7,770 mm face length, worm
Press paper roll	(1)	470 mm diameter, 7,420 mm face length

f. Drier dimensions:

Pressure test		5.0kg/sq.cm G
Doctor	(7)	swing type
Lubricating system		280 l/min, two oil pans
Paper drier	(43)	1,524 mm diameter, 7,420 mm face length, Meehanite cast iron
Felt drier	(10)	1,524 mm diameter, 7,420 mm face length, Meehanite cast iron
Sweet drier	(1)	1,524 mm diameter, 7,420 mm face length, S.D.40.F.C
Siphon	(53)	rotary type, front
Steam fit	(53)	simplex type, back side

Drier arrangement

Group	Paper drier	Felt drier	Sweet drier	Doctor
1	6	2	-	2
2	16	4	-	1
3	12	2	-	1
4	9	2	1	3

Drier felt roll	(95)	456 mm diameter
Drier paper roll	(1)	456 mm diameter, 7,420 mm face length

g. Breaker stack dimensions:

Location		Between Drier Group 3 and Drier Group 4
Breaker bottom roll	(1)	965 mm diameter, 7,570 mm face length, CCR, driving
Breaker top roll	(1)	610 mm diameter, 7,370 mm face length
Breaker paper roll	(2)	456 mm diameter, 7,420 mm face length
Breaker stack doctor	(2)	electric swing type
Steam fit	(1)	duplex type

h. Calender dimensions:

Calender king roll	(1)	965 mm diameter, 7,570 mm face length, CCR, driving
Calender intermediate roll	(5)	610 mm diameter, 7,370 mm face length
Calender spreader roll	(1)	456 mm diameter, 7,370 mm face length
Calender paper roll	(1)	456 mm diameter, 7,370 mm face length
Steam fit	(4)	equipped every two
Doctor	(5)	equipped with an air sledder
Doctor	(1)	swing type

i. Reel dimensions:

Reel drum	(1)	1,220 mm diameter, 7,370 mm face length
spool	(12)	660 mm diameter, 7,620 mm face length
Spreader roll	(1)	456 mm diameter, 7,370 mm face length

j. Machine drive dimensions:

Section	Diff. type	DC motor capacity KW Main	Helper
Couch			260
Wire turning roll	#5		75
Wire returning roll			45
(Dandy roll)			(22)
Suction pickup roll			37
(Wringer roll)			(110)
Primary press	#5		
Secondary press			
Press paper roll			150
Tertiary press	#5		2.2
Drier Group 1	#3		
Drier Group 2	#5		
Drier Group 3	#5		
Breaker stack bottom	#3		
Breaker stack top			22
Drier Group 4	#5		
Calender stack	#5		
Paper rolls			2.2x3 units
Reel	#3		
Line shaft		1,300	

Power is transmitted from the line shaft to each section by means of the differential gear unit.

k. Drier hood dimensions:

Totally enclosed hood	11.0m(W) x 52.5m(L) x 8.0m(H) 99.5% purity Al plate
Wet air exhaust fan	(3) 95,000 cubic meters/hr each equipped with a 30 kW motor
High pressure vapor purge system	(1) 24,000 cubic meters/hr fan equipped with a 30 kW motor
Economizer	(3) box type, treats 210,000 cubic meters/hr
Drier air fan	(3) 70,000 cubic meters/hr fan equipped with a 37 kW motor
Turbo blower	(1) 170 cubic meters/min, 1,400 mmHg supplies cold air to the calender, equipped with a 75 kW motor

l. Winder dimensions:

Winder model	L-26-G-50 double drum winder, right-handed, one unit
Paper quality	newsprint and writing paper
Paper weight	50 grams to 60 grams per square meter
Max. operating speed	2,130 m/min
Max/min rewind roll diameter	1,270/610 mm
Max. trim width	6,900 mm
Max/min slit width	2,250/430 mm
Roll core inside diameter	fits to 70-mm, 120-mm, and 150-mm core shafts

m. Roll wrapping machine dimensions:

Max. roll diameter	1,000mm
Min. roll diameter	610mm
Max. roll width	1,760mm
Min. roll width	430mm
Max. output	60 rolls/hr in the case where rolls has the same diameter and same width.
Average output	20 rolls/hr

n. Reclaim winder dimensions:

(It has been removed.)	
Paper quality	Newsprint and writing paper
Paper weight	50 - 60g/sq.m
Max. operating speed	1,070m/min
Max. diameter of unwind roll	1,270mm
Inside diameter of unwind core	fits to 70 mm, 120 mm, and 150 mm shafts.
Max. trim width	2,200mm
Max. rewind diameter	1,270mm
Number of slitter sets	3
Min. width of rewind roll	280m

o. Paper core manufacturing unit:

Paper core inside diameter	70mm, 120mm, 150mm
Max. core length	2,250mm
Base paper	min. 0.6 mm thick, max. 1.0 mm thick
Manufacturing speed	4 - 16m/min

Core drying chamber	equipped with a steam drier, 2,000 cores of 2,250 mm long and 100 mm diameter can be stored.

p. Simplex cutter and sheet lay boy: 2 units

Paper to be cut	50 - 60g/sq.m writing paper
Design speed	300m/min
Operating speed	240m/min max., 120m/min normal
Max. trim	2,100mm
Min. trim	600mm
Max. flow length	2,100mm
Min. flow length	610mm
Max. number of sheets for cutting	8
Number of slitters	4 (including trimmings)
Max. piling height height)	1,500 mm (including skid

3.1.7 Auxiliaries

(1) Boiler

One unit of boiler having a maximum continuous capacity of 65 tons/hour is installed to supply steam mainly to the paper machine. It is of a fuel-oil-burning natural circulation type, generating heating steam of 61 kilograms/square centimeter and 500 degrees C. Almost the whole amounts of steam for process heating and the boiler are sent out, after driving the back pressure turbine, reduced to 3.5 kilograms/square centimeter g and 215 degrees C. Specifications of the boiler is as follows.

Steam generating capacity	
Maximum continuous capacity	65 ton/hr
Normal operating capacity	55 ton/hr
Peak capacity (within one hour)	72 ton/hr
Operating pressure (at superheater outlet)	61 kg/sq.cm g
Maximum steam temperature	500 degrees C.
Maximum pressure	69 kg/sq.cm g
Feed water temperature at deaerator outlet	105 degrees C.
Steam quality at boiler outlet	
SiO_2 (dissolved)	0.02 ppm
Conductivity	1 micro-mho/cm
Total solids	0.5 ppm
Allowable steam conditions at 10% change in boiler load	
Pressure	±0.5 kg/sq.cm
Humidity	3 deg.C./min

Automatic control is possible at 30% load and over.

Main boiler-related equipment includes a feed water treatment system, degasifier system, fuel storage and supply system. The specifications of the feed water treatment system is as follows.

Two units of 3-bed 4-tower type, 16-hour switching, two units of weak cation ion exchanger, two units of strong cation ion exchanger, two units of anion ion exchanger, and one decarbonator.

Conductivity of treated water is maintained at 2 to 5 micro-mho or below. The fuel storage and supply system consists of two heavy oil tanks having a volume of 2,000 cubic meters and one light oil tank having a volume of 300 cubic meters.

(2) Steam turbine generator

To supply part of electricity required in the mill, a steam turbine generator is installed. A seven-stage back pressure type, it generates electric power of 8,000 kW output, 6,300 volts, and 50 cycles at a revolution of 9,193.5 rpm/3,000 rpm (turbine/generator). Supply conditions of steam are 58 kilograms/square centimeter g, 495 degrees C. and the discharge condition is 3.5 kilograms/square centimeter g. Steam is dehumidified and sent to the mill. The turbine is so controlled as to allow parallel operation with a purchased electricity system.

A conceptual diagram of the boiler, turbine, and generator is shown in Fig. 1 below.

(3) Water facilities

Water is supplied to the mill by subsoil water from wells bored in the riverbed of the Aksu river.

There are currently eight deep wells, and water is consumed at a maximum rate of 1,250 cubic meters per hour. As one well has a capacity of 360 cubic meters/hour (pump capacity), four or five wells are usually in service, with the others preserved. Wells of 12 meters deep were bored at the beginning of operations, but they were renewed in 1984 to deep wells as mentioned above because intake capacity had been reduced by lowering of the water table.

Quality of ground water is good enough for industrial water without any treatment, and hence necessary chemical treatment is done only for drinking water.

Water is supplied to the mill with three pumps of 11.6 cubic meters/min from two water tanks having a volume of 2,200 cubic meters.

(4) Industrial waste water

Industrial waste water is discharged to the Aksu river without special treatment.

(5) Receiving system

Power consumption at the mill amounts to some 22 MW. The electric power company (TEK) has equipment having a capacity of 40 MW, which consist of two independent systems of 20 MW, including power-transmission wires and transformers. From TEK's substation adjacent to the mill, electricity is sent to the mill at 6,300 volts.

(6) Compressed air

Compressed air is supplied for the measuring instruments and operations in the mill.

Compressed air for operations is supplied by three oil-circulation reciprocating compressors (one for reserve) of 7 kilograms/square centimeter g, 31 N cubic meters/min. Compressed air for the measuring instruments is supplied by two oil-free reciprocating compressors (one for reserve) of 7 kilograms/square centimeter g, 11 N cubic meters/min. An electric regenerative drier is used for compressed air for the measuring instruments.

(7) Vehicles and cranes

Vehicle or crane	Location	Spec.	Capacity	Number
Traveling crane	PM		30 + 30T	1
Monorail crane	PM, roll paper		14 + 14T	1
Gantry crane	Processing		25T	1
PH crane	Ditto	25-m arm	15T	1
PH crane	Ditto	10-m arm	45T	1
Loader	Ditto	Caterpillar	2.5T	2
Loader	Ditto	Volvo	4T	1
Dump truck	Ditto		7T	2
Forklift	Product, Materials		2T	8

3.2 Diagnosis on the Mill Apparatuses and Equipment

3.2.1 Log and Processing Process

(1) Dried logs are immersed in the seasoning pond for humidifying them. To humidify those parts of logs exposed to open air, which are difficult to humidify, they are showered from sprinklers. This sprinkling raises moisture content to around 30%, an increase of about 10%, with comparatively little dispersion, producing satisfactory results.

To be more effective, increase of sprinklers is desirable.

(2) 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

(1) Bull screen reject shredder system

Big chips produced after grinding are currently removed with the bar screen and then slivers are removed with the bull screen (8 mmø). But since both chips and slivers are fed to the re-chipper type shredder, emphasis is laid on rough grinding of big chips. This is not desirable. The quantity of them is said to be 4.5 to 8 BDT/D.

Though it is impossible to see stock at the outlet of the shredder, which is enclosed, considerably large chips are found in stock at the refiner inlet. It is desirable that large and fine chips be separately treated with suitable machines.

(2) Pressure screen

The existing screen, a pressure type, lets all large fibers through by force. It is necessary to replace the primary screen and the refiner screen with low differential pressure type screens, with the view of preventing large fibers from mixing into accepts.

(3) Reject treatment system

The quantity of tail will be increased by increased number of shredders as mentioned earlier and replacement of screens, and will be doubled by improvement of the system for stable quality. It is therefore necessary to review equipment of the whole reject treatment system, including installation of more refiners.

(4) Cleaner

Shives cannot be removed only with a screen. The use of a cleaner has been very effective. As new installation of a cleaner causes thin consistency, installation of more polydisk filters should be considered.

3.2.3 Quality of Groundwood Pulp

(1) Analysis of refiberized pulp for newsprint

Table III-3-1 shows the results of measurement of refiberized freeness and shive of the six types of newsprint shown in Table III-2-1.

(2) Analysis of Aksu mill's pulp

Table III-3-2 shows the results of analysis at Aksu mill and in Japan of samples of pulp picked out from each process.

(3) On Aksu mill's pulp

Aksu pulp has various problems: frequent occurrence of sheet break in the process of analysis of paper and pulp and the papermaking process, existence of shives on the surface of paper which can be recognized by sight, frequent occurrence of ink trouble in the process of printing and existence of snow fall on the printed surface of process of printing and existence of snow fall on the printed surface of paper. On the other hand, there is no problem with BKP pulp which plays a key role in maintaining paper strength. To maintain freeness (Canadian standard freeness) at the 600 CC level can be said to represent proper refining. The most important cited problem is that of shives. It is necessary to review various

conditions of the grinding process and improve the selection process as measures to improve GP quality.

(4) Examination of causes of the problem of shives and measures to be taken

1) Stone washing: the high-pressure, hot-water shower bath for washing the surfaces of stones has power of 4.5kg/cm^2, which is not considered satisfactory for eliminating clogging. It has at least power of 6kg to 7kg per square centimeter.

2) To determine the surface friction of stones, freeness (SR) is regularly measured and its fluctuations are checked and after that shaping is carried out. Although this is an important method of determining the friction surface, the dual determination method is preferable in terms of electric power consumption. At Aksu mill, a motor is used to transmit power to two grinders, and therefore it is difficult to estimate the degree of grinding of stones by electric power consumption. But is should be possible to grasp hourly changes in power consumption. It is desirable to establish a method for determining the correlation between power consumption and changes in freeness.

3) Freeness is measured by the shopper wriggler method. However, it would be better if the Canadian standard method were used for determining the degree of grinding of GP stones within the range of 100cc or less.

4) The finer is the grinding, the better for shives. In the case of Canadian standard freeness, it would be better to indicate lower values. The shopper wriggler method values are obtained in

single digits, while in the Canadian standard method two-digit values are obtained, which means a wider scope of determination.

5) Canadian standard freeness is increasingly used in the pulp and paper industries in various parts of the world. Standard freeness after grinding is 60cc to 70cc within the range of 100cc or less.

6) When $40g/m^2$ is used for basis weight for newsprint, the most important question will be opacity (scattering coefficient). Lower GP freeness is thought to be an effective solution to both the problem of shives and that of opacity.

7) A device for continuously measuring freeness has already been developed. It could be installed in the GP line.

(5) Management of shives

In Japan, the target measured value for shives by the TMP and GP shive analyzer is 50 times/20g, with the upper limit value being approximately 80 times/20g. The shive analyzer should be installed on the job site. The operator should conduct analysis every two to three hours as part of the operation to manipulate friction and screening. At Aksu mill, a GP sieve analysis test is incorporated in the process inspection system, but this is not considered appropriate for shive determination.

(6) Installation of centrifugal cleaner

It is possible to effective remove shives with a centrifugal cleaner, but this device is not installed in the GP file line at Aksu mill. Also, more importance should be attached to operation control by

the use of pressure, differential pressure and reject rate.

3.2.4 Dissolving Process

(1) Operating conditions

1) BKP dissolving and stock preparation

A. BKP in a bale of 250 kilograms are fed to the 220 kW pulper having a volume of 40 cubic meters and equipped with a 1.12 meter rotor, through the roller conveyor and inclined conveyor.

BKP of 1.8 tons is fed at a time in batch feeding. Diluting water is fed from the white water storage.

Feeding mainly consists of the following operations.

Charging with white water	5 minutes
Charging with pulp	15 minutes
Blow	5 minutes

One batch is finished in about 25 minutes. Dissolved pulp is shifted to the pulp chest. The pulper rotor is of shark type, which is capable of continuous dissolving. To make continuous dissolving possible, the BKP dissolving system is equipped with a level controller in the white water storage.

B. The BKP refiner is a 3126 type double disk refiner equipped with two disks of 660 mmø (245 kW).

The refiner is said to have a capacity of 50 tons to 100 tons/day/unit. Beating is excess capacity under the present conditions.

On the line from the pulp chest to the refiner, installed is a consistency controller, which is fulfilling its function.

Refined BKP is blended together with GP and broke pulp in the blend chest in accordance with the blending ratio regulated by flow control.

C. Regarding broke, wet broke is stored in the wet broke chest, and dry broke passes through the dry broke storage, is broken in the stock-master type conical refiner (75 kW), then thickened in the drum thickener together with wet broke, and sent to the thickened broke chest.

Broke thus prepared and GP pass through the thickness controller and the flow controller, and are mixed in the blend chest.

2) Diagnosis data

Table III-3-3 and Fig. III-3-2 show the results of the measurement of freeness, thickness, humidity and pH, as well as white water and diluting water.

A problem in the BKP dissolving process is low pulp temperature, i.e., 31 degrees C. This is due to low temperatures of charge water that comes from the water storage through the white water chest of the pulper chamber and with which the pulper is charged.

Stock inlet temperature is usually between 40 and 45 degrees C. The current 33.5 degrees C. is too low, though BKP temperature rises to 37.5 degrees C. after refining. Measures are described in planned renovations mentioned later.

3.2.5 Stock Preparation Process

(1) Broke is collected with one unit of stock drum thickener. That the blend of broke pulp is prescribed at 10% seems to be attributable to insufficient volume of the drum thickener. It is general that wet broke and dry broke are separately treated.

(2) The temperature of the thickened broke chest is 30 degrees C., which is low. This is attributable to low temperature of diluting water pumped to the preparation process where broke is produced in the machine, fresh water used for strip shower of the polydisk filter for collecting pulp in white water, fresh water used for wire shower in the wire part, and so forth. Effective utilization of white water will constitute an important measure for fresh water saving and energy conservation.

(3) A Jordan is installed in front of the machine head box. It is desirable that this refiner (finishing refiner, a conical refiner of 300 kW), generally used for fiber cutting and unnecessary in the process, be removed from the viewpoint of energy saving.

3.2.6 Papermaking Process

(1) The Team's overall survey revealed no particular obstacles to maintaining the design output (82,500 tons/year) in mechanical strength of the machine. No corrosion was found in component materials seemingly because of difference in raw material and operating

environment. Though functional deterioration was found in some parts superannuated by the period of some 20 years, sufficient maintenance seemed to cause no problem.

(2) Apart from raw material, operations, and paper quality, a review for an increase in design output requires grasping whether the apparatus has no problem in design speed, whether the machine is composed of a series ranging from the approach system to the winder, whether the machine has no defects in mechanical strength, by supposing a design speed of 700 meters/min, from a specialists' point of view.

However, the Team could not get a sufficient grasp of these points, because of too frequent machine stoppages and the staff of the mill raising no question in obstacles to operations.

(3) Major obstacles to operations include the following.

A. Sheet break
B. Quality
C. Change in raw material
D. Machine trouble
E. Operators' skill

Operations for a long time make it possible to predict to some extent the above-mentioned factors from experience. To do so, it is necessary to install and maintain measuring instruments that can indicate correct values. The readings of the measuring instruments, which are currently insufficient, are recorded as operational data.

Technical capability is needed for clearing up causes based on data from measuring instruments and taking appropriate measures. A problem consists in

cooperation and education of operators, field staff, and maintenance and equipment staff. Troubleshooting seemed to be individually done at the beginning of operations, but that know-how was lost with the retirement of persons who possessed it, which case was sometimes seen also in Japan in the past. In Japan, however, problems were posed and solved and measures were taken, all these were done systematically, resulting in heightened technical levels.

This is a matter that calls for consideration also at Aksu mill. It is necessary to increase knowledge of functions and structures of apparatuses. The materials first presented by Mitsubishi Heavy Industries, Ltd. are used as they are, and there is no Turkish translation of equipment manuals in the mill. Usually operation manuals are prepared by field staff in Japan, but there are no such manuals, they say, in Aksu mill.

Operators' technical levels: they were performing their duties within the limits of their experience, but they did not cooperate with operators of other parts, which fact resulted in long time required in replacing clothing such as wires and felt.

(4) Main causes of sheet break

Sheet break is one cause that hinders production and lowers papermaking efficiency. Probable causes are as follows.

1) Partially lowered sheet strength due to shives in stock (sheet break at the press, calender, and winder)

* Measures to be taken: strengthening of the cleaner in front of the machine and the screen (slits), though dependent on pulp quality and screening equipment.

2) Partially lowered sheet strength due to foreign matter and slippages, caused by caught foreign matter flowing in the stock piping, stock inlet, wire part system, etc.

* Measures to be taken: cleaning of the stock route, relative roughness within the piping, removal of valves and pumps at the screen accept and subsequent parts, because the structure may allow foreign matter to be accumulated at valves and packing, or because slippages seem to be caused by whirling in pumps.

3) Insufficient dryness of press wet web and poor moisture profile.

4) Rough surface of the roll makes the part adhesive, causing sheet break by partially strengthened tension when wet sheet is released from the roll. This occurs at the press center roll of the stone roll and 3P top roll.

Findings in the survey: grit was disconnected from the stone system at 270 mm on the back side of the center roll and at 700 mm on the front side of the 3P top roll.

* Measures to be taken: review is necessary for stone roll grinding, doctor blade management (streaked rough surface was considerable at the 3P top doctor, whose sliding was not working because of mechanical trouble), and the manner

of showering to prevent the doctor blades from wearing.

5) If the trim jet does not cut well, the sheet edge becomes notched, causing break there. This is particularly likely to occur at first stages in the press part and the dry part.

Findings in the survey: only one nozzle was attached.

* Measures to be taken: the Team recommends that jet pressure and the strainer be arranged in a row, including the nozzle cutter. The trim jet nozzle should be doubled or tripled, clamps should be shifted to the inside, the pipe should be shortened in order to prevent vibration, and the distance between the nozzle and the wire should be adjusted.

* Nozzle cutter ... sheet break during paper run (related to run time)

  The nozzle cutter is attached to the pick up frame and adversely affected by the roll vibrating according to the condition of the felt. It should be shifted to the frame on the suction couch roll, thereby the 3P space should be made larger, and positions and the number of operating buttons should be increased. Operational improvement should be considered by changing paper run procedures and reducing run time.

6) Sheet break due to cockles is caused by formation at both edges, moisture content, fluttering at the drier, drying, and dispersion. Sheet breaks especially at the calender and the winder.

* Measures to be taken: formation of both edges, especially the cheeking piece of the stock inlet should be adjusted. The reality is that the gap between the upper lip is too large to adjust side blow and that instability is caused by letting stock go at the side packing of the cheeking piece. This part requires the greatest skill in adjustment in the stock inlet. When papermaking is accelerated, measures are necessary for this part, moisture profile at the drier inlet, and sheet fluttering within the drier.

7) Draw control and uneven draw

A: Insufficient maintenance of PIV of the drive and the air clutch, causing a slip, results in uneven draw.

B: A large fluctuation in the level at the stock inlet temporarily causes uneven draw.

C: Draw needs to be controlled by basis weight, papermaking speed and pulp conditions (i.e., blending, freeness, temperature). The Team found few changes in them from operation data. Draw seemed to be strong, judged from the condition of running sheet at the press, between 2P and 3P, and between 3P and the drier.

It seemed that draw was made strong in case sheet break should be caused by dirty surface of the stone roll or uneven release of sheet due to grit disconnected from the surface.

What measures to be taken for drainage changes on the wire according to pulp conditions is a matter of operational skill. The Team could not form a clear view in this respect, because of continuous operation lasting short during the Team's stay at Aksu mill.

(5) Quality and productivity

1) Even if output is raised on the reel, operations at the winder seem difficult, in view of current product quality. The winder, judged from the shape of the mill rolls on the reel, the profile at the BM meter, a bite between rolls of paper at the winder (it may also have something to do with core accuracy), cockles from loosening, and sheet break, seems to be operated at a speed of around 1,000 m/min. The machine speed, assumed from this situation, seems to be balanced between 620 m/min and 630 m/min.

The relation between machine speed and winder speed should be reviewed in the time study of the winder. Though the Team could not get stable rolls in its survey, the following calculations were possible.

Finishing roll diameter: ca. 1,020 mm, length: ca. 8,850 m
(the counter meter was not used because of mechanical trouble.)
Winder speed: 13 minutes at 800 m/min
8,850 m/handling x 4 handling = 35,400 m
35,400/57 min = 621 min

A winder speed of 800 m/min and a machine speed of 620 m/min are just balanced if no sheet break takes place at the winder. Time study in real operations needs to be reviewed.

The operation speed is usually about double the machine speed, with sheet break taken into account, and that some time allowance is given to the winder.

It seemed difficult to maintain a winder speed of 800 m/min with the current product quality. It was operated at 600 m/min on March 8 (much broke was produced in reel-made paper).

2) To raise output on the reel to 700 m/min in the future, the current papermaking speed should be around 600 m/min, and paper whose quality stands a winder speed of 1,500 m/min should be made. To attain a design output of 85,000 tons/year or 90,000 tons/year, skill in operating the winder at 1,500 m/min or over is the first necessity.

(6) Improvement in quality and operations

1) Improvement in basis weight and formation

A. Adjustment of the stock inlet lip

To adjust the stock inlet jet in the cross direction, correct the cracks at the tips of the upper and lower lips, and adjust the opening of the upper lip, watching basis weight profile on the BM meter.

B. Shower inside the stock inlet is intended for preventing dirt between the solution surface and air within the flow box as well as foam on

the solution surface. To know the condition of foaming, stop shower and peep from the upper manhole, using a light. If no foam is recognized, prevention of dirt is sufficient. The amount of shower therefore should be as small as possible. A large quantity of shower causes change in basis weight profile.

As a deculator is installed, there seems no occurrence of foaming. It is recommended that shower temperature be almost equal to stock temperature.

C. Gland seal for the rectifier roll

Since the flow meter that controls gland seal water of the rectifier roll within the stock inlet is not functioning, a great quantity of seal water seems to exist in the inlet. The flow meter should be repaired to make the quantity of seal water optimum because too large a quantity of seal water affects formation and basis weight at the edges of the front side and the back side.

If no seal water exists in the inlet, foreign matter is accumulated in the gland, which may cause sheet break.

D. Flow on both sides of the stock inlet

There is a 0.18 mm opening between the cheeking piece and the upper lip on the front side, which debases formation of the edge. Narrowing the openings on both the front and back sides to about 0.06 mm to prevent leaks at the edge will improve edge formation and basis weight profile.

E. Control of landing at the tip of the foaming board and the inlet jet

Reach is changed by lip openings and the position of the upper lip, according to jet speed, on which a manual must have been prepared by Mitsubishi Heavy Industries, Ltd. Control stock dewatering at the tip of the foaming board, by observing formation. Control is possible on the surface of formation, by judging from foaming there. Improvement involves the following.

a. Lip opening
b. Longitudinal adjustment of the upper lip
c. Longitudinal adjustment of the foaming board (adjustment is not smooth because blade material has been changed into ceramic, causing the box to be changed at the same time, as a result of the installation of foil in the Albania system.)

Formation and dewatering should be taken into consideration, in the case of a. above, because stock consistency may vary in the inlet.

F. Breast roll shower

Currently shower is stopped during papermaking and showering is implemented only while a temporary stoppage. Shower is used to prevent stock from sticking to the under surface of the lower lip, and the quantity required may be a minimum that makes even showering possible in the cross direction.

Temperature should be controlled within stock temperature ± 1 degree C, with the view of preventing the lower lip from being distorted by heat. A heat-deformed lower lip causes dispersion in basis weight profile.

G. Freeness and temperature of stock

From the current stock freeness (70 to 75 C.S.F.) and temperature (34 degrees C.), it is judged that dewatering capacity of the wire should be 650 m/min at the maximum.

As measures taken in Aksu mill, raised vacuum of vacuum oil and the suction box may be considered. However, they can adversely affect wear of the wire, causing shortened life of it and lowered output.

Current vacuum (mmHg)
Vacuum foil = #1--25mm, #2--35mm, #3--40mm
Suction box = #1--60mm, #2--220mm, #3--240mm,
#4--90mm, #5--190mm, #6--200mm

Measures for the present include the following.

a. Raising freeness by reviewing GP and SBKP refining.
b. Reviewing the white water system and the clear water system, in order to maintain stock temperature in the stock inlet between 42 degrees C. and 45 degrees C. Maintaining this level of temperature will be attained without steam heating, if GP temperature is between 70 degrees C. and 80 degrees C.

H. Wire table arrangement

Foil was introduced in January 1990 to the Albania system together with plastic wires, and thereby operation at a papermaking speed between 540 m/min and 600 m/min became possible. But there is a problem in quality. Especially stock is injected from the stock inlet in streaks in the transverse direction. Dewatering takes place around #3 of six suction boxes. Pulp having enough water speed to reach #3 to #6 is dewatered in 11 or 12 streaks in the transverse direction. It is natural that basis weight profile should be inferior.

The dewatering apparatus consists of the following.

* Foaming board: blade width 220 mm + 50 mm x 6 rows material = ceramic distance between the blade tip and the lower lip tip = 180mm

* Single foil: blade width 80 mm x 6 units material = ceramic

* Multi-foil: blade width 50 mm x 5 blades x 3 units

  The blades are of insert type and made of plastic with a

  15-mm wide ceramic piece at the tips.

* Vacuum foil: blade width 20 mm x 6 blades x 2 units x 7 blades x 1 unit compound type with ceramic on the upper surface.

A seal pipe that reaches the conduit of the save-all is attached to the lower part of the box.

* Suction box: compound slit type blade width 25 mm x slit width 16 mm x 8 blades x 6 units.

It is impossible for the Team to give its views on the current table arrangement because of insufficient time for survey on papermaking, but the interval between the units of single foil in the foaming zone (ca. 685 mm) seems too wide. When stock temperature becomes around 45 degrees C., narrowed intervals and saving initial dewatering will make better formation and reduce wire marks.

Though formation depends on performance of a dewatering apparatus, operational skill plays an important part in arranging it. Variations of arrangement should be tried in Aksu mill, just as they are tried at mills of Japan for satisfactory conditions of stock, consistency, temperature, and papermaking speed, aimed at the best formation.

One problem is that the vacuum foil is not so structured as to allow easy shifting.

2) Moisture profile

The record of the BM meter showed great dispersion in moisture profile, as in the case of basis weight. It was impossible to find where and how moisture unevenness should be corrected.

No existence of quality standards is partly attributable to SEKA and Aksu personnel having no

knowledge of appraisal given to their products by customers, and partly attributable to no person and no manual that give instructions in procedure correction.

In Aksu mill, introduction of a VIB humidifier is considered for moisture profile control, regardless of the degree of moisture unevenness.

Improvement of moisture profile includes the following items.

(1) Measuring moisture profile of the press and correcting the roll nip crown.
(2) Felt management, standard days of use (change in steam quantities, moisture profile).
(3) Introduction of a steam box.
(4) Shower management of the press.
(5) Drier drainage.
(6) Ventilation within the drier.
(7) Installation of an auxiliary drier in the drier and selection of canvas.

3) Caliper profile

The machine calender that gives smoothness and gloss to paper and decides caliper has a metal roll, which, affected by thermal expansion resulting from temperature dispersion in the transverse direction, causes unequal roll diameters. Where moisture content of paper passing through the calender is small, temperature is high and roll diameter becomes large, increasing nip pressure in that part. Where moisture content is large, on the other hand, paper temperature is low. Both cases affect caliper, after all.

A cold air apparatus, hot air apparatus, or dielectric heating apparatus should be installed to cope with the situation. The cold air apparatus installed at the start of Aksu mill is still used.

Measurex System 2002 was introduced in June 1989 and a hot air apparatus of the company was installed. The apparatus has a control device only for caliper, whose profile seems to be regarded as an operational standard in Aksu mill.

4) Caliper and paper dust

As shown in the record of caliper management, paper caliper is 85 microns to 90 microns at a basis weight of 49 grams/square meter. Aksu people hope to get a caliper of around 70 microns. The quantity of paper dust is very large, as shown in winder operations and appraisal by newspaper companies.

Possible measures are as follows.

A. Paper caliper

a. Strengthened press
b. Use of a breaker stack

B. Paper dust

a. Review of stock --> reduced shive --> strengthened screen
b. Heightened stock temperature
c. Strengthened press
d. Raised moisture content

5) Roll wrapping, handling, and loading onto trucks

Product rolls finished at the winder are sent on the slat conveyor to the packaging machine.

A. The packaging machine is not used seemingly because of some problems in the edge folder, and two persons are engaged in edge folding. Production increase will cause insufficient capacity, and improvement is necessary, as a result.

Diameter 1,020 mm x width 760 mm -- 8 rolls
width 700 mm -- 1 roll;
9 rolls in total
Operating time = 9 to 10 minutes
Handling time: ca. 14 minutes at a winder speed of 800 m/min

B. i. Winder --> ii. Slat conveyor --> iii. Packaging machine --> iv. Lifter -- v. Warehouse (rolls carried, rolled over by hand)

ii. Slat conveyor: Insufficiently maintained, it may cause damage to roll paper. Its pit is filled with paper scraps. Drops fall from the ceiling to roll paper while conveyance.

iv. Lifter: Insufficiently maintained and partially deformed, it may cause damage to products. Its pit is filled with paper scraps.

v. Rolling by hand: Moving products by rolling them by hand (20 meters to 30 meters) may cause damage to them. It is necessary to review the original plan as well as measures for increased production.

C. Loading onto trucks: In locating roll paper in a truck, its edge is jimmied with an iron rod, which may cause damage to products.

6) Operational improvement

Listed below are measures against sheet break, preventive measures for defective paper, and heightened papermaking efficiency, which may constitute a guideline to future improvement.

A. Procedure of starting papermaking

a: Operating order of the pump, screen, etc. before stock is placed on the wire.
b: Places to be inspected.
c: Attention to wear of the wire, prevention of ceramic heat shocks, etc.

B. Procedure of stopping papermaking

Before stopping the machine, stop the stock pump, make paper with the wire until inlet consistency becomes low, and then stop the stock system (deculator).

a: In the case of a temporary stoppage ..... Operate the screen only (for preventing clogging on the plate).

b: In the case of a long stoppage .....

* Silo white water drainage system
* White water drainage system of the screen and cleaning
* Other operations

c: Pulp removal at the deculator receiver tank and the subsequent apparatuses

Follow the procedure of either a: or b: above.

C. Cleaning of stock system piping (for preventing sheet break and defective paper)

a: Add 200 liters of 30% caustic soda and continue operation about 40 minutes.
b: Discard caustic soda, pour clear water in its place, and continue operation about 20 minutes.
c: Cleaning cycle = about 7 days

D. Brushing inside and outside of the silo and save-all, and cleaning with pressurized shower

a: Frequency = about once/month
b: Apply pressurized shower every time the machine is stopped.
c. Attention to be paid in cleaning (wire etc.)

E. Brushing of the wire and shower pipe of the press part

F. Machine stoppages due to full-loaded wet and dry broke pits

Though no stoppage took place during the Team's survey, some had been recorded in Aksu mill. It is necessary to review the pits, agitator, pump, and shower.

G. Improvement in paper run operations

H. Examination of the fresh water and white water filters

(7) Major improvements in equipment

1) Renewal of the cleaner: for longer life of the lining and higher rate of shive cut

2) Renewal of the screen: for higher rate of shive cut by changing perforations into slits. A three stage system is introduced for higher rate of dust prevention.

3) The driving motor of #2 fan pump is replaced by a D.C. motor.

4) Renewal of the stock inlet: for improvement in basis weight and formation

5) Renewal of piping pertaining to 2) and 4).

6) Press remodeling: for higher strength of wet sheet by stronger press and improved paper quality. Ventanip press is introduced as 2P and 3P.

7) Equipment for moisture profile improvement

A. Installation of a steam box (at 1P)
B. Installation of a hot air roll (PV roll) in the dry part

C. Renewal of the closed hood, remodeling of the air system
D. Replacement of the siphon in the drier cylinder and joint
E. Remodeling of the drier drainage system

8) Remodeling for resuming the use of the breaker stack

A. Location
B. Remodeling of the paper run
C. Rearrangement of the driers
D. Foundations

9) Remodeling of the machine drive:

The current DIFF DRIVE should be replaced with sectional drive.

10) Replacement of caliper control equipment:

A dielectric heating apparatus should be installed in place of the cold air apparatus.

11) Renewal of the packaging machine

12) Various improvements pertaining to operability, papermaking efficiency and stable quality

A. Location of the stuff box and remodeling of the pulp pipe (measure against basis weight fluctuation)

B. Extension of shower on both sides of the wire part (measure both against dirt and for wire edge protection)

C. Improvement of sheet knock off shower and trim knock off shower (for preventing shower from reaching the output, by passing over the couch pit)

D. Relocation of the nozzle cutter (PU to couch) and appropriate location of the operating buttons

E. Review of the trimming nozzle, water quality of the nozzle cutter, the filter, pressure

F. Review of press broke shoot shower (structure and management of shower in the case where broke is let down from the press center and in the other case)

G. Maintenance of press center roll doctor shower (prevention of wear in the doctor blades)

H. Maintenance of the press 3P top roll doctor and shower (prevention of wear in the doctor blades)

I. Relocation of the #1 drier canvas roll (for improving paper run, tail shoot)

J. Review on introducing single canvas

K. More stable running of sheet (blow box etc.)

L. Improvement in paper run operations

   a. Renewal of the cutting device in the drier
   b. Air doctors between mid-calender roll nips
   c. Installation of a paper run doctor at the calender bottom roll

d. Review on changing the air shoot system into the vacuum system

M. Review of shower of the dry broke pit (structure and management of shower)

N. Installation of a reel spool changing device

O. Trim and installation of a downstairs dry broke treating pulper

3.2.7 Packaging, Storing, and Shipping

(1) Packaging

Paper rolled by the winder in the prescribed length (which is controlled by the roll diameter because the counter meter is out of order) is conveyed to the packaging machine for wrapping. The process is as shown below.

Wamp packaging -- application of internal filler paper (by hand) -- edge folding (by hand) -- filler paper pasting -- application of external filler paper -- adhesion -- weighing -- filling up labels and attachment of them -- lifter

During the Team's survey, it took nine or ten minutes to package one handling which consisted of nine rolls having a length of 8,850 meters. It took about 13 minutes to roll up one handling, with the winder operated at 600 m/min to 700 m/min. If the speed is raised to 760 m/min or 1,000 m/min after renovations are implemented, the speed of the winder should also be raised, as a matter of course (usually, double or 2.5 times the papermaking speed).

It is feared that insufficient capacity of the packaging machine could cause restricted speed of papermaking. The packaging machine should be replaced with new one for higher capacity.

(2) Storing

Packaged and weighed rolls are brought downstairs on the lifter, rolled over and conveyed by human power over 20 meters to 30 meters into the storehouse, and stored upright with the lift, according to their date of production and roll widths.

The lifter is partly deformed because of inadequate maintenance, which could cause damage to rolls.

The path on which rolls are rolled over for the storehouse is also passed by workers. Tiny stones fallen from their shoes or hard substances, caught by rolls, may cause damage to them.

The storehouse has a space of 4,320 square meters. Rolls having a width of 760 mm are stored, with the clamp lift, in six layers, and rolls having a width of 1,520 mm are stored in three layers, both upright. There is no broken part on the floor of the storehouse, which has sufficient space. The lift can be operated without touching stored rolls, which are therefore in very good condition.

Apart from the matter of storage, it is feared that difference in roll cores may cause damage to roll edges. There should be no core differences.

(3) Shipping

Rolls in the storehouse are arranged on the floor with the lift, loaded onto trucks by a forwarding agency,

and carried to customers.

Too high clamp pressure of the lift might sometimes deform rolls, but no such occasion was found in Aksu mill in the Team's survey. However, damage to rolls in loading them onto a truck posed a great problem.

Rolls to be loaded in the second or third layer were rolled over on a board laid on the first layer of rolls. Where there was no more board laid, rolls were rolled over and put upon others with a pipe whose tip was flattened. In truing up edges of rolls, they were shifted with a lever set on the gate of the truck.

Trunks and edges of rolls were deeply damaged, as a result. It was a matter of course that this caused sheet peeling or sheet break at newspaper companies.

Though rolls were loaded in the presence of seemingly mill people, the Team was astonished at no attention paid to damage to rolls.

It was true that loading of rolls in three layers on a truck lowered transportation costs, but considerable would be impact of rolls fallen down from the upper layers.

At a newspaper company in Istanbul, a complaint was made about rolls impossible to use because of their crushed or jimmied cores. This seemed to have been caused while unloading rolls stacked in three layers.

If it is difficult to quit three-layer loading, from the viewpoint of transportation costs, it is necessary to mechanize loading and unloading.

3.2.8 Utilities

(1) Boiler

The boiler is usually operated at a load of about 40 tons per hour, which is much lower than its design capacity of 65 tons per hour. Generated steam has a pressure of 57 kilograms per square centimeter and a temperature of 490 degrees C., which are almost as high as the design values.

The machine was often stopped by sheet break and boiler load at that time was sharply lowered from 40 tons/hour to 21 tons/hr. The Team studied the boiler's capability of following up this sharp decrease in load. Steam pressure rose by about 3 kilograms per square meter but recovered to the preset pressure in ten minutes. Operators did not give any special handling. Machine stoppages therefore proved to have no influence on stable operations of the boiler.

Seven stoppages due to boiler trouble were recorded during two years and ten months from January 1987 to November 1989. The main cause was the damaged tube of the first stage economizer. At the regular repairs in November 1989, the whole tubes of the first stage economizer were replaced and a preheater tube was attached. Since no trouble took place from that time on, this measure proved to be appropriate and there remained no problem any more.

About 80 tons of fuel oil is consumed a day. Its calorific value is 10,040 kcal/kg and sulfur content was 2.78%. Properties and purchase specifications of typical fuel oil are as follows.

Fuel Oil Specifications

	Typical data	Specifications
Flame point	123 deg.C	min. 66 deg.C.
Density at 15 deg.C.	0.966	0.935 - 0.985
Ash (weight)	0.24%	max. 0.25%
Water	None	max. 2%
Sulfur	2.78%	max. 4%
Heat value	10,040 kcal/kg	min. 10,000 kcal/kg

Thermal efficiency of the boiler is 70%, when estimated with operation at a low load of about 40 tons/hour, which is an average for this type of boiler.

An analysis of boiler feed water is as follows.

Analysis of Boiler Feed Waters

	P cc	SiO_2 mg/lt	pH	Cl^- mg/lt	Conductivity micro mho/cm	Fe mg/lt	P_2O_5 mg/lt	NH_4 mg/lt
Ion exchanger outlet	0.00	0.15	8.0	<3.5				
Degasser outlet	0.00	0.18	8.2	<3.5	1			
Condensate water	0.00	0.16	6.5	<3.5				
Boiler blow water	0.15	2.00	10.0	<3.5	<50	<0.02	1.5	0.1

The values pose no particular problem.

The quantity of recovered steam condensate is 23 tons/hour for generated steam of 40 tons/hour and the rate of recovery is about 60%.

Oxygen content of flue gas is monitored.

2.0% at 40 T/LI load
4.0% at 20 T/LI

The boiler is operated with some allowance in load, without posing any problem. It is judged that the boiler does not cause any hindrance to paper production.

(2) Steam turbine generator

The steam turbine generator is operated under the following conditions.

Output: 3.7 MW
Steam intake: 42 tons/hour
Steam conditions: intake.. 53 kg/square centimeter g,
480 degrees C.
exhaust.. 3.5 kg/square centimeter g,
240 degrees C.

Exhaust steam from the turbine is sent to the mill at a lowered temperature of 190 degrees C. The steam turbine is operated at low load, as in the case of the boiler. Efficiency of the steam turbine is 52%, which poses no problem. It underwent no regular overhaul during the past two years.

(3) Water facilities

Recent water intake was within the range of 1,100 cubic meters to 800 cubic meters per hour. Water consumption has been reduced since the middle of February 1990, to an average of 850 cubic meters per hour.

Water analysis data are shown in Table 4 below. Water of good quality can be obtained all through the year at Aksu mill.

Raw Water Analysis Data

Item	Unit	Data
Temperature	deg C.	11
Conductivity	micro S/sq.cm	368
pH		7.55
Total hardness	ppm $CaCO_3$	210
Mg	ppm $CaCO_3$	44
Ca	ppm $CaCo_3$	164
Na	ppm $CaCO_3$	13
K	ppm $CaCO_3$	1.2
Fe	ppm	0.3
Mn	ppm	na
P alkali	ppm $CaCO_3$	na
M alkali	ppm $CaCO_3$	100
HCO_3	ppm $CaCO_3$	100
CO_3	ppm $CaCO_3$	na
Cl_2 (Cl^-)	ppm $CaCO_3$	16
SO_4	ppm $CaCO_3$	69
SiO_2	ppm SiO_2	12
Turbidity	ppm SiO_2	na
CO_2 (free)	ppm	3.3
O_2	ppm	5.8

Sampling on December 21, 1988

(4) Industrial waste water

Industrial water discharged from the mill is estimated at 850 cubic meters per hour, almost the same as intake in quantity. Analysis of it is shown in Table 5 below. Suspended solids, temperature, and pH are measured every day.

Temperature	27 - 29 degrees C.
pH	6.5 - 7.7
S. S.	690 mg/lit. (mean)
COD	700 mg/lit.
BOD	270 mg/lit.

(5) Receiving system

Purchased amount of electricity is 22 MW on the average, which is transmitted through two 20 MW systems. Fluctuation in voltage and cycle is small recently, and the mill receives sufficient and stable electric power, as a result.

In the past, instability of purchased electricity was considerable, and caused frequent machine stoppages. Machine stoppages due to power failures and change in voltage amounted to 75 times in 1989 and 35 times during eight months of 1988. The electric company's transmission system was changed on December 15, 1989 (disconnection of the distribution network to the Soviet Union), and the problem of unstable electric power seems to have been solved.

3.2.9 Buildings of Aksu mill and Facilities Around Them

The following are the results of diagnosis on facilities other than production-related facilities.

(1) Mill buildings

There are a number of broken panes, at which not only insects but also pigeons are coming in and out. This may cause sheet break in the papermaking process. The broken panes need to be replaced. The number of broken panes is estimated at about 1,000 in the whole mill.

(2) Access road

Damage in the road from the national road to the mill is considerable, hindering the carrying in and out of products, logs, and other items. Repairs are needed in order to allow smooth carrying in and out of equipment and materials for renovations. Seven hundred meters of the existing access road needs repairs.

(3) Plant roads

Damage is considerable in the concrete pavement, which needs repairs.

(4) Vehicles

1) Vehicles belonging to the mill

	Vehicle	Location	Specifications	Number
a.	Loader	Processing	Caterpillar, 2.5T	2
b.	Loader	Ditto	Volvo, 4T	1
c.	Dump truck	Ditto	7T	2
d.	Forklift	Prod., Mat	2T	8

2) Most repairs are done in the mill. Large-scale repairs are done at outside repair shops.

3) Log conveyance is undertaken by subcontractor companies, which carry logs on vehicles possessed by them.

4) Regarding vehicles, there seems no problem in number as well as in scale of the repair shops.

4. Raw Material and Auxiliary Materials Supply System

4.1 Forest Resources of the Republic of Turkey

4.1.1 General

The Republic of Turkey has a total land area of 780,000 square kilometers, of which farm land accounts for 275,000 square kilometers (31.4%), with forests accounting for 200,000 square kilometers (25.9%). This forest area accounts for about 14% of the country's territory.

The cumulative amount of forests is about 800 million cubic meters. Forests are thin, with a small cumulative amount per square kilometer.

Forests are distributed mainly on the coasts of the Black Sea, the Mediterranean, the Aegean, and the Sea of Marmara. Forests are scarce in regions ranging from the middle of Turkey to the southeast district near the borders between Syria and Iraq.

Forests mainly consist of red pines and black pines on the coast of the Mediterranean and the south coast of the Aegean (Izmir and southward), while they consist of conifers such as spruces and firs and broadleaf trees such as beeches on the coast of the Black Sea.

Pines in the north region include yellow pines and black pines. Black pines predominate in the western part of the region and yellow pines predominate in the eastern part.

Trees for afforestation include pines (which account for the largest part), poplars, Douglas firs, and eucalyptuses (south region).

4.1.2 Forestry Production in the Republic of Turkey

(1) Table III-4-1 shows the 1989 actual output of each industry and the planned output (1994) set in the sixth five-year plan.

As seen from the Table, forestry has a share of 0.9% in the whole industries (1989) and is estimated to be lowered to 0.7% by 1994. The rate of output growth is 1.89%, much lower than 7.27%, which is the average growth rate for the whole industries.

(2) Although output of forestry itself will remain low, steady growth is forecasted in the timber-related industries. Forestry has a great role to play as a supplier of industrial materials.

4.1.3 Demand for Wood in the Republic of Turkey

(1) In Turkey, about 70% of the demand for wood is for fuel and remaining 30% is for industrial use including use for utility poles and mine pillars, as shown in Table III-4-3. The demand for pulp wood accounts for only 5% of the total demand for industrial wood.

(2) The demand for fuel wood tends to be decreased year after year, seemingly as a result of improvement in conditions of domestic fuel and people's living standard.

(3) In the sixth five-year plan, expanded share of industrial wood is planned, with the share of fuel wood decreased to 60%. This plan seems desirable from the viewpoints of both forest resources preservation and afforestation efforts.

4.2 Log Supply to Aksu Mill

4.2.1 Forest Resources around Aksu

Aksu Newspaper mill is currently supplied with logs from five Forest Districts, namely, Giresun, Artvin, Trabzon, Erzurum, and Amasuya.

Major species of trees in these districts include firs, spruces, yellow pines (which are conifers), beeches and oaks (which are broadleaf trees).

4.2.2 Lumber Output in the Forest Districts around Aksu

(1) Actual output of industrial lumber

Tables III-4-4 to III-4-8 show the actual output of industrial lumber between 1985 and 1989 in the Forest Districts around Aksu, classified by kinds of trees.

The Tables show that output of broadleaf trees is higher than that of conifers, that pines account for the largest part of conifers used for GWP, followed by spruces and firs, and that beeches predominate among broadleaf trees.

(2) Actual output of pulp wood

Tables III-4-9 to III-4-12 show the actual output of pulp wood between 1985 and 1989 in the Forest Districts around Aksu, classified by kinds of trees. No pulp wood production has been recorded in the Erzurum District.

As shown in the Tables, conifers are used, but broadleaf trees are not used, for pulp wood. Among conifers, spruces predominate, accounting for 56%, followed by pines (mainly yellow pines) and firs (see Table III-4-13).

(3) Industrial lumber storage in forests

Table III-4-14 shows the amount of industrial lumber stored in forests in the Forest Districts around Aksu in 1988. This amount is nearly twice the output of an average year. In these Districts, the felling season begins at the end of March or in April, when trees begin growing, and conveyance of them starts around May after the thawing of snow.

Felled trees are barked and stored outdoors, classified by uses. The period of storage is one year on the average and they say it is seldom that the period exceeds two years. That felling zones are on high altitudes is said to be effective to natural drying and protection of stored wood from decaying.

4.2.3 Prospects for Log Supply

The above-mentioned data show that supply of pulp logs from the Forest Districts around Aksu has been decreasing year after year (Table III-4-15). It will not long before the supply drops below 160,000 cubic meters.

Another problem is that log sources have become more and more distant from Aksu mill. As shown in Fig. III-4-1 and Table III-4-16, most logs are conveyed from distant places 400 kilometers to 500 kilometers away from Aksu mill. Logs carried from places more than 300 kilometers away from the mill accounted for 52% in 1987, and they reached 64% in 1988.

This problem seems to mean a decreased cumulative amount of lumber in the neighboring Forest Districts. We fear log prices will be raised as the distance of conveyance becomes longer.

On our inquiry about the prospect for log supply for Aksu mill, the Ministry of Agriculture and Forestry revealed that a supply of 220,000 cubic meters a year was planned, as shown in the lower row of Table III-4-17. The planned supply presented by SEKA in this respect is shown in Table III-4-17. SEKA said it was able to satisfy the demand of 180,000 cubic meters with firs and spruces alone, and to supply further 90,000 cubic meters of pines.

As mentioned above, it seems difficult even to maintain a supply of around 150,000 cubic meters, in the light of past data. It will be necessary to get a definite promise from the Government for long-term supply. The problem of log supply needs further investigation.

Utilization of waste paper is one measure both for coping with uncertain supply of logs and for resources preservation. Also, the following should be considered.

a. Intensification of afforestation
b. Utilization of broadleaf trees (TMP etc.)

4.3 Auxiliary Raw Material and Auxiliary Material Supply System

4.3.1 Present Condition and Problems in BKP Supply

(1) The Republic of Turkey began pulp import in September 1987 and has quitted using homemade pulp since June 1988. As the reason for this deed the Government of Turkey mentions inferior quality of homemade pulp due to contaminations such as foreign matter, shive and bark.

(2) The amount of purchases recorded an increase of 45 percent in 1988, as compared with the amount in an average year, for unknown reason.

In the fall of that year 7,000 tons of pulp imports received in spite of the long strike then instituted bloated inventory at a stroke. This situation lasted until the end of 1989.

The total stock was 12,500 tons in December 1989, which was equivalent to 11 months' amount of inventory. Pulp ran out of storage space, as a result, and most of pulp stored outdoors began decaying, contributing to inferior brightness and strength as well as deteriorated quality (average annual inventory: 10,800 tons, annual consumption: 13,090 tons). The 1989 reduction of pulp purchases to less than half the amount of an average year did not lead to reduced inventory. The Team wishes more drastic and earlier measures could be taken. Urgent measures are needed for optimum inventory.

(3) Pulp prices

The price of homemade pulp was almost the same as that of imported pulp in 1986. However, the difference between the prices became larger. The price of imported pulp was more than double the price of homemade pulp in 1987, and more than triple in 1988.

The price of homemade pulp seems to be based on a political decision, but, in the Team's opinion, there would be no reason for not using cheaper homemade pulp.

(4) BKP Imported between 1987 and 1989

One lot of pulp imports consists of 2,000 tons to 5,000 tons. Purchase from several companies seems to be reasonable.

Pulp is said to be purchased on an annual contract in the case of homemade pulp and on an annual contract or a long-term contract in the case of import, and either contract is concluded by the Head Office of SEKA. It would be necessary to consider buying methods that can cope with changing conditions.

4.3.2 Measures for Solving BKP Problems

(1) Two years have passed since the use of homemade pulp was discontinued on account of its inferior quality.

A survey is necessary to know what improvement has been given to it. If the improvement is insufficient, further improvement should be promoted, and an attempt should be made at using homemade pulp as much as possible, whose price is low.

(2) The Team recommends that measures be taken regarding the following, though it may be difficult to reduce the excessive inventory as a consequence of the strike.

1) The contract conditions should be revised, if an annual contract or a long-term contract, which is concluded between SEKA and the Government Agency, impedes flexibility in buying.

2) Company-wide adjustment of inventory should be done in SEKA, which must already be conducted, as a matter of course, in order that only one mill will not suffer bloated inventory. Releasing part

of inventory to private businesses at spot prices should be considered at the same time.

3) Other measures include using decomposed or deteriorated pulp for low grade paper, regardless of profitability, and selling it to private companies to maintain quality of products of Aksu mill.

4.3.3 Present Situation of Chemicals Supply

(1) Alum

Consumption 50 tons/month

The stock of alum, which amounted to 360 tons in January 1989, was reduced to 60 tons in December. An average stock of 204 tons (for four months) a year is too large. Alum, a homemade product, can be received in two days after an order is placed. It would be unnecessary to keep such a large quantity of alum in stock. There was a month, as shown by past data, for which inventory was only 9 tons.

(2) Dyestuffs

Consumption 5 tons/month

Inventory in 1989 was 24 tons at the maximum, 4 tons at the minimum, and 14 tons a year on the average (for 2.8 months). An order is placed once a year. That dyestuffs are purchased in lot, which consists of 10 tons, may cause larger inventory. (This way of placing an order is also applied to the buying of the chemicals mentioned below.) As powder dyestuffs are put in a 50 kg cask, it is possible to make one lot smaller, and it may be possible to reduce inventory to a large extent because they are domestic made products

even if half a month is necessary until they are received.

(3) Slime control agent

Consumption 300 kilograms/month

Inventory in 1989 was 6 tons at the maximum, 3 tons at the minimum, and 5 tons a year on the average (for 16 months), part of which is imported. It takes three weeks to carry imports by sea, but inventory that can always meet one year's demand is too large, after all. A slime control agent is carried in solution, which must be transported in tank. Review of a minimum lot for purchase would be needed.

This is true of the anti-foaming agent, felt detergent, HCl and NaOH that are consumed at Aksu mill, whose annual amounts of expenses are smaller than those of alum, dyestuffs and slime control agent. Inventory of these latter three need decisive improvement.

(4) Measures for Solving Current Problems in Chemicals

1) Though it is impossible to make an accurate judgment on scarce data obtained by the fall of 1988, inventory that was bloated as a consequence of the strike has not been reduced at all. This is a problem that exists also in pulp.

The primary measure to be taken is setting optimum inventory for each chemical. To this end, careful review is needed for places of purchase, ways of transportation, periods, lot size, and emergency measures.

2) If the problems are the consequences of the restrictions on purchase contracts, contracts should be revised to more flexible. As chemicals are domestically produced in most cases, unlike pulp, it is recommended that the term of a contract be shortened so that it can easily meet the situation.

3) Measures should be taken that contribute to adjustment of inventory in whole SEKA, to prevent concentration of inventory pressure to only one mill.

4) Improvement in methods of purchase

A. Currently alum, HCl, and NaOH are said to be purchased by the Head Office of SEKA. It is recommended that other chemicals used in more than two mills be also purchased by the Head Office, with a view to buying them at lower prices. (Those chemicals whose consumption is large are purchased in the lump by the Head Office, as a rule, they say.)

B. Some materials are purchased from several companies with the view of buying them on competitive pricing. Spread of this way of buying is desirable.

4.3.4 Wrapping Materials

A. Flat sheet wrapping
Kraft paper 160 grams/square meter 140 x 130 cm

B. Roll wrapping
Kraft paper 160 grams/square meter

C. Core paper

(Outside core) Kraft paper

300 g/sq.m 115 mm x 920 ø

(Inside core) Paraffin coated kraft paper

160 g/sq.m 125 mm x 920 ø

D. Base paper, which is produced at Ismit mill of SEKA, is internally purchased.

1989 consumption 433 tons

Max. stock 397 tons, Min. stock 191 tons

Avg. stock 295 tons (for 8 months)

The stock has gradually been increasing, irrespective of the strike. Now that base paper is internally supplied, the stock should promptly be reduced to an optimum level.