3.1.5 Outline of Newly Installed DIP Process

(1) DIP Project

1) Specifications of waste paper

Among all waste newsprint paper in imported bales (mainly from the U.S.A. and Europe), newspaper occupies 80% while about 20% of magazines is mixed. The waste paper is packed in a bale weighing about 1 ton with 10% moisture content. Waste paper is to be consumed by 100 BD T/D in the Renovation Plan.

2) Finish DIP

85 BD T/D

3) Quality of DIP

Brightness Hunter 55°

4) Place to be installed

The existing pulp machine room is to be used. After removing all the equipment and chests presently installed in the first and second floors, the DIP facilities are installed in the room as well as in the space which has been used for a warehouse.

(Note : Prior to selecting machine types, it is necessary to check floor load of the existing building.)

(2) Main features of the DIP system

Since paper machines often cause troubles due to insufficient deinking and wax removal in the DIP, the Plan has been made by placing priority to prevention of such troubles, though the whole system seems rather heavily equipped.

1) Baled waste paper can be processed without making any classification, if the Fibreflow is installed. This device allows such foreign matters as vinyl sheets and plastics to be removed almost in their original shapes, not rendering them into pieces, allowing less foreign matters to enter the main flow of fibers. Hot melts can also be easily removed in the same way.

2) A double separator engages in defibering and screening. This machine which is placed outsides the main system accurately classifies and eliminates light-weight and ordinary foreign matters.

3) A disperser is installed to mix chemicals and steam. Its kneading action facilitates separation of inks and waxes from fibers and such foreign matters are to be removed by a final thickener.

(3) Principal facilities of DIP

1) A steel-framed building (18m x 40m) is newly constructed to provide a place to stock a certain amount of waste paper and to handle it. A clamp vehicle is used to load a few bales at a time on a slat conveyer where wires are cut off.

A crusher (500 mmø x 1.6 ML screw x 3, motor of 5.5 kW x 3) uses screws to crush the baled waste paper into pieces and to discharge them uniformly.

A conveyer scale and a crusher which are to be installed on a subsequent conveyer are inter locked so that a specific weight of waste paper may be fed constantly from the crusher.

Once the waste paper in bale is placed on the conveyer, it is continuously processed until it reaches a pulp pit of the Fibreflow.

2) Fibreflow (to be installed outdoors)

2,750 mmø x 16.3 Ml, 14 R/M, Motor 160 kW

By dispensing waste paper, NaOH, and a deinking agent at the entrance of the drum, the inside wall lifter which is lifted by the waste paper and then drops down to the original location offers shearing force and friction, thereby freeing inks, hot melts, laminates from fibers.

A first half of the drum conducts high-concentration defibering while the latter half acts as a screening zone to pass defibered pulps through holes from 6 to 10 mmø while they are showered. Then, they are changed into raw pulps which will occupy about 3 to 4% of the total raw pulps required. Vinyl sheets, hot melts, laminates, and other foreign matters are discharged form the rear end of the drum, without being cut into pieces.

Since this machine conducts nothing but rotation, required power is less than a half of a pulper and required doses of chemicals are also minimized.

3) Double separator (coarse-selection screen)

Strainer 3.0 mmø, Screen basket 0.25 mm slit
Electric motor 110 kW

Raw materials which have not been defibered in a tub are put to a re-defibering process using an impeller. At the same time, they are chosen through a directly coupled screen. The slits on the screen effectively eliminate hot melts.

Light-weight foreign matters are first separated and are put to a vibration screen (2.0 mmø, 3.7 kW) for eliminating them.

On the other hand, separator tails are subjected to two-stage fine selection by means of a tail screen (0.25 mm slit, 45 kW) and a reject screen (0.25 mm slit, 22 kW) both of which are installed outsides the system. Impurities and foreign matters are discarded in this manner, thereby preventing recirculation of the foreign matter within the system.

4) Flotator

The Plan adopts a couple of vertical flotators since they do not require so much space while they display relatively high de-inking efficiency. Froth is sucked from above and is discharged out of the system. The operational principle of the flotator is that both pulps and air are mixed in an injector and that two times more air than conventionally used is blown into it under a double aeration system to produce excellent brightness.

5) 1st to 3rd screens (fine screens)

1st screen	Plate	0.2 mm slit	75 kW
2nd screen	Plate	0.2 mm slit	45 kW
3rd screen	Plate	0.2 mm slit	22 kW

Fine particles are captured by the plate which is finer by one rank compared with the 0.25 mm slit of the separators. Tails of the third screen are discharged.

A cascade method is employed to assure stable dust- removing ratio. These screens display excellent effects in eliminating adhesive materials and fine particles.

6) Centri-Cleaner

1st Centri-Cleaner (75 mm ⌀)	110
2nd Centri-Cleaner (75 mm ⌀)	36
3rd Centri-Cleaner (75 mm ⌀)	11
4th Centri-Cleaner (75 mm ⌀)	3

The cleaners with less differential pressure display excellent cleaning efficiencies to reduce volumes of foreign matters to be discharged.

7) Disperser

A machine in which a number of rotors and stators are combined with each other. Motor : 350 kW

Kneading action is effected together with chemical mixers and steam mixers. H_2O_2, Na_2SiO_3, NaOH, and steam are applied to pulps which have been dewatered to a high consistency in the previous stage of a screw press (75 kW) and the mixture is heated to a high temperature. As fibers are rubbed with each other, hot melts and wax are freed and dispersed. This disperser possesses such features as it neither damages the fibers nor reduces freeness. Higher kneading effect requires higher concentration and temperature.

8) Bleaching tower

60 m^3, 20% consistencies, 60°C, retention time = 3 hours

9) Refiner

Bleached pulps are put to a refining process to further exfoliate inks and waxes which have not been separated from fibers even after the bleaching process.

A cylinder press is used to eliminate them, thereby high-quality pulps being produced.

10) Recycled water filter

Part of recycled water which is discharged from the dewatering passes through a filter and is then used as water for cleaner balancing and showering water for screens and extractors, so that use of fresh water may be saved. (1.8 m^3/min. Motor 0.4 kW)

11) Construction of a new building

Since the existing warehouse has no sufficient number of pillars, it is impossible to install heavy machines on the second floor. A reinforced concrete, two-storied building (12m x 42m) is to be built along the west plaza. The second floor is of a steel-framed structure.

12) Motors

Total number 91, total capacity 2,486 kW

(4) Deinking and brightness

Inks are separated from defibered pulps by dispersing, coagulating, or washing coloring agents (carbon) and vehicles adhering to them. An appropriate deinking agent is to be selected from among many types, such as cation, anion, nonion, etc. Presently, nonion types are employed in most cases.

Brightness of the pulps after deinking is generally 40 to 45% (Hunter) and it does not satisfy qualitative needs in the present newsprint paper market. Higher brightness has been demanded year after year in the market. As previously stated, a value of 55% by a Hunter brightness meter is now valued in the market. Therefore, a DIP system to assure de inking efficiency has been adopted to increase the brightness by about 10 points.

A target value of brightness after the deinking process is 50 to 55%. However, this value depends upon brightness of waste paper to be used. Since the DIP system is making remarkable progress, including kinds of dehydrating agents, the system proposed herein indicates one of the typical systems available at present.

(5) Pulp strength and mixture of BKP

GP has less strength when compared with chemical pulps. Since newsprint paper belongs rather to a disposable type of paper, required range of the strength should cover from the strength suitable for preventing paper cut in a paper-making process to that suitable for preventing paper cut in a printing process in newspaper companies. Main requirements to prevent paper cut in both processes include:

- That the paper should be flat enough, neither thick nor thin

- That it does not contain shives.

However completely these requirements should be satisfied, it is impossible to make a paper of 100% GP or to put such paper to a printing process. So, BKP of chemical pulps is mixed to maintain required strength.

To assure cost reduction, manufacturers with advanced technology attempt to reduce the BKP-mixing ratio after meeting the above-mentioned two factors of the requirements. Presently, the ratio ranges from 15 to 18% for low basis weight of 45 g/m^2.

The Renovation Plan recommends 20 to 25% of an initial BKP-mixing ratio, by considering the level of techniques to which persons concerned have accustomed themselves and naturally it advises the Plant to take measures necessary for reducing the ratio gradually while meeting the above-mentioned two requirements and observing improvements in states of paper cuts in the processes.

BKP contributes especially to improvement of tearing strength of newsprint paper. Since higher freeness (CSF) results in easier tearing, it should naturally be refined within an available states of textures. It will also contribute to energy saving substantially.

(6) Chemical agents for DIP

List of chemical agents for DIP

1. (DIP) Hydrogen Peroxide (H_2O_2)
   (Solid : 50%)

2. (DIP) Deinking Agent
Olinol 042
Commercial name:

3. (DIP) Surface Active Agent
PCX Akling Kaolin
Commercial name:

4. Na_2SiO_3
Sodium silicate (solid)
Commercial name:

(7) DIP Process Flow-sheet

A new DIP process flow-sheet is shown in Fig. IV-3-10.

(8) Dip Room Layout

New DIP process layout is shown in Fig. IV-3-11 and IV-3-12.

3.1.6 Auxiliaries

(1) Utilities

1) Steam

The table below shows a comparison between current steam consumption, boiler load, and fuel consumption and those after renovation.

Steam Balance

(Unit: tons/hour)

Plant	Present	Case 1	Case 2
GP	7.0	0.0	0.0
DIP	0.0	5.5	5.5
Papermaking room	25.0	21.8	24.5
Auxiliary apparatus	3.8	3.8	3.8
In-plant steam	12.5	14.1	15.3
Total	48.3	45.1	49.1
Boiler load	46.6	43.5	47.3
Fuel consumption	4.01	3.75	4.07

The rationalized paper machine and execution of energy conservation measures raise paper output, and DIP equipment is newly installed. Nevertheless, there is little change in boiler load before and after renovation. Equipment expansion is therefore not needed.

2) Electric power

The table below shows a comparison between current power balance and purchased power and those after renovation.

Power Balance

(Unit: kWH/H)

Plant	Present	Case 1	Case 2
GP	10,088	8,289	12,204
DIP	0	1,432	1,432
Papermaking room	8,629	8,283	12,296
Auxiliary apparatus	1,517	1,669	1,669
Total	20,234	19,673	27,601
In-plant power generation	-3,479	-3,252	-3,536
Purchased power	16,755	16,421	24,065

There is little difference in power balance before and after renovation in Case 1, while there is an increase of about 7,300 kWH/H in purchased power in Case 2. However, the existing receiving equipment is sufficient even in Case 2.

3) Water

The table below shows a comparison between current water consumption and that after renovation.

Water Consumption

(Unit: cubic meters/hour)

Plant	Present	Case 1	Case 2
GP	27.4	40.0	40.0
DIP	0.0	84.3	84.3
Papermaking room	574.0	370.5	593.2
Other processes	19.9	24.2	31.5
Utilities	158.4	158.4	158.4
Auxiliary apparatus	70.3	70.3	70.3
Total	850.0	747.7	977.7

We have seen to it that the total feed water requirement will not be increased, by incorporating reuse of white water in the machine and the DIP process as well as reuse of warm waste water of machine and cooling water as process water. Capacity expansion of the existing water intake and supply facilities is not needed.

(2) Waste water disposal equipment

1) Present condition

Industrial waste water is currently discharged, without any overall treatment, to the Aksu river at the point one kilometer downstream from the mill.

The quantity of waste water is 850 cubic meters/hour on the average and quality is as mentioned in its the previous Section. Around the waste water outlet accumulated are chips and solids, which condition is by no means desirable.

2) Regulations on waste water and measures taken by SEKA

The table below shows a comparison between actual quantity of waste water from the mill and stipulated quantities.

Waste Water Quality and Regulations

Analysis	Unit	Existing quality	SEKA's target	Regulation to deep sea	Regulation to river
pH		6.5-7.7	6-7	6-9	6-9
Temperature	deg C	27-29	25-30	35	35
Suspended solid	mg/lit	690	20	350	-
BOD5	mg/lit	270	170	250	35
COD	mg/lit	700	350	400	100

The stipulated quantities are applied to the paper and pulp industry and its combined processes (groundwood pulp and paper machines). Quantities are stipulated in two ways, according to waste water discharge systems. Those who are going to discharge waste water can choose between discharging to a river and discharging to the depths of the sea. Regulations are less severe in the latter way of discharge. For Aksu mill, discharge to the depths of the sea seems to be attractive in view of topographic characteristics of the Black Sea, because the distance between the mill and the river mouth is short.

SEKA plans to construct a waste water treatment equipment in Aksu mill, in order to satisfy the regulations on industrial waste water. It plans a total investment of TL 12 billion (breakdown: TL 2 billion in 1990 and TL 10 billion in 1991 and 1992), expecting completion of the equipment in the end of 1992. The basic plan of the equipment: a pipe is laid over 2 kilometers and waste water is discharged to the depths of the sea through one-stage treatment with the gravity settling method only. The basic plan includes positive reuse of white water of the papermaking process with a view to reducing the quantity of feed water, as a matter of course.

As this plan is expected to be completed before execution of renovations, measures are needed only if the quantity of waste water exceeds 860 cubic meters/hour after renovation, or if there is change in waste water quality (e.g., by additional new processes). This ceiling quantity--860 cubic meters/hour--is based on a paper output of 100,000 tons/year, with reduction in waste water from the processes taking into consideration.

3) Waste water treatment plan

A. Concept of waste water treatment equipment

The newly installed DIP equipment, which includes a bleaching process, produces waste water that contains a large quantity of solutes and whose BOD value is high. As a result, the waste water treatment facilities planned in Aksu mill only for GP and the paper machine will be incapable of effective treatment.

In planned renovation, facilities are separately installed for DIP waste water treatment, to reduce BOD value through two-stage treatment consisting of physical treatment (separation of suspended solids) and biochemical treatment to purify waste water to the extent that its quality is superior to water quality stipulated by regulations for discharge to rivers, and then waste water is discharged to the Aksu river.

We have seen to it that load on the planned waste water treatment facilities will not be larger than the planned basic load after the execution of renovations (even in Case 2 having a planned output of 130,000 tons/year). For this purpose we have incorporated not only positive reuse of white water from the machine and the DIP process but also measures for total water saving, such as use of warm waste water from the machine and the heat exchanger in the papermaking process.

Regarding waste matter, a complete process of incineration is introduced. Waste to be incinerated includes waste matter from the DIP equipment, sludge from the primary and secondary waste water treatment facilities, and bark, as well as sludge from planned waste water treatment facilities. Ashes from the incinerator can be used for land reclamation.

As the incinerator is fed with waste matter that contains a large quantity of water, it is impossible, from the point of view of heat balance, to get hot water or steam from incineration.

B. Description of the process

The flows of feed water, waste water, and waste matter before and after renovation are shown in Figs. IV-3-12, IV-3-13, IV-3-14, and IV-3-15. Fig. IV-3-12 shows condition at current output before completion of the planned waste water treatment facilities. Fig. IV-3-13 shows condition at current output after completion of the planned waste water treatment facilities. Fig. IV-3-14 shows the flow in Case 1 (output of 100,000 tons/year), and Fig. IV-3-15 shows the flow in Case 2 (output of 130,000 tons/year).

Regarding water balance, water that shifts between processes together with pulp is regarded as having a pulp consistency of 5%. A small quantity of water that comes in and out with stock and products and that evaporates is disregarded, with a view to making the quantity of supplied feed water equal to the quantity of discharged feed water.

Regarding cake from the planned waste water treatment facilities (solid of 0.34 T/hr in Case 1), it is regarded as having a water content of 80%, after dewatered by the press.

Regarding discharge water from the DIP equipment, suspended solids are flocculated and precipitated (or made to rise) by addition of a flocculent, and separated in the primary treatment process. Then discharge water is sent to the secondary treatment process, with BOD matter reduced here below the stipulated quantity, and discharged to the Aksu river.

Sludge from the primary treatment process and cake from the planned treatment process are dewatered with the press. This dewatered cake is burned in an incinerator together with waste matter from the DIP equipment, bark, and excess sludge from the secondary treatment process. Ashes from the incinerator is used for land reclamation etc.

C. Specifications of the major apparatuses

The following are specifications of the major apparatuses in the waste water treatment equipment and the industrial waste treatment equipment.

(A) Primary waste water treatment equipment

Method: pressure flotation (with a flocculent)

Separation tank volume: 250 cubic meters
Separation tank size: 9 m (D), 2.8 m (H)

(B) Secondary waste water treatment equipment

Method: packed tank type, biochemical treatment
Separation tank volume (height): 5m x 6m (square) x 5.5m
4 units

(C) Press (dewatering equipment)

Method: screw press
Screw measurements: outside diameter 800 mm,
effective length 6 m,
revolution 0.1 to 1.0 rpm

(D) Incinerator

Method: rotary kiln
Rotary drier measurements: outside diameter 1,300 mmø,
8 m (H)

3.2 Improvement in Unit Requirements after Renovation

3.2.1 Unit Requirement of Utilities

(1) Steam

	Current state	Case-1	Case-2
Consumption	48.3T/H	45.1T/H	49.1T/H
Production	249T/D	303T/D	394T/D
Unit consumption	4.66T/T	3.51T/T	2.99T/T

(2)	Electricity	20,234KwH/H	19,673KwH/H	27,601KwH/H
	Production	249T/D	303T/D	394T/D
	Unit consumption	1,950KwH/T	1,558KwH/T	1,681KwH/T
(3)	Water	850.0T/H	737.7T/H	977.7T/H
	Production	249T/D	303T/D	394T/D
	Unit consumption	81.9T/T	59.2T/T	59.6T/T

3.2.2 Papermaking Chemicals

The unit requirements of the chemicals now used in Aksu mill are used as they are.

The degree of closeness of a system greatly affects unit requirements of papermaking chemicals, causing differences between actual results and planned results.

Regarding unit alum requirement, for example, 10 kg/paper ton is used in both Aksu mill and newspaper mills in Japan. Nevertheless, pH of the flow box exceeds 6 in Aksu mill, while it is below 4.5 in Japanese mills. Use of 10 kg/T alum is planned in renovation, in view of the use of DIP and as a measure for coping with pine pitch.

The amount of dyestuffs is greatly reduced. To make light weight newspaper of 45 g/square meter, addition of calcium silicate by 5% is planned.

As the ratio of pine blending reaches 10% in Case 2, we have planned addition of mistron vapor by 5%.

Though savings in other chemicals could be expected, consumption of almost the same amount as present is planned, on account of insufficient survey data.

3.2.3 Consumables

The following are planned amounts of consumables used in a year.

	Case 1	Case 2
GP stone	2 pieces	2.66 pieces
GP refiner plate	10 sets	14 sets
Preparation refiner plate	12 sets	18 sets
Wire cloth	12 pieces	12 pieces
Press felt	32 pieces	42 pieces
Drier canvas	4 rolls	5 rolls
Wrapping paper	460 T	600 T
Paste	60 T	78 T

3.3 Process Flow and Layout

3.3.1 Material Balance

The following table shows material balance under the present situation, in Case 1, and Case 2. Major conditions are set in the table.

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

The following have been taken into consideration in setting these conditions.

(1) Finishing efficiency

The ratio between rolls on the reel and products.

(2) Stock loss

Stock loss of the whole process is expressed as loss from two places, namely, the machine and the others.

(3) Paper machine circulation ratio

The circulation of dry broke, wet broke, and white water are combined and expressed in one numeral. The quantities of circulating white water and stock depend on the type of former.

(4) DIP amount

Though it is possible to treat 100 BDT/D of waste paper with the equipment, a regular supply of 85 BDT/D is planned, in view of the rate of operation and yield.

(5) KP blending

In Case 2, KP blending is planned especially at 25%, with the speed of papermaking taken into consideration.

(6) Pine content

In Case 1, no pine is used because of sufficient supply of spruces and firs.

We have prepared a simplified material balance sheet (see Fig. IV-3-16, IV-3-17) for each plan. The intermediate numerals, however, are mentioned for convenience, with a view to understanding material balance in the whole mill. For comparison purposes, material of the existing mill is shown in Fig. IV-3-18.

3.4 Estimated Cost for Renovations

3.4.1 Equipment and Materials

Cost items for equipment and materials include the following.

1) Wood processing equipment
2) GP equipment
3) DIP equipment
4) Preparation equipment
5) Paper machine equipment
6) Finishing equipment
7) Utility equipment
8) Auxiliary equipment

Material costs for civil works are not included.

We have planned to import special materials such as main equipment, main parts, and stainless steel pipes, from Japan or Europe.

We have planned to procure materials made of carbon steel (such as steel plates, steel pipes and sections), carbon steel, small apparatuses made of cast iron, heat insulating material, painting material, wires and cables in Turkey, so long as there is no problem in quality and delivery.

Costs for imported equipment and materials, which are to be paid in foreign currencies, are FOB prices at ports of export of the countries where apparatuses and materials are procured. Cost for local equipment and materials, which are to be paid in Turkish currency, are factory gate prices at Aksu mill of the Republic of Turkey.

3.4.2 Spare Parts

We have appropriated the necessary sum for a reserve supply for implementing two-year commercial operations after renovations are completed and commercial operations are started. We have made a list of spare stocks based on our experience as a consultant firm.

We have planned that spare stocks should be procured at the same time apparatuses and components for renovation are procured.

We have included the expenses for spare stocks to be purchased, all of which are imports, in the sum paid in foreign currencies. Prices are FOB prices at the ports of export of the countries where these spare stocks are procured.

Estimation of expenses for spare stocks has revealed that the ratio of expenses for spare stocks to expenses for apparatuses and materials is about 8 percent in Case 1 and about 13 percent in Case 2.

3.4.3 Dismounting Work

The existing apparatuses, components, and materials (piping, frames, etc.) whose remodeling is planned in renovation need to be removed and conveyed to specified places. Most of existing concrete foundations for apparatuses that need remodeling cannot be used again. It is necessary to remove the existing concrete foundations before construction of new foundations.

Expenses for foundation removal includes labor expenses for local workers who will be engaged in removing apparatuses, components, materials, and concrete foundations.

Unit labor cost and the necessary number of workers are shown in Attachment IV-3-5.

3.4.4 Erection and Installation Work

Expenses for installation work include labor expenses for local workers who will be engaged in installing and fixing apparatuses and components, piping, wiring, insulation, and painting.

Unit labor cost and the necessary number of workers are shown in Attachment IV-3-5.

3.4.5 Civil and Building Work

We have estimated the total sum of expenses for civil engineering and construction materials and labor expenses necessary for renovations.

(1) Construction, remodeling, and repairs of buildings.

(2) Construction of reinforced concrete foundations for apparatuses (excluding removal of existing reinforced concrete foundations).

(3) Part of the access road from the Port of Giresun to Aksu mill.

(4) Repairs of part of the plant roads.

(5) Piling work for foundations for newly installed large apparatuses.

Repairs are needed for the access road from Giresun Port to Aksu mill, with a view to ensuring safety during transportation of large apparatuses and components for renovation. We have appropriated US $155,000 (see Note 1) for repairs of the road, but this will become unnecessary if repairs of the road is implemented as public undertaking before renovations are started.

Note 1: The same sum, including expenses for construction machines, is appropriated in Case 1 and Case 2.

As it seems possible to procure all of civil engineering and construction materials in Turkey, expenses for them are planned to be paid in Turkish currency. We have planned concrete piling instead of steel tube piling. Steel tube piles need to be imported.

Unit labor cost and the necessary number of workers are shown in Attachment IV-3-5. Attachment IV-3-6 shows major civil engineering and construction work.

3.4.6 Construction Equipment

A budget is formed for rental or lease expenses for construction machines possessed by local leasing companies or local constructors.

Expenses for construction machinery include, in addition to expenses for construction machine such as truck cranes, forklifts, and dump cars, expenses for machines and instruments that are necessary in construction work, such as machine tools, welding machines, electric tools, manual tools, measuring instruments, and jigs.

Construction machinery is classified by use into machines for relocation, conveyance and installation of apparatuses and materials to be removed and to be installed in Aksu mill, and machines for civil engineering work.

The field survey has revealed that there are no crane trucks that can be rented in the Giresun District. It is necessary to lease a crane truck in Istanbul and to carry it to Aksu mill. In this case, the days for moving it have to be counted in leasing expenses. As lease contracts on large machines such as truck cranes and dump trucks are on a month-to-month basis, a rational plan is needed for reducing months of leasing.

Regarding welding machines, tools, and measuring instruments, which are assumed to be possessed by local construction companies, we have included the rent over the period of use in expenses for construction machinery.

Expenses for some of special tools and measuring instruments necessary for fixing or centering of new apparatuses and components are included in expenses for apparatuses and materials mentioned in 3.4.1 above. Expenses for the other special tools and measuring instruments, which are to be brought by experts whom manufacturers of them dispatch to the construction site, as mentioned below, are not included in expenses for apparatuses and materials.

As mentioned above, it seems possible to procure all of construction machines in Turkey. Expenses for leasing and rent of construction machinery as well as labor expenses for operators and drivers are therefore included in expenses for construction machinery paid in Turkish currency.

Attachment IV-3-7 shows the names, specifications, and number of major construction machines as well as the necessary number of operators and drivers.

3.4.7 Ocean Freight

The total weight of those apparatuses and materials, among those used in renovation, to be imported from overseas countries reaches about 10,400 freight tons in Case 1 and about 20,900 freight tons in Case 2.

Although apparatuses and materials are expected to be imported from Japan and Europe, expenses for transportation by sea have been estimated on the assumption that all these apparatuses and materials are imported from Japan.

The imports are shipped into ocean liners at ports of export in Japan, carried to Istanbul via the Suez Canal, transshipped into coasters at Istanbul, and carried to Giresun Port.

We have planned transportation of the imports in two ships in Case 1 and in three ships in Case 2, taking delivery of them into consideration.

Unit cost of expenses for transportation by sea from Japan to Istanbul consists of US $216/FT of basic freight charges and US $13.85/FT of additional charges, totaling to US $229.85/FT. Expenses for transportation from Japan to Istanbul are included in expenses to be paid in foreign currencies.

Unit cost of transshipping expenses at Istanbul is US $14.00/FT and unit cost of expenses for transportation from Istanbul to Giresun Port is US$20.68/FT, totaling to US$34.68/FT. Expenses for transportation by sea from Istanbul to Giresun Port, including transshipping expenses at Istanbul, are included in expenses to be paid in Turkish currency.

Attachment IV-3-8 shows the weight of each apparatus and material to be transported by sea.

3.4.8 Insurance

The maritime insurance premium has been calculated by adding the FOB prices of the whole apparatuses and materials to be imported and the expenses for transportation by sea, that is, by multiplying the C&F prices by an insurance rate of about 0.45%. The gross premium is included in expenses to be paid in foreign currencies.

3.4.9 Inland Transportation

The field survey has revealed no problem in the length of the quay and water depth of Giresun Port, without setting limits on size of freight vessels. The Port is well equipped with unloading facilities, posing no problem in discharging imported apparatuses and materials.

Giresun Port is under the control of the Ports and Harbors Bureau of the Republic of Turkey, and the loading of imported materials that have been discharged here onto trucks and trailers is conducted also by the Bureau.

Necessary expenses for unloading imported materials at Giresun Port or unloading them and loading them onto trucks or trailers include US$7.0 of harbor charges and customs clearance fee, US$8.22 of expenses for drinking water, US$7.0 of expenses for freight handling, and US$0.8 of temporary storage fee per freight ton, totaling to US$23.02/FT.

Aksu mill is only 7 kilometers away from Giresun Port. Expenses are the same for either transportation by truck or transportation by tailor. Unit cost of transportation over this distance amounts to US$5.00/FT, including unloading expenses at Aksu mill.

The total unit cost of unloading and transportation amounts to US$28.52/FT, as a result. We have calculated expenses for unloading at Giresun Port and for transportation to Aksu mill on the basis of this unit cost, and included them in expenses to be paid in Turkish currency.

3.4.10 Indirect Field Expenses

Overhead costs at Aksu mill include the following expenses.

(1) Expenses for constructing temporary buildings for an office and camps for workers.

(2) Expenses for furniture and fixtures.

(3) Expenses for constructing water and power facilities for temporary buildings.

(4) Personnel expenses for clerks and typists and other expenses including those for consumables.

(5) Miscellaneous expenses

(6) Fuel expenses for construction machinery

(7) Insurance premium for assembly.

The total expenses for constructing temporary buildings, water and power facilities, office work, miscellaneous expenses, and fuel expenses are included in expenses to be paid in Turkish currency. Expenses for materials of temporary buildings are estimated as leasing expenses, and estimated wages include wages for assembly and disassembly after completion of construction.

The insurance premium for assembly is a total of direct equipment expenses, expenses for construction machinery, expenses for transportation by sea, maritime insurance premium, and expenses for unloading and transportation in Turkey. The insurance rate is based on 0.4%, the rate of all risk insurance. The insurance premium for assembly is included in expenses to be paid in foreign currencies.

We have assumed that electricity and water are supplied free of charge from Aksu mill for the office, temporary workshop, and workers' camps, and the construction budget does not include these expenses, as a result.

Details of temporary building construction are shown in Attachment IV-3-9.

3.4.11 General Contractor's Services

Services offered by the general contractor (for the form of contract, see 3.5 below) and fees for them include the following expenses.

(1) Fixed cost on the side of the general contractor.

(2) Expenses for managers and supervisors dispatched by the general contractor.

(3) Expenses for dispatching experts who give instructions in the installation and centering of main apparatuses and components as well as in a trial run of them.

(4) Expenses for dispatching civil engineers and construction engineers living in Turkey who manage and supervise civil engineering and construction work.

(5) Expenses for dispatching mechanical and electrical engineers living in Turkey who assist the general contractor in management and supervision.

Fixed costs of the general contractor mentioned in i. above include the following.

(1) Design fee and engineering fee.

(2) Expenses for procuring apparatuses and materials.

(3) Expenses for inspecting apparatuses in the presence of personnel from the makers of the apparatuses.

(4) Expenses for preparing operation manuals and other documents.

Expenses for experts dispatched by the general contractor and manufacturers have been estimated on the assumption that these experts are Japanese.

Regarding the general contractor's and manufacturers' expenses for dispatching experts, technical fees and passenger fares of international air service are included in expenses to be paid in foreign currencies, while passenger fares of air service in Turkey, taxi fares both ways from Trabzon to Aksu mill, hotel charges, and daily allowances in Turkey are included in expenses to be paid in Turkish currency.

Expenses for technicians living in Turkey are included in expenses to be paid in Turkish currency.

Persons dispatched by the general contractor and manufacturers are engaged in supervising and instructing workers in construction work and trial runs, as well as in technical education and training of employees of Aksu mill.

Attachment IV-3-10 shows the names of the persons dispatched by the general contractor and manufacturers, the number of local workers, the total number of local workers, months, and unit prices.

3.4.12 Estimate of Investment Cost

Construction costs estimated on the basis of the above-mentioned conditions are shown in Table IV-3-3 (Case 1) and Table IV-3-4 (Case 2).

3.5 Procurement of Mechanical Equipment and Form of Contract

3.5.1 Consideration of Form of Contract

The form of contract shall be lump sum contract, as a rule.

We have studied concrete forms of contract and chosen a proposed form of contract, taking the following matters into consideration.

(1) In construction work of paper mills, there have been few examples of turn-key lump sum contract.

(2) If turn-key lump sum contract is chosen, there will be a great possibility of European and American constructors not offering a tender for construction work, in international bidding.

(3) As construction work to be implemented this time consists of renovations, an effective remodeling plan cannot be made without detailed materials on the existing equipment. In addition, those apparatuses that undergo renovation need to be removed, which will entail complicated work, and it is necessary therefore to select an experienced constructor.

(4) Renovation involves shutdown of the plant. To shorten the period of shutdown, a term of work pertaining to shutdown should be as short as possible. To make a term of work shortest, it would be effective to have local construction companies undertake, either in the lump or separately, responsible construction work

including removal and installation of apparatuses and civil engineering as well as leasing of machinery.

As a result, we have planned procurement of mechanical equipment and the following form of contract for renovation.

3.5.2 Procurement of Mechanical Equipment and Proposed Form of Contract

(1) Remodeling of mechanical equipment pertaining to renovation, design and engineering of all work including civil engineering, procurement and supply of equipment materials, preparation of technical data, technical instruction in renovations and management and supervision of them, necessary training, instructions in start-up and operation, commissioning and guarantee of plant capacity.

We choose construction companies that possess sufficient technology and experience in paper mill construction and select a company that undertakes these jobs, through international competitive bidding. An order is placed for construction work under a fixed lump-sum contract.

A construction company that receives the order is called a general contractor.

(2) Apparatuses and materials other than those to be procured in Turkey are procured and supplied by the general contractor, by way of vendors who have been selected from among specified vendors in international competitive bidding (upon consent of the owner) under the management of the general contractor. Expenses for mechanical equipment and transportation are calculated in the actual result integration method.

(3) Regarding removal and installation of mechanical equipment including construction machinery needed in renovations, the owner selects a local constructor in competitive bidding under the control of the owner, in accordance with technical bidding specifications prepared by the general contractor. The owner makes direct negotiations with the local constructor.

(4) Regarding civil engineering, including civil engineering materials and construction machines, a constructor is selected in the same manner as mentioned in (3) above, and the owner makes direct negotiations with the constructor.

(5) Plant operations are implemented by the owner under the guidance of an expert with whom the owner makes a separate contract, and under the cooperation of the general contractor.

Under this form of contract, the owner can obtain the total plant design made by a reliable contractor and ensure integrity of design as well. The owner may rely on capability of the contractor in supply (manufacturing or procurement) and installation of important equipment of the plant. Also, the owner can enjoy lower costs of plant construction than in the case of a turn-key contract, by placing orders with other vendors for less important equipment. Furthermore, the owner can enjoy advantages equal to those expected in a turn-key contract, by entrusting to the contractor not only overall scheduling, coordination and inspection but also attainment of specified performance by the stipulated date.

This form of contract, contributing to reduction in construction costs as well as saving in foreign currencies, is desirable from the view point of localization of plant construction.

3.6 Renovation Execution Schedule

Figs.IV-3-19 and IV-3-20 show execution schedules of Case 1 and Case 2. They have been prepared on the following assumptions.

1) As execution of the Project needs the Diet's approval, we have to wait until October 1991, at the earliest.

2) It is expected, from experiences of the past, that one year is required for final decision on necessary financing to be made after the Diet's approval.

3) Regarding bidding, if a soft loan (institutional financing) is used, the financing institution's approval is needed at all steps to the conclusion of a final contract. We have therefore assumed that the period between the beginning of bidding document preparation by the consultant and conclusion of a contract with a constructor is one year.

As shown in Figs.IV-3-19 and IV-3-20, the period between selection of a constructor and completion of construction work is 21 months in Case 1 and 28 months in Case 2. A term of shutdown due to renovation of existing equipment is six months in 1995 in Case 1. In Case 2, shutdown is needed for 14 months from 1995 to 1996 because about 95 percent of the paper machine is replaced. Orders are placed under a fixed lump-sum contract.

3.7 Planned Technology Transfer

As mentioned in 1.3 of this chapter includes improvement of equipment, as well as management and operational technology, is the key to successful renovation.

The best way of improving management and operational technology is technology transfer through direct instructions given in the production scene by experts invited from countries that have advanced technology in the paper and pulp industry.

It would also be useful to experience production management of technologically advanced countries.

The outline of proposed improvement in management and operation is given below, in accordance with the renovation schedule of the Project.

3.7.1 Manning of Experts

A.	Project manager (1)	.... Overall management of production
	(Chief Advisor)	.... Organization improvement
		.... Education and training system
B.	Pulp expert (1)	.... GP, BKP, stock preparation
C.	DIP expert (1)	.... DIP in general
D.	Preparation (1)	.... Preparation
E.	Papermaking (2)	.... Papermaking, finishing
F.	Maintenance (1)	.... Repairing, parts management, etc.

3.7.2 Technical Instructions

(1) Management

- Organization improvement
- Improvement of the education and training system
- Establishment of a target management system
- Preparation of management manuals for each production process
- Establishment of a system for collecting and promulgating
  technological information

- Establishment of a participatory production system
- Improvement in inventory management (raw material, auxiliary raw material, materials, spare parts, products)

(2) Logs and pulp

- Improvement in quality control regarding accepted logs
- Improvement of the log yard
- Improvement in stock management (logs, BKP, waste paper, auxiliary materials)
- Improvement of the pulp quality control system
- Improvement in operational technology in the pulp process
- Preparation of operation manuals of the pulp process
- Technology for avoiding pitch trouble
- DIP equipment operation technology

(3) Preparation, papermaking, finishing

- Improvement in operational technology in the preparation process
- Improvement in papermaking technology
- Operational technology concerning a new type machine (on top wire or twin wire)
- Preparation of operation manuals
- Improvement in product finishing, storing and delivering
- Improvement of the product stock management system
- Improvement in tool maintenance, repair and replacement technique

(4) Maintenance

- Improvement of the maintenance system
- Improvement of the spare parts stock management system

- Technology for operating and managing equipment for environmental pollution prevention
- Preparation of operation manuals

3.7.3 Schedule of Technical Instructions

The schedule of technical instructions is shown in the attached Figure IV-3-21.

4. Examination of Main Applicable Technologies

4.1 Increase in Use of Pine Resources and Measures against Pitch Trouble

4.1.1 Use of Pine Resources

When aggregated since 1972, the consumption rate of GWP logs at Aksu mill amounts to approximately 330BDkg/m^3 times logs. This is considerably below the ordinary figures in Japan. Some improvement in the yield is expected to be made by the implementation of the Renovation Project. Nevertheless, consideration should be observed for particular circumstances in resources of Turkey. In this research, recommended consumption amounts of logs are calculated using the resulted consumption rates.

Alt-1 Proposal: 144,270m^3/year

Alt-2 Proposal: 194,610m^3/year

Supply limit of fir and spruce: 180,000m^3/year

Supply limit of pine: 90,000m^3/year

If the above are applied, compound percentages of pine are 0% for the Alt-1 Proposal and approximately 8% for the Alt-2 Proposal. This shows that pitch trouble is expected to happen in the Alt-2 Proposal. In the following text, measures against pitch trouble will be discussed. First, what pitch trouble is will be argued. Then, as an attachment, general descriptions of pitch trouble will be made.

4.1.2 Effective Measures

As already indicated in Attachment IV-4-1, there is no specific measures against pitch trouble. However, we believe that the most suitable measures for Aksu mill can be found through implementation of the following measures.

(1) Seasoning Pine Logs

A moisture content of GP logs for Aksu mill when delivered is conventionally low. This arouses problems in GP quality; therefore, efforts have been made to supply as fresh logs as possible. However, to solve pitch trouble caused by pine, logs that have been seasoned for a year should be purchased. Since the wood yard area is limited, the logs should be stored in the mountain foot for a year. (Yet care must be taken not to supply over 2-year old logs.)

(2) Adding Talc

It is sometimes effective to add talc powder to a finished GP chest at the rate of approximately 0.5% of pulp. The particle of the talc should be able to pass through the 325 mesh or should have a 5 -- 10 micron diameter.

(3) At some other paper mill in Japan, there is a case that proves to be successful by adding an anionic surface active agent that corresponds to 0.1% solid of pulp.

(4) Currently, the common method in Japan is to add alum so that the machine head box PH is smaller than 4.5. Accompanied by the production of DIP especially, viscous substance is generated from DIP, and this can be a hindrance. For this reason, addition of alum is an indispensable and effective method in general.

4.2 Measures to Reduce GP Shives

4.2.1 Shive Analysis

It is apparent from visual observation alone that products of Aksu mill have plenty of shives. The investigation team obtained a sample for newspaper and measured it with a shive analyzer. The results are in the table below.

Newspaper Shive Measurement Results
Samples: 8 types of newspaper

	Alfthan shive count (time/20g)
1. Aksu Aksu Mill	60
2. Balikesir SEKA Head Office	16
3. Canada Gunaydin/Istanbul	16
4. Norway Gunaydin/Istanbul	14
5. France Gunaydin/Istanbul	10
6. Japan Hokkaido/Japan	2
7. Aksu m/c Chest	145
8. Aksu Head Box	84

Unfortunately, products from Aksu mill are inferior in particular. SEKA Balikesir mill is on the same level with the Western countries. The sample from Japan is superior by a wide margin.

Even on the Japanese market, newspaper with considerably big shives were once accepted.

From the late 70s to the early 80s when newspaper became lightweight on a worldwide scale, Japanese newspaper publishing companies started demanding more rigorous quality standard. Especially when four-color process printing began due to improvement made in printing machines, the quality difference between newspaper and ordinary printing paper suddenly narrowed. There are many measures against shives depending upon required quality standard. At any rate, it is indispensable to introduce a shive analyzer that can measure shive mechanically.

4.2.2 Examined Measures against Shives

How to reduce shives of GP is how to control quality of GP in other words.

There are, of course, aspects necessitating improvement in terms of facilities and aspects requiring consideration in terms of operations. Therefore, they will be discussed separately.

(1) Problems in Terms of Facilities

1) Replacement of Screens

Screen performance greatly affects reduction of shives above all. In this Renovation Project, the current pressure screen with 1.6mm dia. should be replaced with a patented high-performance screen.

The width of this screen's slit is 0.12mm for cleaning and 0.13mm for rejecting. Unlike a screen plate created by grinding process, this is made by welding and composing wire rods with a wedge-shaped section using a special processing technique. This minimizes twine of pulp fibers.

2) Enhancement of Screen Reject Handling Capabilities

Superiority of a screen system can be decided by its reject handling system. In this Renovation Project, the performance of shredders for sliver handling and capabilities of cleaning screen reject handling should be enhanced. Power supply more than electric power consumption rate of 800kWH/T reject should be used for reject handling.

3) Replacement of Tail Screens

By installing tail screens having the same slit width as that of the cleaning screens, separation of coarse fibers will be improved. This will, moreover, minimize possibility of recirculation of shives through extremely tight slits, only 0.13mm wide.

4) Installation of Centri-Cleaner

The centrifugal air cleaner currently installed only at the reject line will be introduced to the main line as well. Accompanied by reduction of handling density, capabilities of polydisk filters will be insufficient. Thus, enhancement of the filters is required in the Alt-2 Proposal.

(2) Problems Related to Operations

1) Controlling Grinding Power

The most important point for reduction of shives is to fix load fluctuation of a grinder motor as much as possible.

The grinder equipment of Aksu mill comprises one motor and two pockets. So there is a problem for controlling load.

Rather, two units of grinder equipment should be regarded as a pair. And all the operations including feeding of wood, burring of grinder stone, pressurization, etc., should be performed simultaneously. This will let standardization of operations make progress definitely.

2) Controlling Grinder Stones

Grain sizes of all stone material must be standardized. It is indispensable to reduce shives.

One of the causes of load fluctuations is cleanness of stone surfaces. High-pressure water has to be applied constantly to wash grain.

In addition, unevenness of stone surfaces causes load fluctuations, increasing a shive ratio. The stone surfaces have to be controlled carefully.

3) Maintenance of Temperature in the System

Overflow of white water in the system, careless injection of fresh water into the system, etc., will all cause temperature fluctuations in the system.

As a result of this, the system will increase shives because of grinding fluctuations. The system should be enclosed so that the temperature of system circulating white water is always 70°C or more.

4.3 Product Handling

4.3.1 Automatic Roll Wrapping Machine

The specifications of the existing machine include 60 rolls per hour at maximum (provided that trim and diameters are kept the same respectively). It takes ten or eleven minutes to roll a set of nine rolls which is the utmost to handle rolling operated 700 meters per minute.

Accompanied by increase of the speed due to the renovation, the winder will be replaced with a new one. Naturally, deficiency of the wrapping machine's capabilities will occur. Therefore, it will have to be replaced with a machine with large handling capacity.

4.3.2 Lifter

Distortions are seen in some parts. This can mar paper rolls. A large amount of exfoliated paper was found at the bottom of the lifter. This probably came from marred paper rolls.

The lifter should be replaced with a new one due to the upgraded paper machine.

4.3.3 Carrying Paper Rolls to the Warehouse

The paper rolls lifted down to the first floor by the lifter are carried to the warehouse while being rolled about 20 or 30 meters by a worker. During this, there is a great chance that the paper rolls will be marred by picking up foreign objects on the floor. There are three measures against this:

(A) Laying rails to carry paper rolls by a lorry.

(B) Installing a slat conveyer.

(C) Using a roll clamp.

In accordance with various circumstances, (A) would be the ideal choice for Aksu mill.

4.3.4 Carrying Paper Rolls out of the Warehouse

When paper rolls are delivered to clients using trucks, there are currently two possible problems:

(A) Marred paper rolls.

(B) Crushed paper rolls.

As for the occurrence of mars in (A), when the 760 mm paper rolls are loaded on a truck, they are arranged in three rows and piled on three layers. When a roll on the second or third layer is moved past the board placed on the end of the first layer, a lever that is made by flattening one end of a steel pipe is stuck into the space between rolls on the first layer to make the loading easier. Moreover, when the rows are to be formed neatly, this lever is placed at the edges of the rolls and the rolls are moved forcibly. In either case, deep mars are made through packing paper.

As a result of investigation conducted at a newspaper publishing company in Istanbul, these mars were considerably deep, and a part of a roll was torn off deeply. A 15--20-cm scratch was found at the end of a roll mounted on a newsprint press. This obviously would cause a sheet break.

(1) Distortion of Paper Rolls

There were claims from the newspaper publishing company in Istanbul, saying that SEKA's handling of rolls was poor. Some cores of rolls were crushed, so the chuck of the newsprint press could not operate and the rolls could not be used. Some rolls were distorted, thus causing a malfunction in feeding paper during printing.

These rolls were crushed presumably because, when unloaded from the truck to the client's building, they were dropped and the dropping impacts from the second and third layers were especially strong.

When the roll (1) is unloaded, the rolls (2) and (3) will drop together. This is true for the rest of the rolls. If a roll is dropped on a truck's bed, the impact will be absorbed by the truck's suspensions to some extent. However, if a roll is dropped onto a building's floor, the impact will be great and the roll will be crushed. If dropped in a certain manner, even the core can be crushed too.

(2) Handling of Paper Rolls in Japan

It is obvious that prevention of damaged rolls will contribute to increased profits. Handling methods of rolls at major Japanese paper mills are described for reference as follows.

1) Loading Paper Rolls on a Truck

Rolls A (width: 1,620mm) are arranged in one row on a truck, and rolls D (width: 813mm) in two rows, using a crane or lift. When the first layer is finished, worn-out felt from a paper machine with a width of approximately 250mm is laid in two rows on the rolls, onto which the second layer's rolls are placed. (Photo No. 1)

At this time, wooden instruments called *geta* are placed between the first layer's rolls to facilitate rolling of the rolls. (Photo No. 2)

In addition, to prevent rolls from sliding and to avoid dangerous consequences, rubber of 50mm in width and 3--5mm in thickness is laid on the blankets between the upper and lower layers. (Photo No. 3)

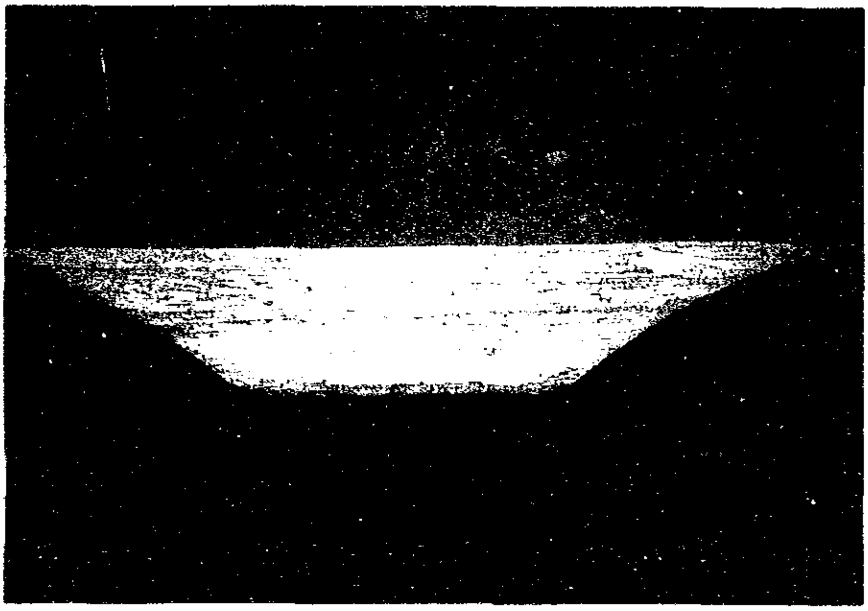
2) Unloading Paper Rolls from a Truck

When the rolls are to be unloaded from the truck, the end of the blanket laid on the first layer is trampled down and the roll on the first layer is moved towards the unloading side little by little. Keeping pace with this movement, the trampled blanket is loosened little by little. Now, the roll on the second layer will gently get down to the truck's bed.

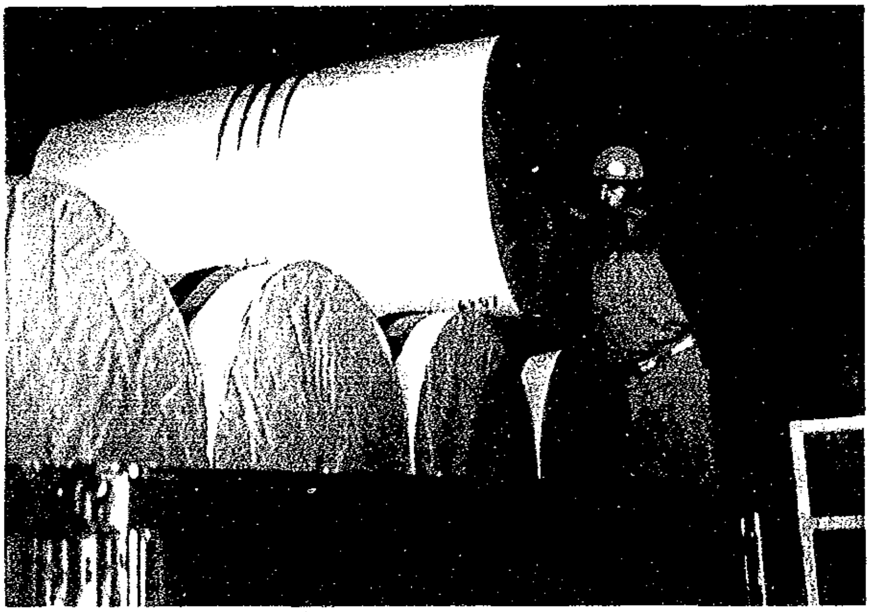
While the roll (1) is moved, the roll (2) is taken down to the truck's bed. After the roll (2) is unloaded from the truck, the roll (4) is taken down to the truck's bed. Now, the roll (3) is unloaded from the truck, so is the roll (4). This is repeated in order.

When the height from the building's floor to the truck's bed is great, a thick urethane mat (1,000mm (width) x 1,600mm (length) x 300mm (thickness)) is placed below the unloading section of the truck to absorb the impact.

No.2



No.3



Additionally, the urethane mat is wrapped in worn-out felt from a paper machine.

3) Education on Damage Prevention

Transportation of paper rolls is entrusted to a transport company.

This company carries out education of product handling and instructions of various techniques for their employees such as truck drivers and roll clamp operators.

Meanwhile, the company holds a damage prevention meeting with the paper mill once a month. Details are discussed in this meeting to help prevent damages of rolls, etc. Furthermore, in case damage of rolls is reported from the client, the company clears up the cause of the damage thoroughly, every time, to prevent it from happening again. As a result of such efforts, now there is virtually no damage of rolls.

4.4 Energy Saving

A large amount of exhausted heat is generated on a low level at a pulp and paper mill. It is important to examine how to recover the exhausted heat so that the required steam is saved and the consumption of fuel is reduced.

Recycling of white water and heat recovery of paper drying process can be effective measures for energy saving. Besides, recycling of white water is also good for waste water treatment because it reduces the amount of waste water Various rationalization plans that will be implemented in this Renovation Project have energy-saving effects directly or indirectly, as well as improvement of paper quality. The following are the major objectives of energy

saving.

4.4.1 Recycling of the Heat Exchanger's Thermal Waste Water into Process Water

Currently, a large quantity of the heat exchanger's thermal waste water is drained using a once-through system in paper machine and utility facilities. When the Renovation Project is implemented, the amounts of the drained water in those facilities are estimated to be as follow.

Paper machine:	$400m^3$/hr (Alt-1)	$608m^3$/hr (Alt-2)
Utility:	$109m^3$/hr	
Total:	$509m^3$/hr (Alt-1)	$717m^3$/hr (Alt-2)

By installing piping for recovery, the above drained waste water will be recycled into process water.

Assuming the temperature difference between the entrance and exit of the heat exchanger is 20°C, the recovered heat values will be:

$10,180 \times 10^3$ kcal/hr (Alt-1)
$14,140 \times 10^3$ kcal/hr (Alt-2)

These heat values show that the use of steam will decrease and the consumption of fuel will be reduced in its turn. Moreover, the amount of the drained waste water will be reduced, so recycling of waste water will be also very effective measures for waste water treatment as mentioned above. (Refer to 3.1.6, (1), 3)

4.4.2 Stoppage of Blowing Steam for Heating the Grinder Shower Water (GP)

At present, the GP grinder shower water is obtained by blowing steam to heat filtered water through the polydisk filter with a view to saving energy required for the grinder. This method will be replaced with use of high-temperature water from the paper machine. This will make possible reduction of the steam by 0.8T/GP BDT in the original unit. (Refer to 3.1.2, (2), 4), B))

4.4.3 Intermittent Operation of Pulpers

Presently, the pulpers (220kW, 2 units) which are located under the calendars are operated regularly. A broke pulper (150kW, 1 unit) will be newly installed downstairs. The pulpers under the calendars will be operated when out-of-paper signals are input. By suspending the operation of those pulpers except when paper runs out, electricity will be saved as follows.

Assuming that the paper runs out 8% of the operation time, 172kW of electricity can be saved on average. (Refer to 3.1.4, (3), 2), O)(Refer to 3.1.4, (4), 2), R)

4.4.4 Sealed Dryer Hood

The existing hood and waste heat recovery system have become obsolete. Exhaust cannot be performed sufficiently, and steam blows off into the room in great quantities. Moreover, the waste heat recovery system does not function properly. All this equipment will be replaced with new one.

This makes possible recovery of waste heat of high-temperature humid air exhausted from the hood as well as heating of dry air supplied to the hood. (Refer to 3.1.4, (3), 2), H) (Refer to 3.1.4, (4), 2), I)

4.4.5 Replacement of the Pulp Dust Collector/Deaerator

The AC motor for the fan pump will be replaced with a DC motor with the output as follows. Energy saving will be achieved by precisely adjusting the rotation in accordance with changes in the processing speed and flow rate.

Alt-1	Fan Pump No. 1	AC700kW --> DC450kW
	Fan Pump No. 2	AC320kW --> DC240kW
Alt-2	Fan Pump No. 1	AC700kW --> DC550kW

(Refer to 3.1.4, (3), 2), B,(c)) (Refer to 3.1.4, (4), 2), B, (C))

4.4.6 Rise in Temperature of BKP Dissolving Pulp

Currently, the temperature of BKP dissolving pulp is 31°C.

By changing the flow of white water, it will increase to 50 - 55°C.

This will make the temperature of the stock inlet increase by approximately 5°C, so drying effects will improve. It will contribute to the reduction of required steam in drying process. (Refer to 3.1.3, (1), 8))

5. Environmental Protection

5.1 Saving Resources and Preserving Forests

5.1.1 Demand for Wood and Pulpwoods in Turkey

The ratio of industrial wood in demand for wood in Turkey is comparatively low. On the other hand, the demand for fuel wood is extremely high.

Composition of Demand for Wood

(Unit: $100m^3$)

	Turkey (1988)		World (1987)		Japan (1987)	
	Demand	%	Demand	%	Demand	%
Industrial wood	10,199	29.8	1,633,089	48.7	31.735	97.2
- For lumber	(5,700)	(16.7)	(1,002,620)	(29.9)	(19,015)	(58.8)
- For pulp	(1,536)	(4.5)	(405,366)	(12.1)	(11,785)	(36.5)
- For other	(2,936)	(8.6)	(225,101)	(6.7)	(935)	(2.90)
Fuel wood	24,000	70.2	1,593,886	47.6	371	1.1
Other	-	-	125,472	3.7	216	0.7
Total	34,199	100.0	3,352,447	100.0	32,322	100.0

When compared with Japan, the annual wood consumption in Turkey is higher than in Japan, despite the fact that the area of forests and the stock of wood in Turkey are both lower than in Japan. Moreover, the stock of wood in Turkey is decreasing every year.

On the other hand as the Turkish standard of living is improving, the use of wood for fuel is decreasing every year. Nevertheless, it still takes a great proportion.

As measures against this problem, improvement of income in farming regions, provision of alternate fuel, expansion and reinforcement of tree-planting projects, etc., are possible.

The Project was examined as a forest resource issue. Although the percentage of demand for pulpwood is not very high in Turkey, the following effects were pointed out.

5.1.2 Saving the Resources by Introducing the DIP

By introducing the DIP, approximately 30,000-ton paper can be produced annually without using logs. This amount of paper corresponds to logs of 91,000m^3/year.

Assuming the current output of newspaper at Aksu mill is 74,700 tons/year, if the DIP is introduced at the mill, the current required logs of 181,000m^3/year will be halved to 90,000m^3. This proves how effective the introduction of the DIP is for saving the resource.

Currently, Japanese newspaper is mixed with 35 - 45% of waste paper. There is room for increasing the waste paper mixture rate at Aksu mill after the renovation.

5.1.3 Saving Resources by Reducing the Basis Weight

In the Renovation Project, the weighing capacity of newspaper is planned to be lightened from present 49g/m^2 to 45g/m^2. This will save approximately 8% of the material. When this percentage is converted into saved amounts of logs, the figures for the Alt-1 and Alt-2 are as follow respectively:

Alt-1: 11,200m^3/year
Alt-2: 16,700m^3/year

5.2 Water Pollution Control

From a pulp and paper mill, a variety of organic substances contained in logs will be discharged as waste water and industrial waste in large quantities. However, the characteristics of the discharged waste vary with the manufacturing process of which the mill is comprised.

The major pollutant components in the waste water at Aksu mill after the Renovation will be: bark, chips, and wood flour from the wood process (wet barker); shives and fine fibers from the GP process; BOD substance that is generated especially from the bleaching procedure of the DIP process; and fine fibers from the paper machine process.

In general, there are three ways to reduce the load of waste water at a paper and pulp mill: 1) circulation of water to recycle it, 2) recovery of chemicals and frost of yarn, and 3) comprehensive waste water treatment. In the case of Aksu mill, the pulping process is composed of the GP and DIP; therefore, the above-mentioned methods 1) and 3) will be combined to cope with the reduction of waste water load.

Presently, at Aksu mill the waste water is discharged into adjacent Aksu River (this is also the river from which the water is taken in) without performing comprehensive waste water treatment. The amount of the discharged waste water is $850m^3$ on average. The quality of the waste water is not very good as shown in Table below. It contains a large amount of suspended solid and looks cloudy as a result.

Temperature	27 - 29 degree C
pH	6.5--7.7
S.S.	690 mg/l (Average)
COD	700 mg/l
BOD	270 mg/l

In order that this waste water may conform to the regulations, SEKA is planning to build a comprehensive waste water system and scheduling the completion at the end of 1992. Combining a precipitator and water circulatory recycling system, they will employ the discharge into the deep sea (from the shore of the Black Sea) which has less strict regulations than the discharge into rivers.

Meanwhile, the Renovation Project will create two factors to increase the waste water discharge load that are the increased production of paper and newly installed DIP equipment. Thus, the reduction and circulatory recycling of water will be carried out more boldly, and a comprehensive waste water treatment system exclusively for the DIP waste water, apart from SEKA's project. Because the DIP waste water contains a considerable amount of BOD substance unlike the waste water from the existing process, a two-step waste water treatment system that combines physical separation and biochemical treatment will be employed for the DIP waste water. This treatment system will lower the BOD value and enable the DIP waste water to be discharged into Aksu River.

As shown in Table IV-5-1, after the renovation the amount of the waste water load from the entire mill will decrease in both alternatives as compared with now (or even after SEKA's project starts operating).

5.3 Industrial Waste Treatment

Organic substances contained in logs mainly such as bark and chips in discharged as industrial waste. It seems that this industrial waste is utilized for land filling and household fuel of the residents in the neighborhood. However, a systematic treatment method has not been established yet.

In the Renovation Project, in addition to the existing waste, a large amount of waste will be generated by the DIP equipment which utilizes waste paper for material. This will result in sludge created by the waste water treatment system, so all of this waste will be incinerated.

The industrial waste which will be subject to incineration are shown in Table IV-5-2. The ashes from the incinerator will be used for land filling.

5.4 Prevention of Air Pollution

The air pollution at a pulp and paper mill is mainly caused by SOx, NOx, as well as soot and dust.

Currently, fuel oil C with 2.78% sulfur content (acceptance limit: 4% max.) is used for the power boiler. It is estimated that 47,000 Nm^3/hour (damp) combustion gas with approximately 1,600 ppm of SO_2 concentration is now exhausted at the present 46.6T/H boiler load. Additionally, the height of the chimney is 25 meters from the ground.

In this region, there is no environmental regulations for exhaust of combustion gas. It appears to be no special issue in this region.

When the renovation is implemented, the process incorporated with energy saving measures will be employed. For this reason, the fuel consumption will stay almost at the same level as it is now although the production of paper will increase as shown in the table below.

	Present	Alt-1	Alt-2
Paper production (T/Y)	130,000	34,700	100,000
Boiler load (T/H)	47.3	46.6	43.5
Fuel combustion (T/H)	4.07	4.01	4.01

Therefore, as long as the fuel oil with the same sulfur content is used, it is expected that the effects of SO_2 on the environment will remain virtually the same as it is now. It is unlikely that a new air pollution problem will arise.

In the meantime, as for the newly installed waste incinerator, it is now planned to incinerate toxic substance, so there should not be a problem it soot and dust in the gas are eliminated thoroughly.

In addition, any particular measures do not seem necessary for NOx.

5.5 Noise Abatement

The main sources of noises at Aksu mill are presumably the drum barker, and collision of chips that enters and exit from the drum barker, exhaustion of the paper machine's dryer hood.

Nevertheless, these noise sources are sufficiently distanced from residential areas and schools. Therefore, it does not appear to be a particular problem now.

After the renovation, the dryer hood which has now ceased the operation will start operating again. Sufficient muffling measures will be taken for the dryer hood. In addition, the newly installed DIP equipment and waste incinerators are not machines that especially generates noise. It is yet planned to incorporate measures against noise in accordance with requirements.

Table IV-3-1 GRINDER SETTING SCHEDULE 1990 February

○ Setting (2-hour down time)

	No. 1 G	No. 2 G	No. 3 G	No. 4 G	No. 5 G	No. 6 G	No. 7 G	No. 8 G
2/ 1								
2					○			
3								
4	○							
5				○				
6								
7							○	
8								
9								
10				○				
11	○							
12	4Hr	10	2	2	2	2	2	2
13		20			○			2
14	2	22						
15	2	24	4	4	2	2	2	○ 2
16	12	12	24	18	12	12	12	12
17	18	24	18	18	18	18	18	18
18	2	4	22	2	○ 2	2	2	2
19	2	2	24	4	2	○ 2	2	2
20			24	○				
21	10	10	○ 8	4	4	4	○ 4	4
22	○ 4	2	2	22	2	2	2	2
23				24				○
24	10	10	10	24	10	10	10	10
25			4	24				
26	4	4	○ 6	24	4	4	4	4
Setting interval	11days	* 30days	5days	10days	5days		14days	8days
Total down time	-60H (2. 5days)	-144×2H (12days)	-24H (1days)	-54H (2. 3days)	-32H (1. 3days)		* -56H (2. 3days)	-42H (1. 8days)
Balance	8. 5 days	* 16days Exception	4days	7. 7days	3. 7days		11. 7days	6. 2days
Average 7. 1days								

Table IV-3-2 COMPREHENSIVE FREENESS AND CONCENTRATION OF GRINDERS

(1990. 2. 12～26)

Grinder	Freeness		Concentration	Remark
	S R°	CF conversion		
	20℃	20℃	%	
Grinder No. 1	45 ～ 74		1. 7 ～ 3. 4	
Grinder No. 2	50 ～ 73		1. 8 ～ 3. 9	
Grinder No. 3	46 ～ 73		1. 8 ～ 3. 9	
Grinder No. 4	54 ～ 75		1. 5 ～ 3. 9	
Grinder No. 5	48 ～ 73		1. 5 ～ 4. 2	
Grinder No. 6	47 ～ 74		1. 6 ～ 3. 7	
Grinder No. 7	46 ～ 73		1. 8 ～ 3. 9	
Grinder No. 8	45 ～ 75	260 ～(50)	1. 5 ～ 3. 8	
Bull Screen	59 ～ 74	140 ～(50)	1. 5 ～ 2. 4	
Polydisk Filter	64 ～ 74	(110 ～ 50)	4. 2 ～ 5. 7	
Refiner Chest	28 ～ 59	450 ～ 220	4. 7 ～10. 3	

Note: Figures in the parentheses are only for reference because there is no proper conversion table of SR-CF for these figures.

Table IV-3-3 ESTIMATE OF INVESTMENT COSTS (CASE-1 100,000 T/Y)

[USD 1,000]

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

Table IV-3-4 ESTIMATE OF INVESTMENT COSTS (CASE-2 130,000 T/Y)

[USD 1,000]

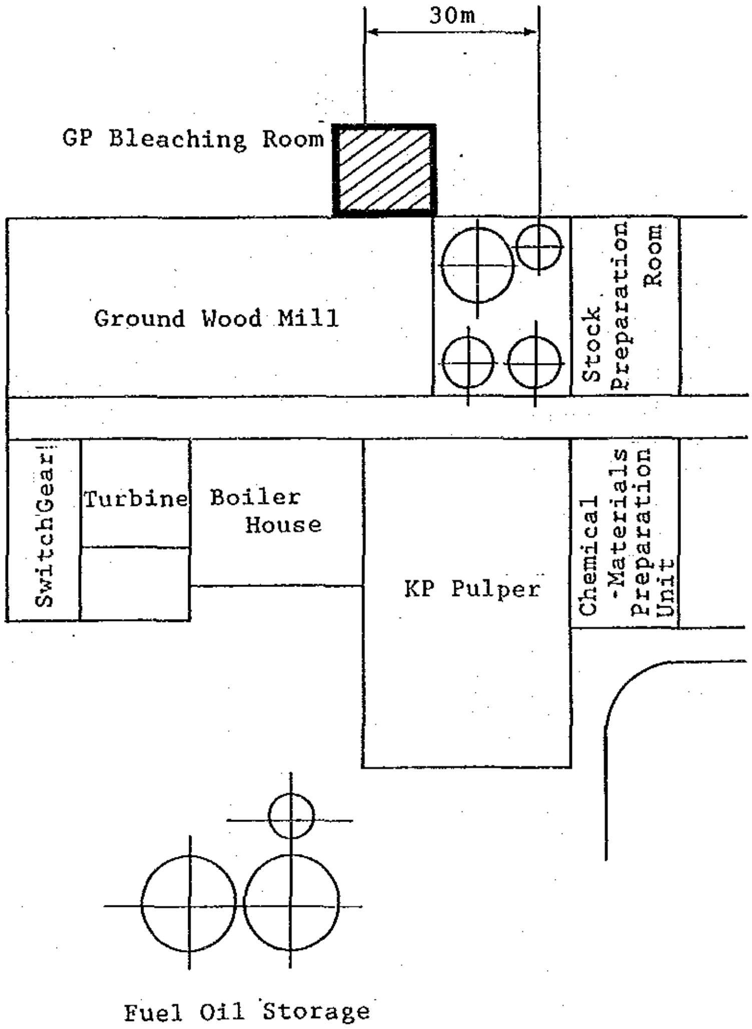
	FOREIGN CURRENCY	LOCAL CURRENCY	TOTAL
1. Site Preparation & Development	0	0	0
2. Plant Direct Cost	70,893	14,250	85,143
(a) Plant Equipment & Materials	62,526	3,328	65,854
(1) Wood Handling Section	0	6	6
(2) GWP Section	5,999	298	6,297
(3) DIP Section	5,544	303	5,847
(4) Stock Preparation	1,440	85	1,525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

Table IV-5-1 LOAD COMPARISON OF WASTE WATER TREATING PLANS

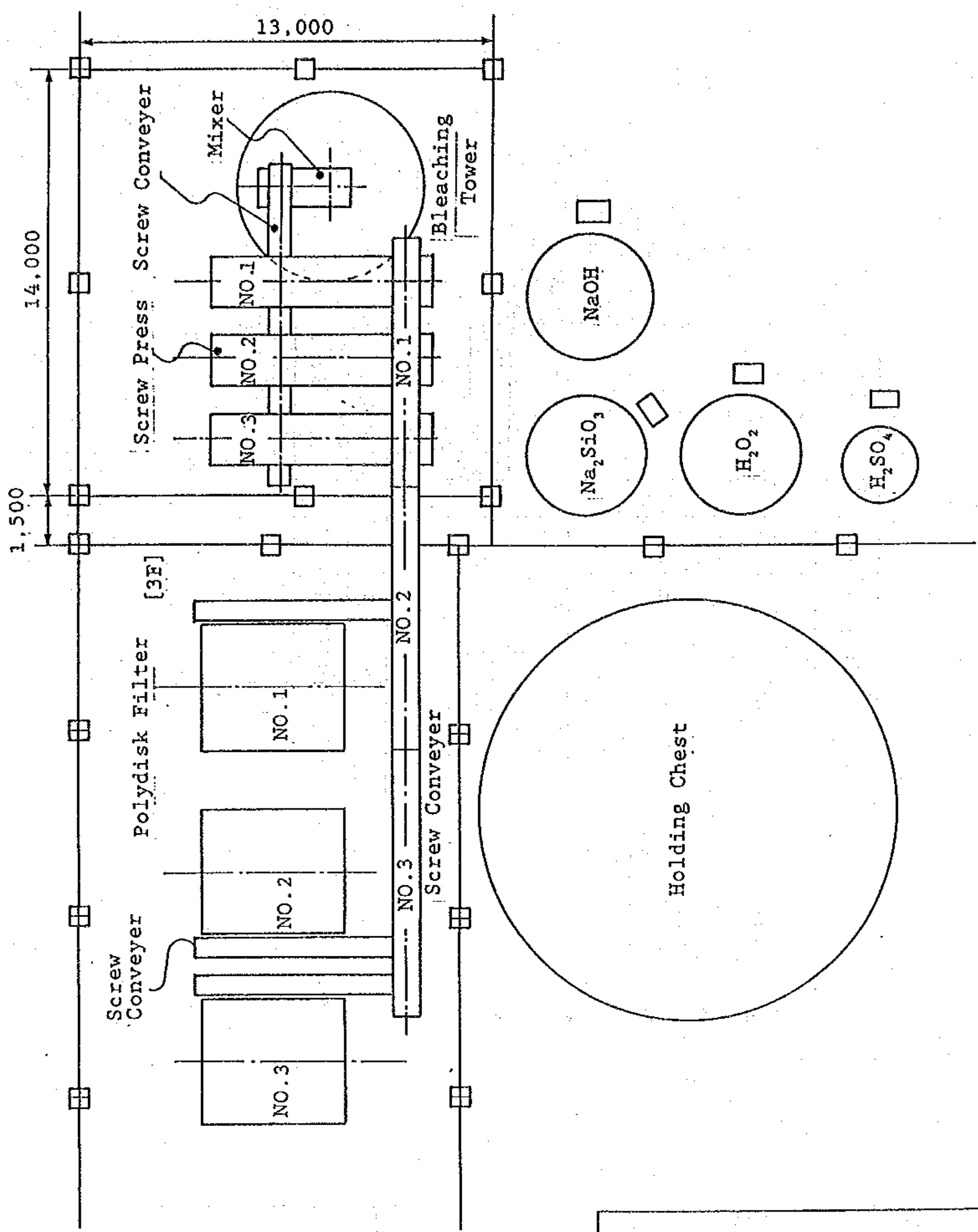
	Existing		Case-1					Case-2				
	SEKA's Plan		SEKA's Plan		Renovation		Total	SEKA's Plan		Renovation		Total
	Conc [mg/l]	Amount [kg/h]	Conc [mg/l]	Amount [kg/h]	Conc [mg/l]	Amount [kg/h]	Amount [kg/h]	Conc [mg/l]	Amount [kg/h]	Conc [mg/l]	Amount [kg/h]	Amount [kg/h]
Flow Rate [m3/hr]		965		534		252	786		775		252	1027
Inlet Water												
S.S.	842	812	847	452	1170	295	747	838	650	1170	295	945
COD	2584	2494	2372	1266	700	176	1442	2602	2017	700	176	2193
BOD5	758	731	747	398	400	101	499	764	592	400	101	693
Treated Water												
S.S.	20	19	20	11	-	0	11	20	15	-	0	15
COD	350	338	350	187	70	18	204	350	271	70	18	289
BOD5	170	164	170	91	25	6	97	170	132	25	6	138
Eliminated Substance												
S.S.		793		441		295	736		634		295	929
COD		2156		1079		159	1238		1745		159	1904
BOD5		567		308		95	402		461		95	555

Table IV-5-2　LIST OF INDUSTRIAL WASTE

Source	Existing		Case-1		Case-2	
	Solid	Water	Solid	Water	Solid	Water
	T/hr	wt.%	T/hr	wt.%	T/hr	wt.%
Bark	0.10	50	0.07	50	0.10	50
SEKA Waste Water Cake	0.81	80	0.45	80	0.65	80
DIP Wastes	-		0.33	65	0.33	65
1st Stage Waste Water Sludge	-		0.29	95	0.29	95
Bio-chemical Sludge	-		0.05	95	0.05	95
Total	0.91		1.20		1.43	



GP BLEACHING ROOM LAYOUT
Fig. IV–3–1
JICA



GP BLEACHING EQUIPMENT LAYOUT

Fig. IV–3–2

JICA

Fig. IV-3-3 WOOD GRINDING FLOW SHEET (CASE-1 100,000T/Y)

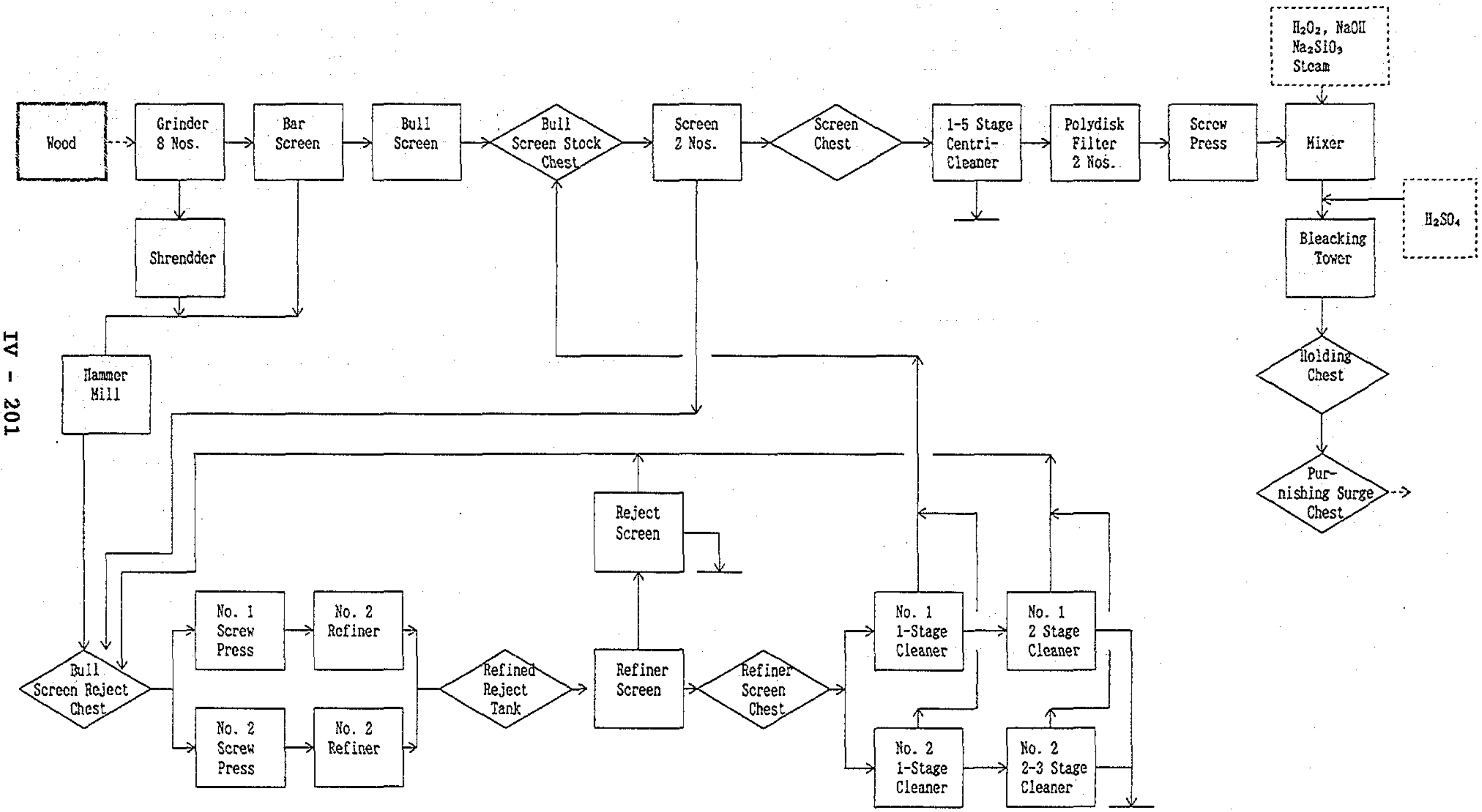


Fig. IV-3-4 WOOD GRINDING FLOW SHEET (CASE-2 130,000T/Y)

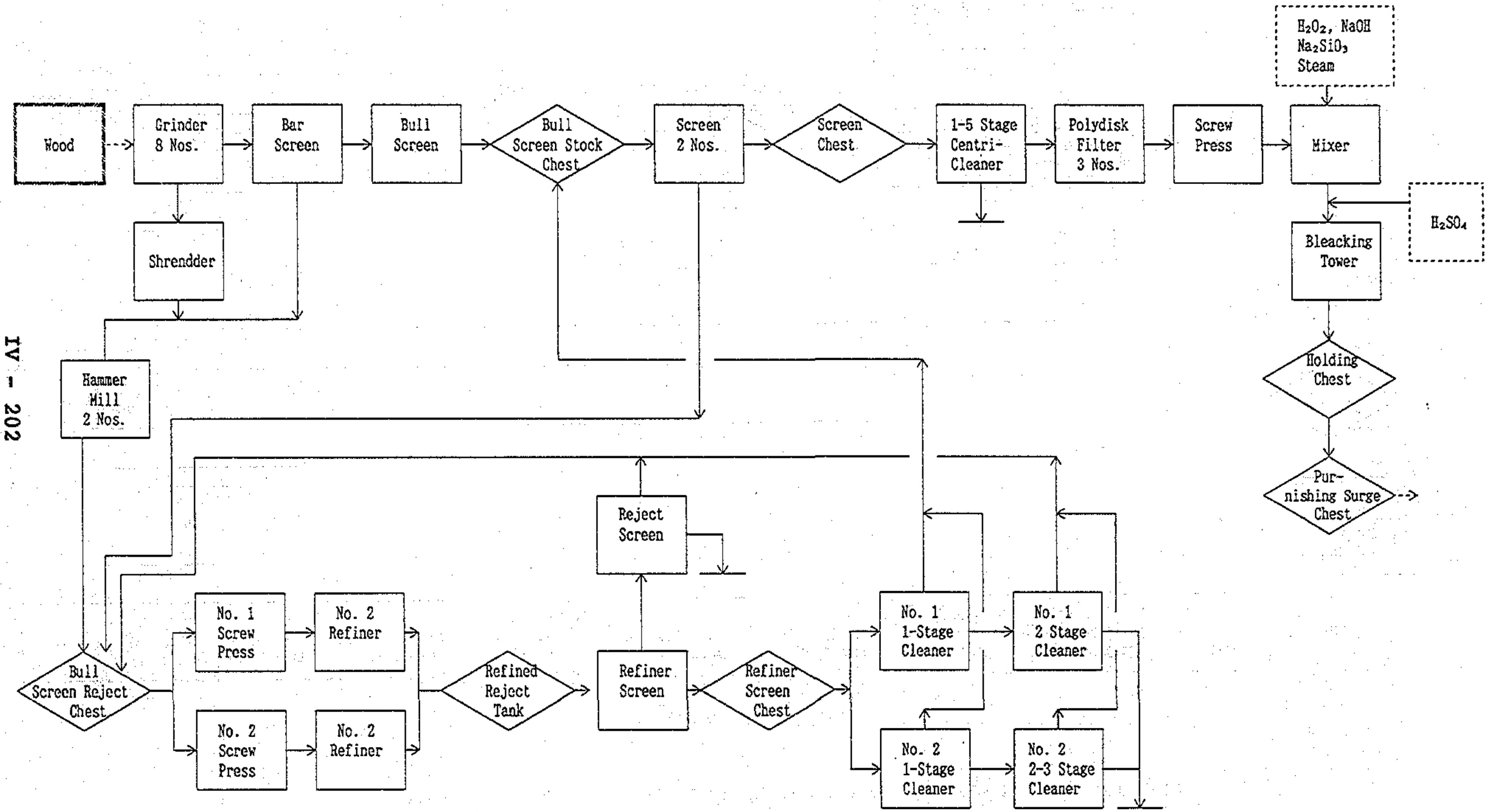


Fig. IV-3-5 WOOD GRINDING FLOW SHEET (EXISTING MILL)

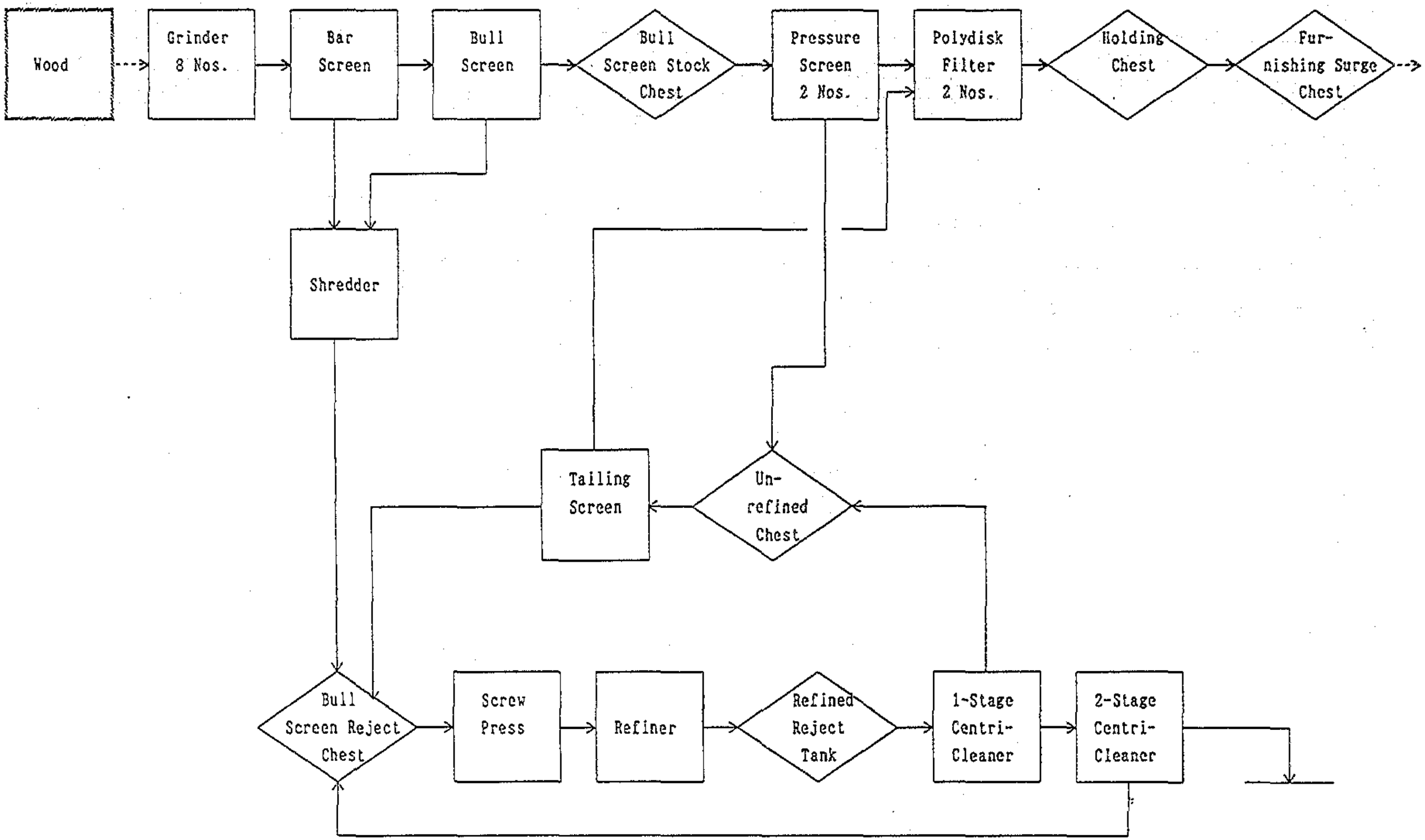


Fig. IV—3—6 PAPERMAKING PROCESS FLOW SHEET (EXISTING MILL)

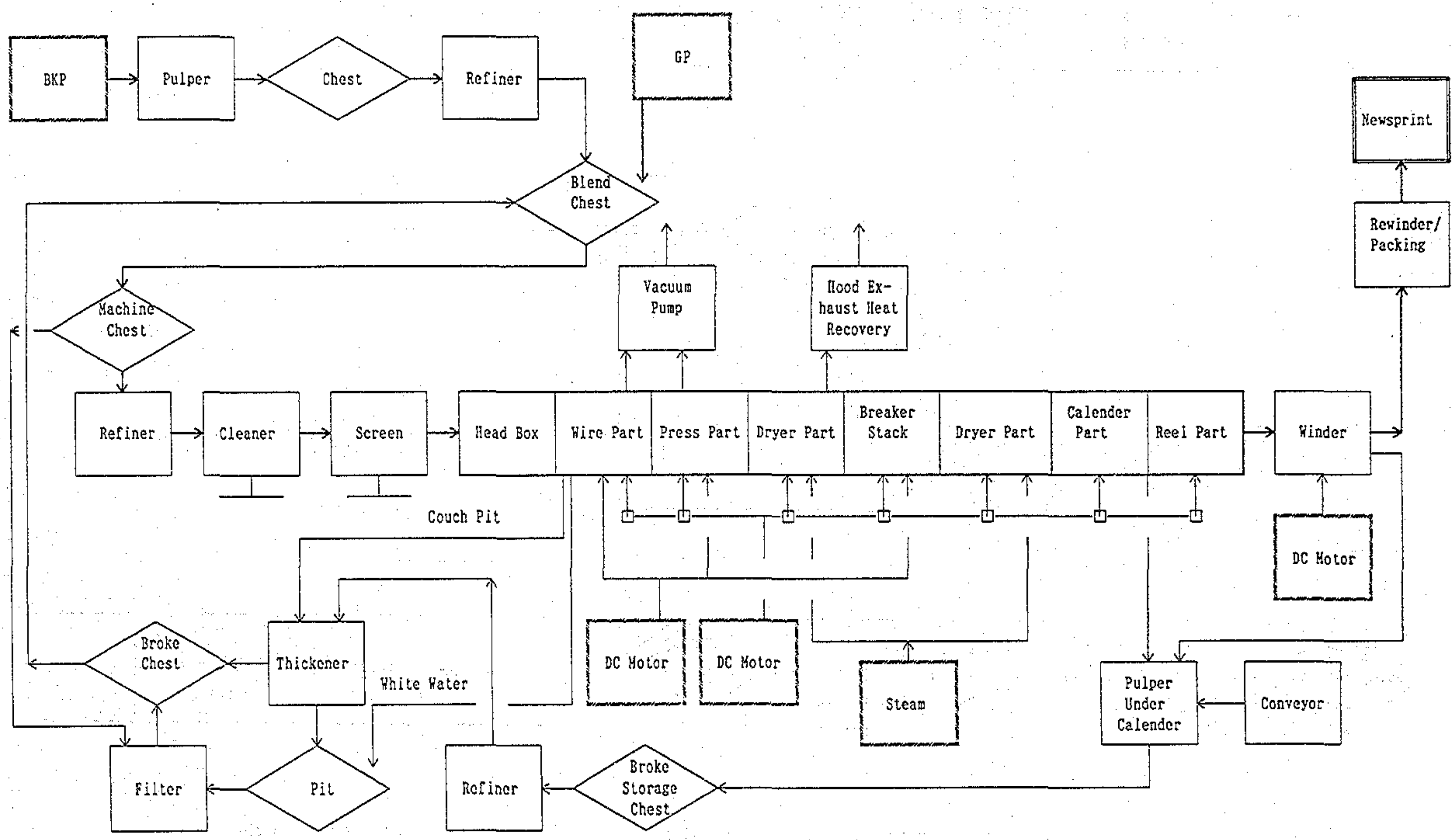


Fig. IV—3—7 PAPERMAKING PROCESS FLOW SHEET (CASE—1 100,000T/Y)

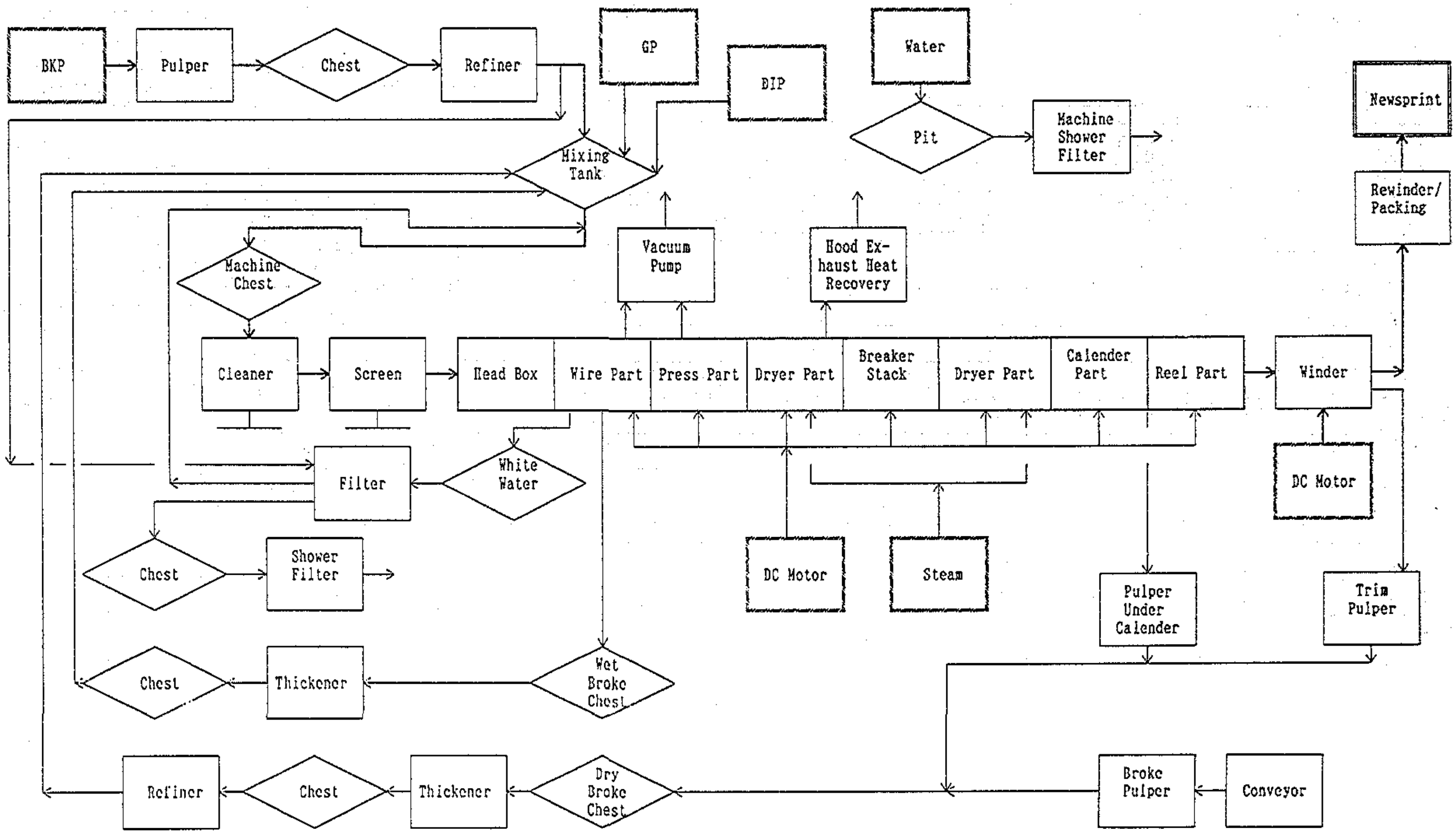


Fig. IV-3-8 PAPERMAKING PROCESS FLOW SHEET (CASE-2 130,000T/Y)

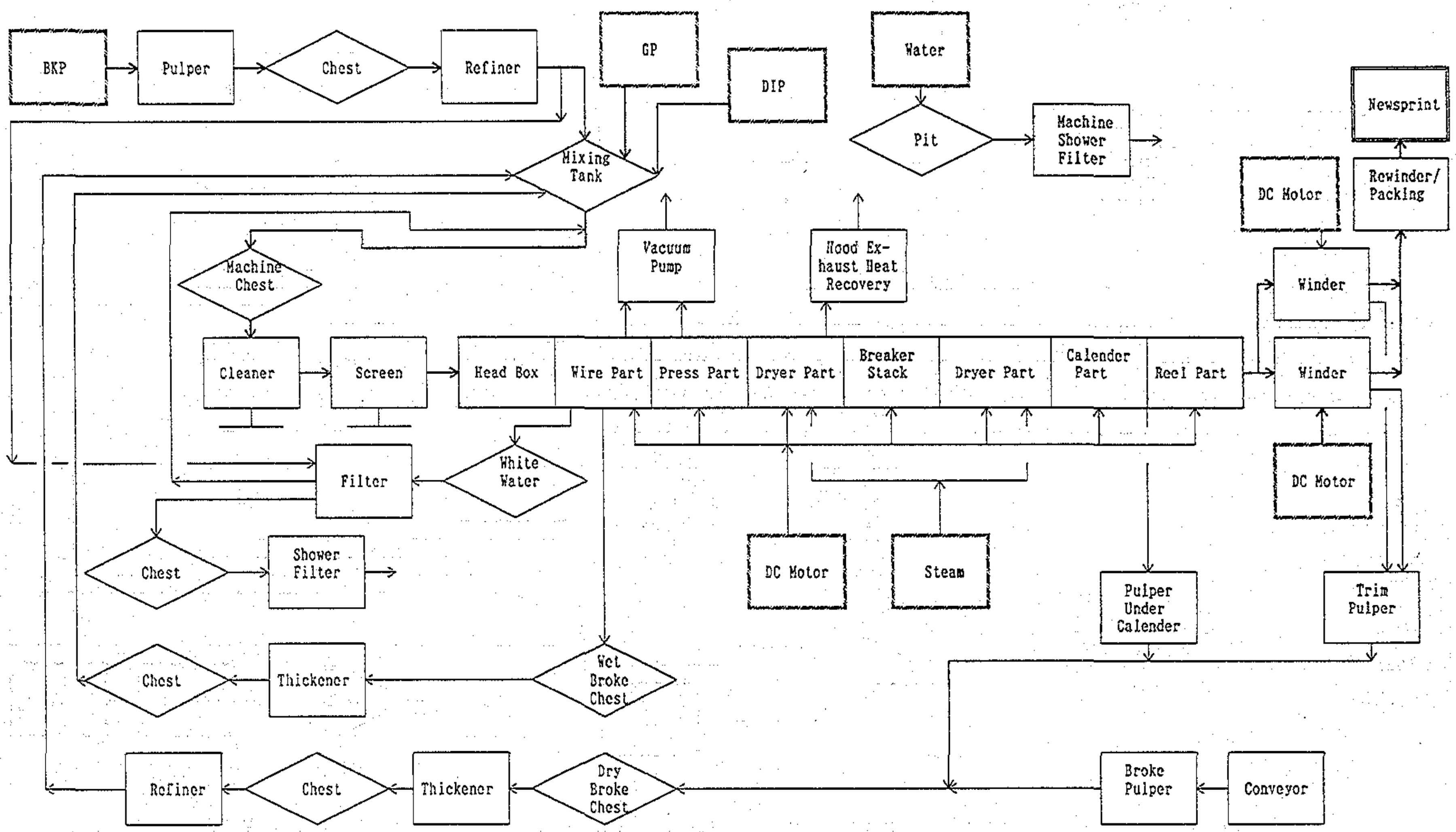
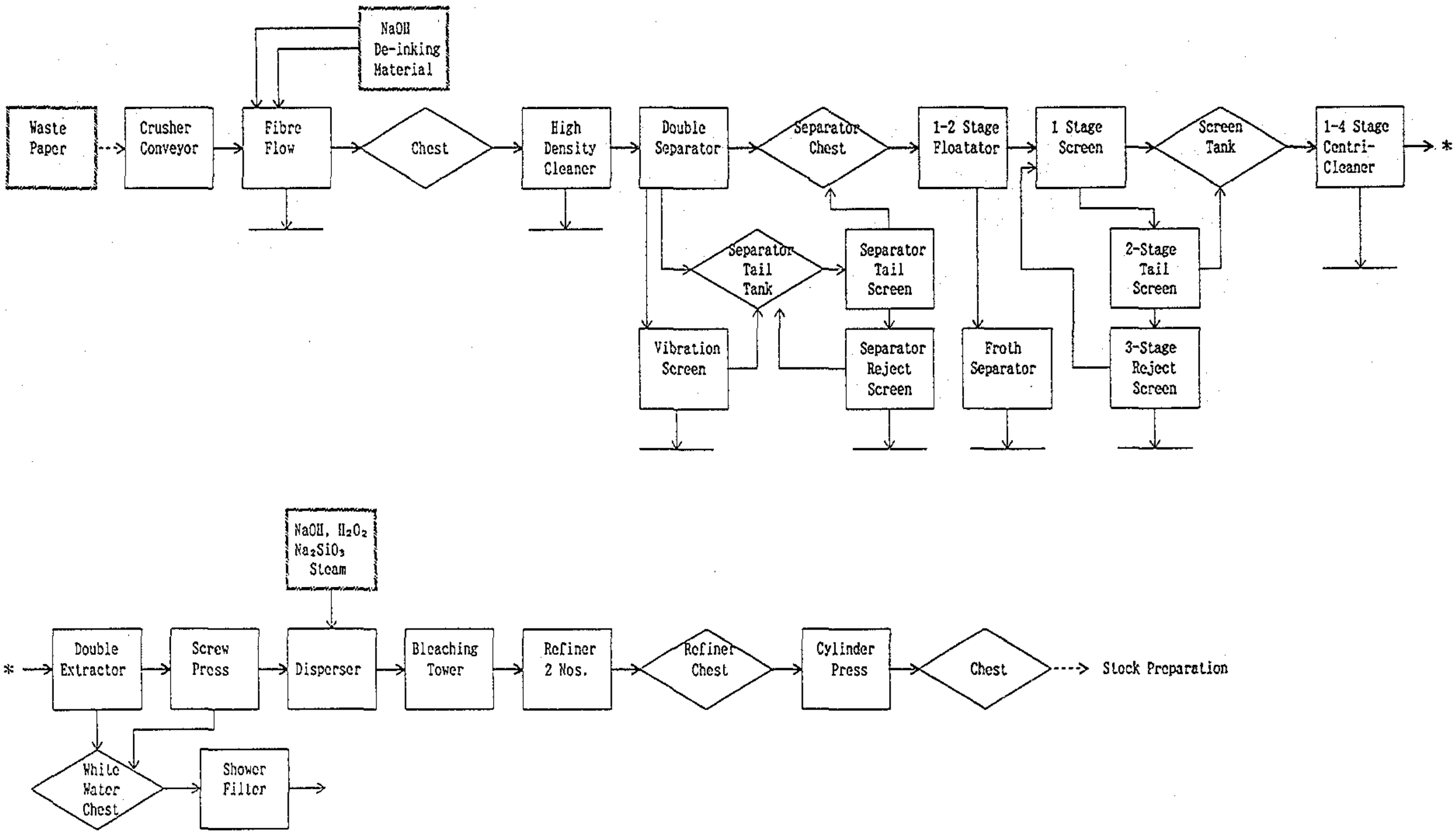
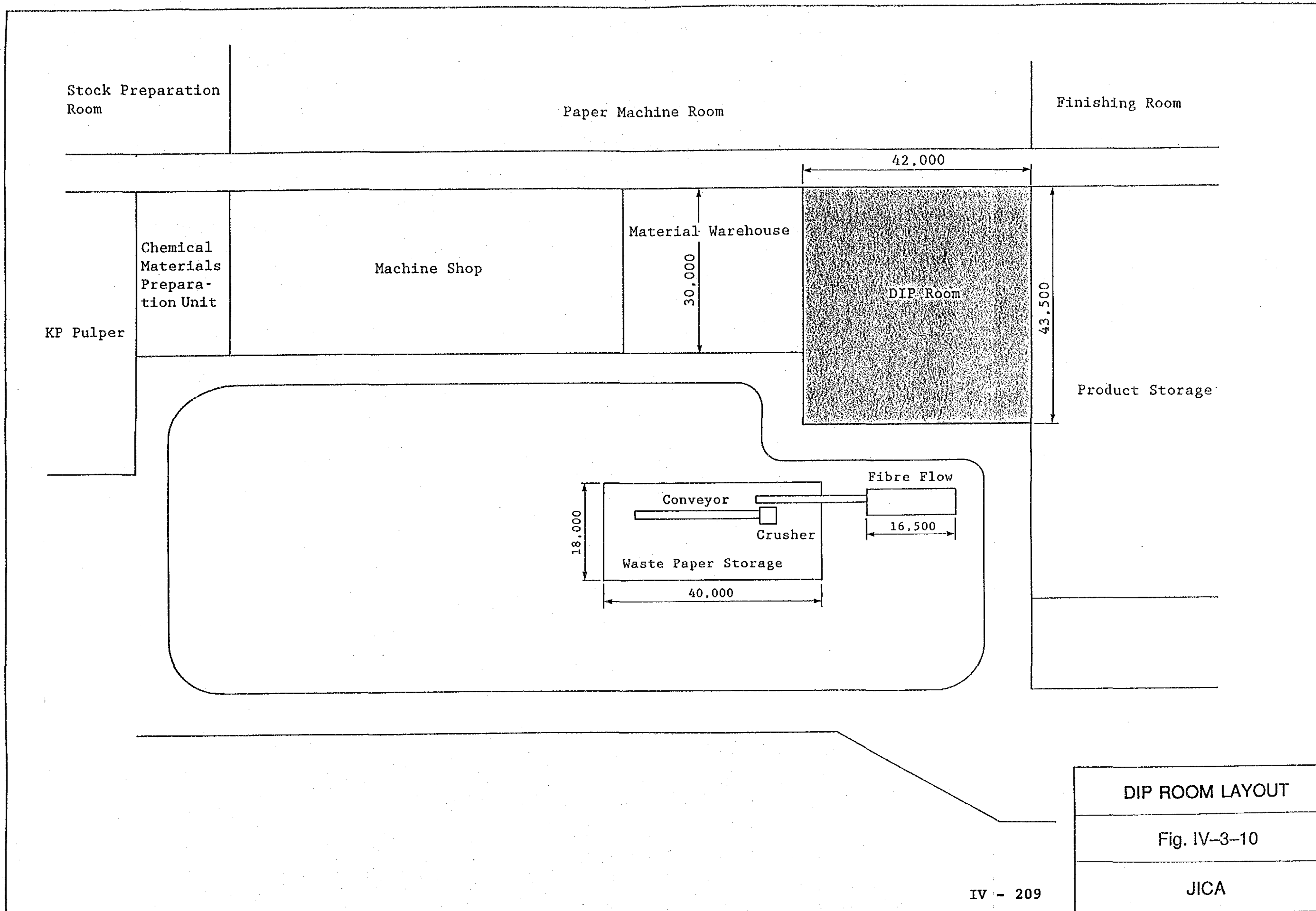


Fig. IV-3-9 DIP FLOW SHEET

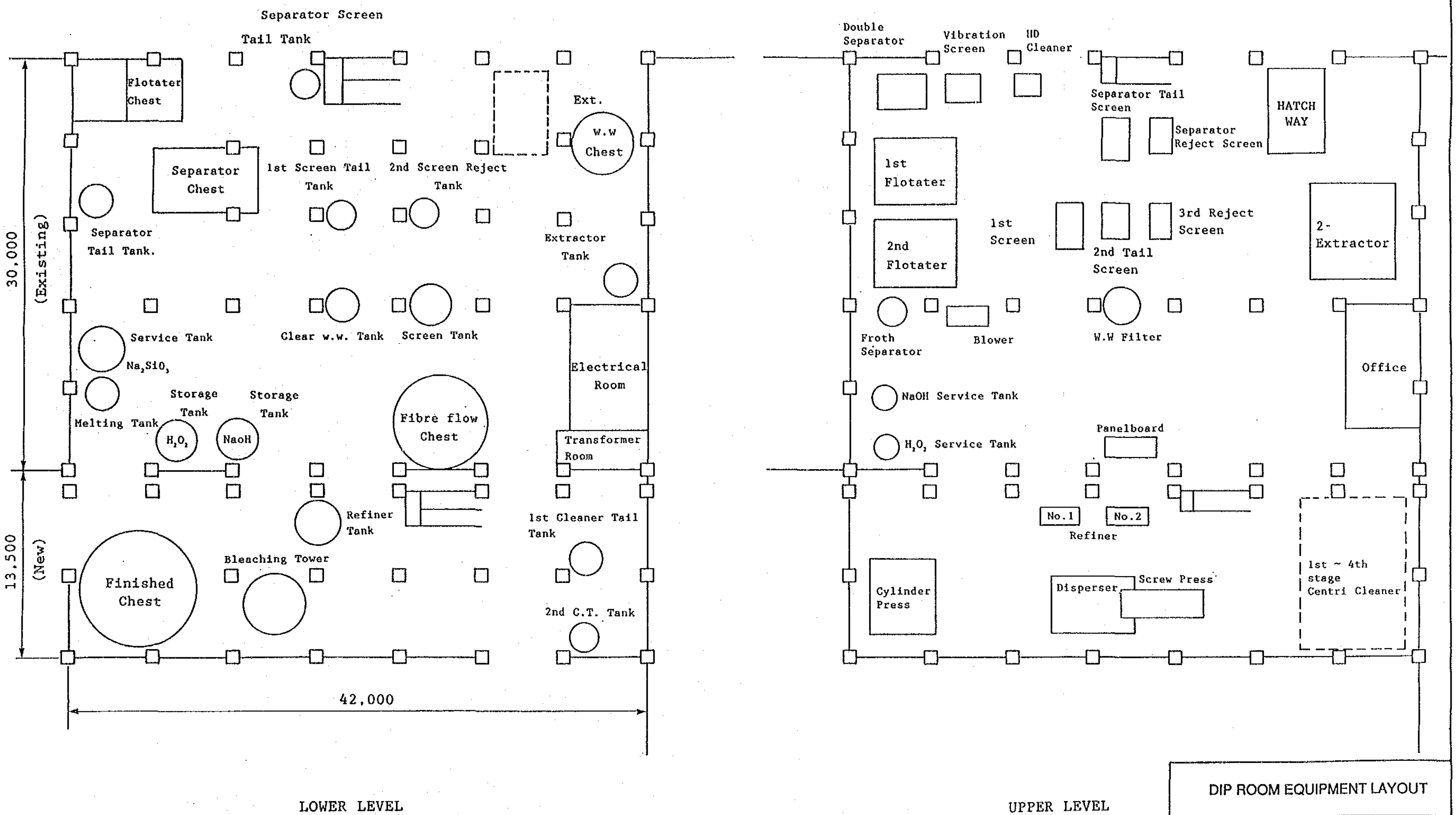




DIP ROOM LAYOUT

Fig. IV-3-10

JICA



DIP ROOM EQUIPMENT LAYOUT

Fig. IV–3–11

JICA

Fig. IV-3-12 OVER ALL FLOW DIAGRAM OF MILL WATER, WHITE WATER, WASTE WATER AND INDUSTRIAL WASTES
Existing Scheme-1 (without SEKA's Plan)

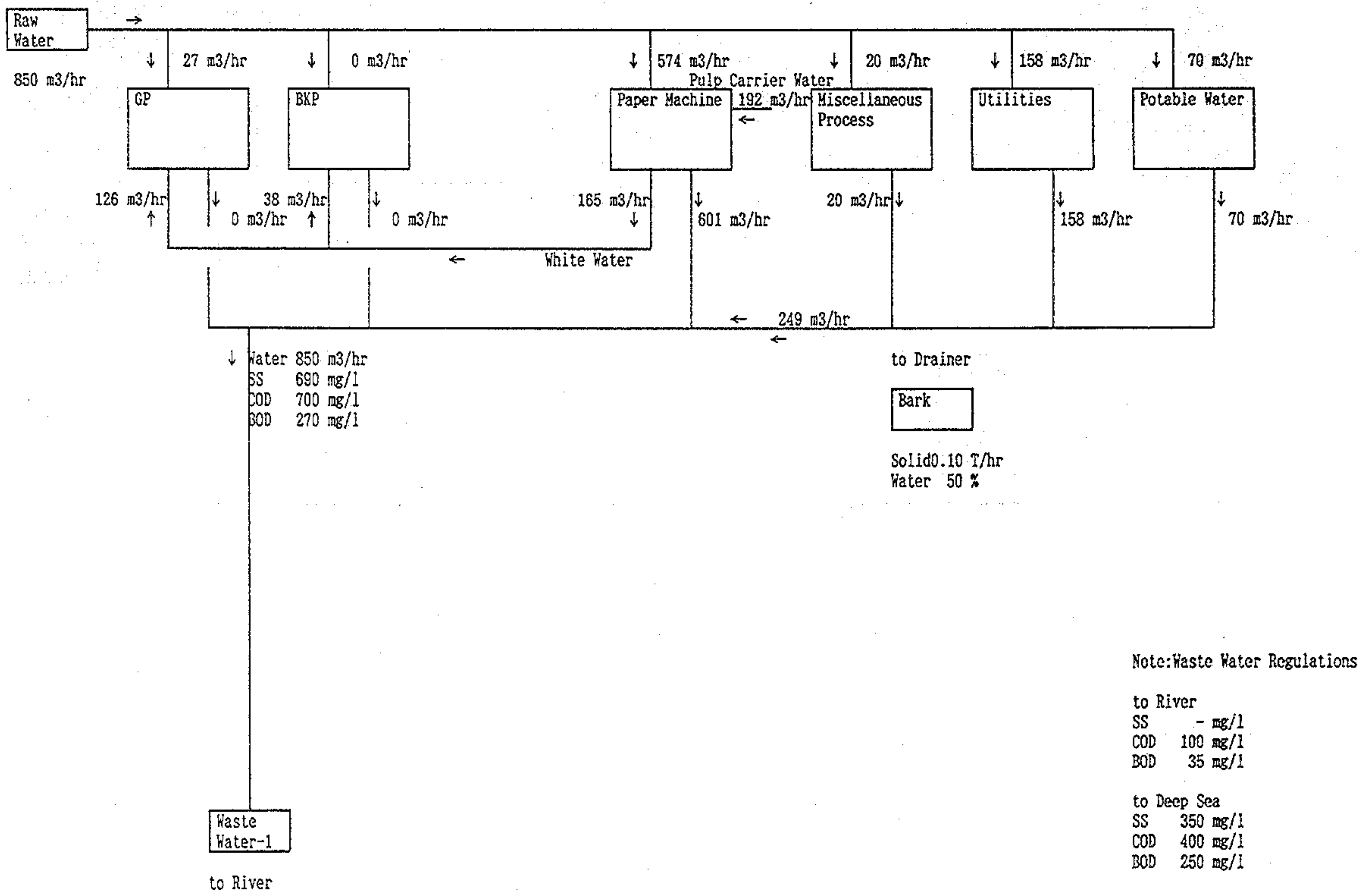


Fig. IV-3-13 OVER ALL FLOW DIAGRAM OF MILL WATER, WHITE WATER, WASTE WATER AND INDUSTRIAL WASTES
Existing Scheme-2 (with SEKA's Plan)

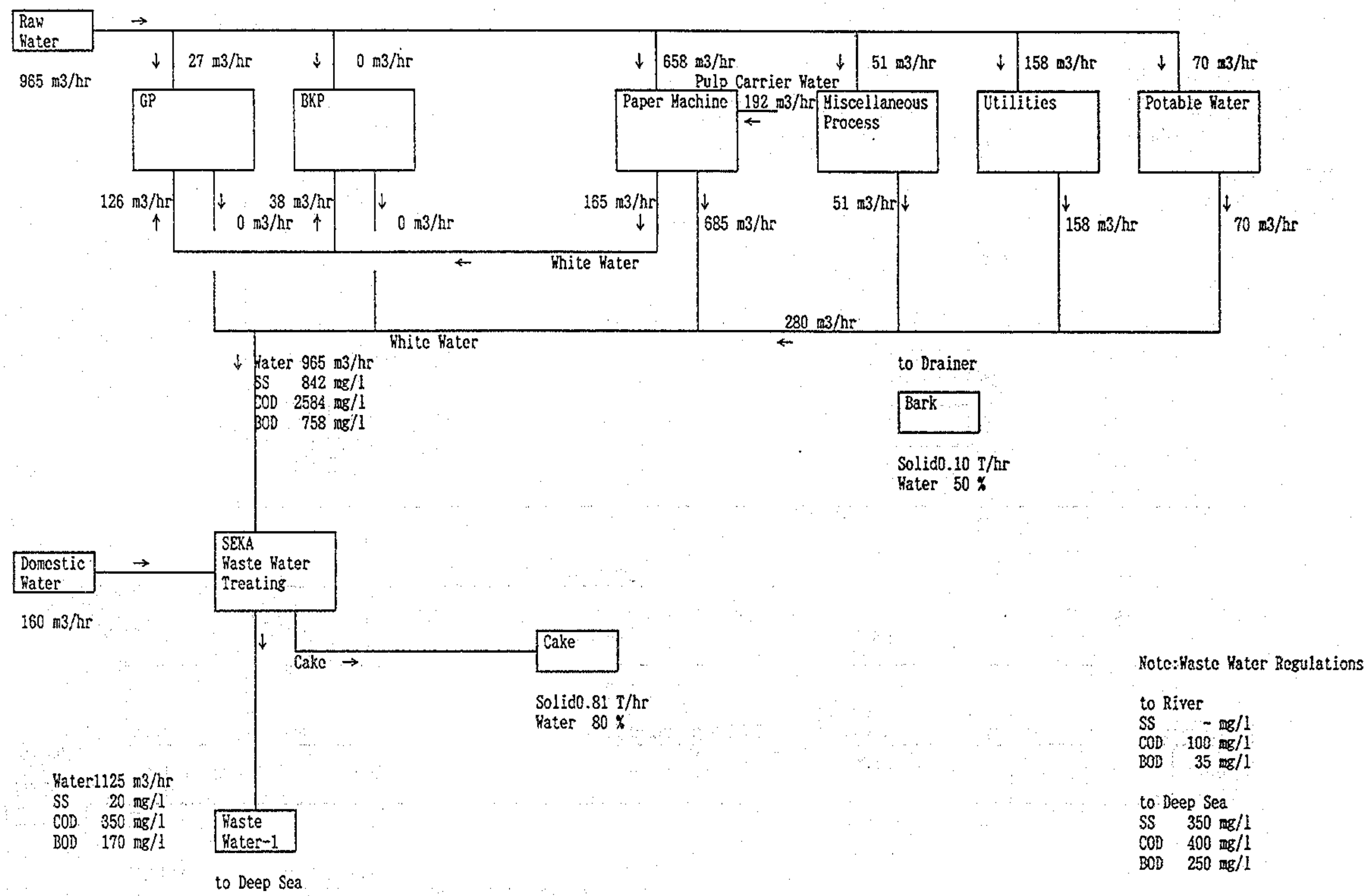


Fig. IV-3-14 OVER ALL FLOW DIAGRAM OF MILL WATER, WHITE WATER, WASTE WATER AND INDUSTRIAL WASTES
Case-1

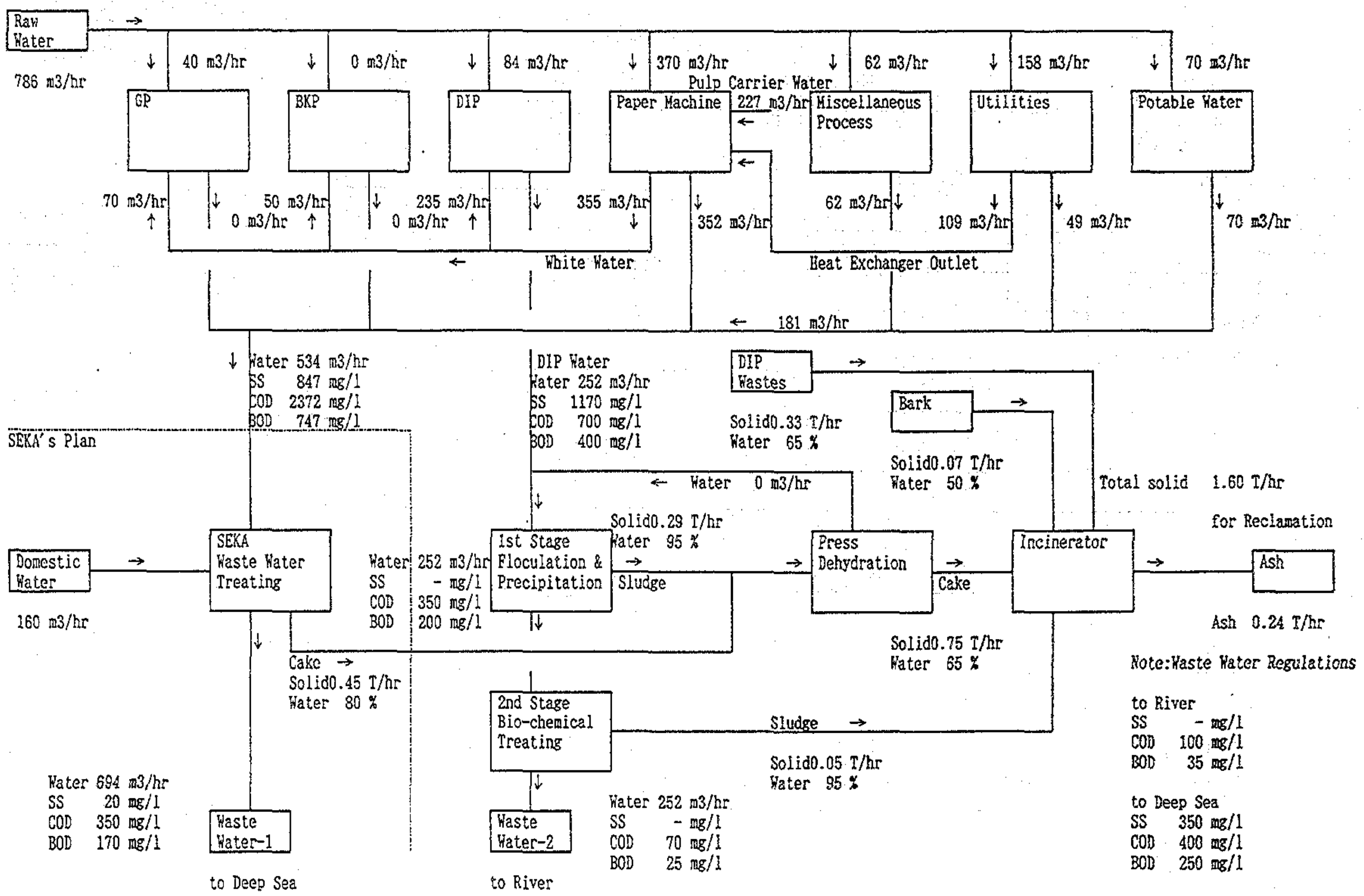


Fig. IV-3-15 OVER ALL FLOW DIAGRAM OF MILL WATER, WHITE WATER, WASTE WATER AND INDUSTRIAL WASTES
Case-2

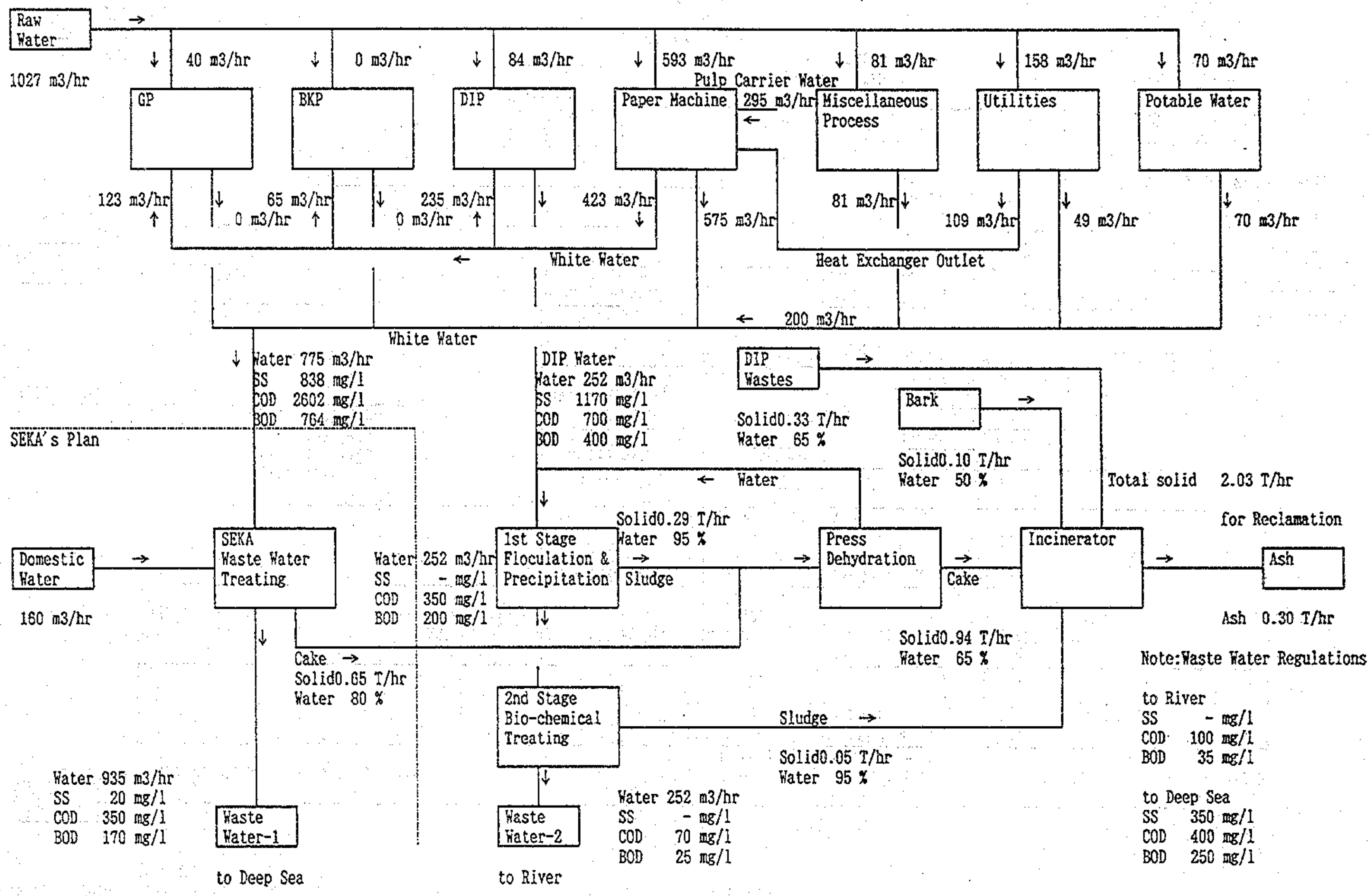


Fig. IV-3-16 MATERIAL BALANCE (CASE-1 100,000T/Y)

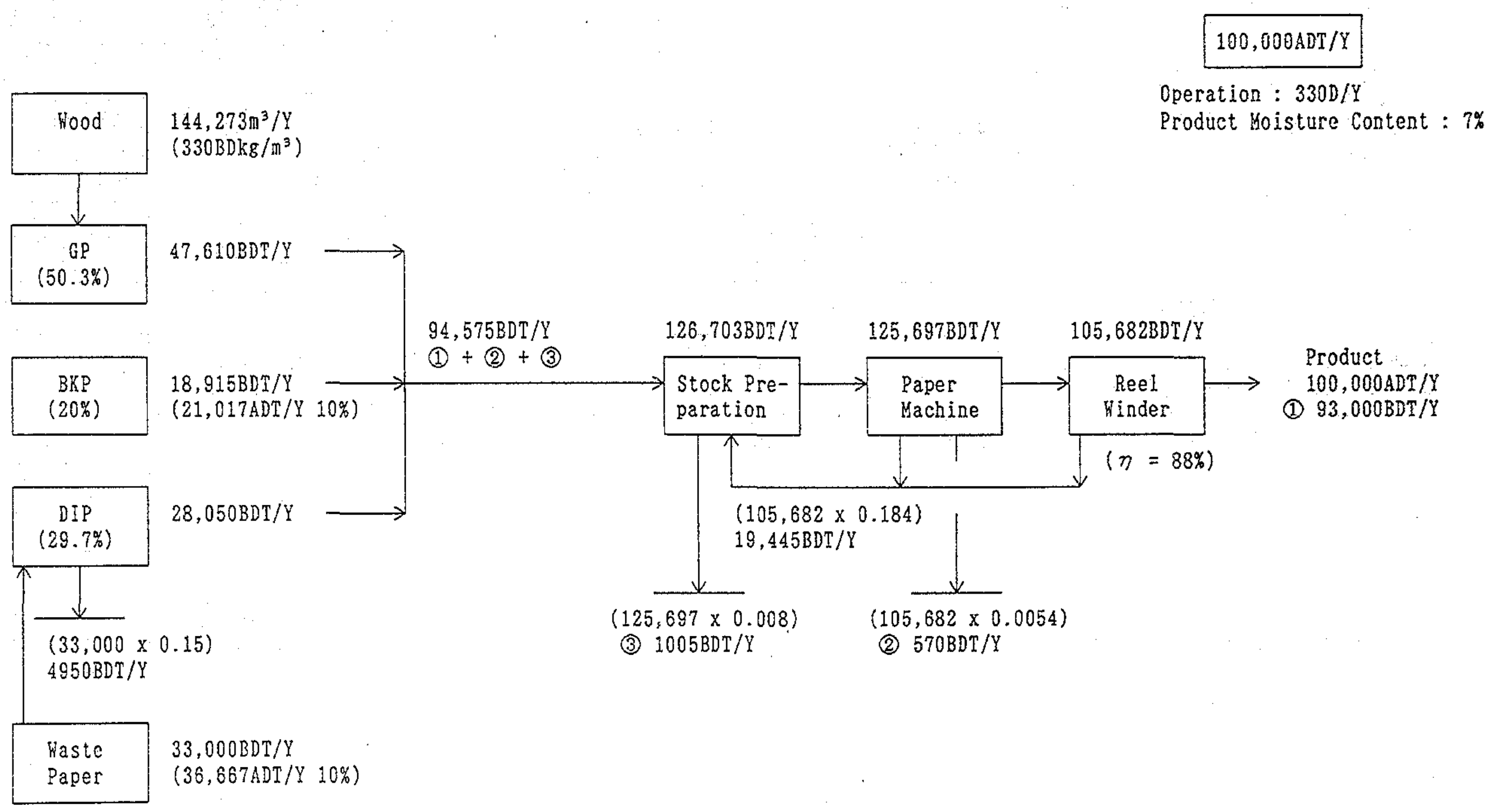


Fig. IV-3-17 MATERIAL BALANCE (CASE-2 130,000T/Y)

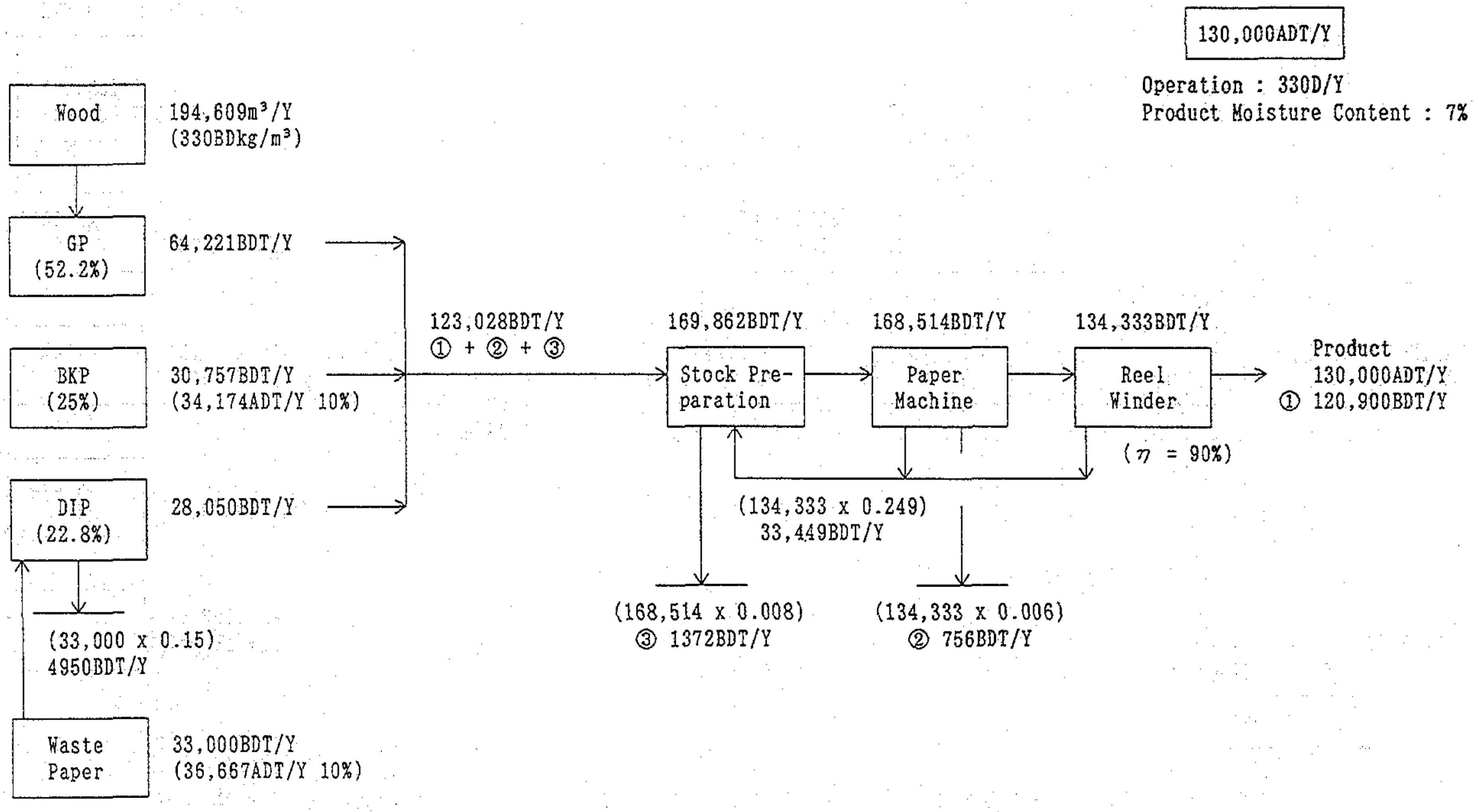


Fig. IV-3-18 MATERIAL BALANCE (W/O CASE 74,700T/Y)

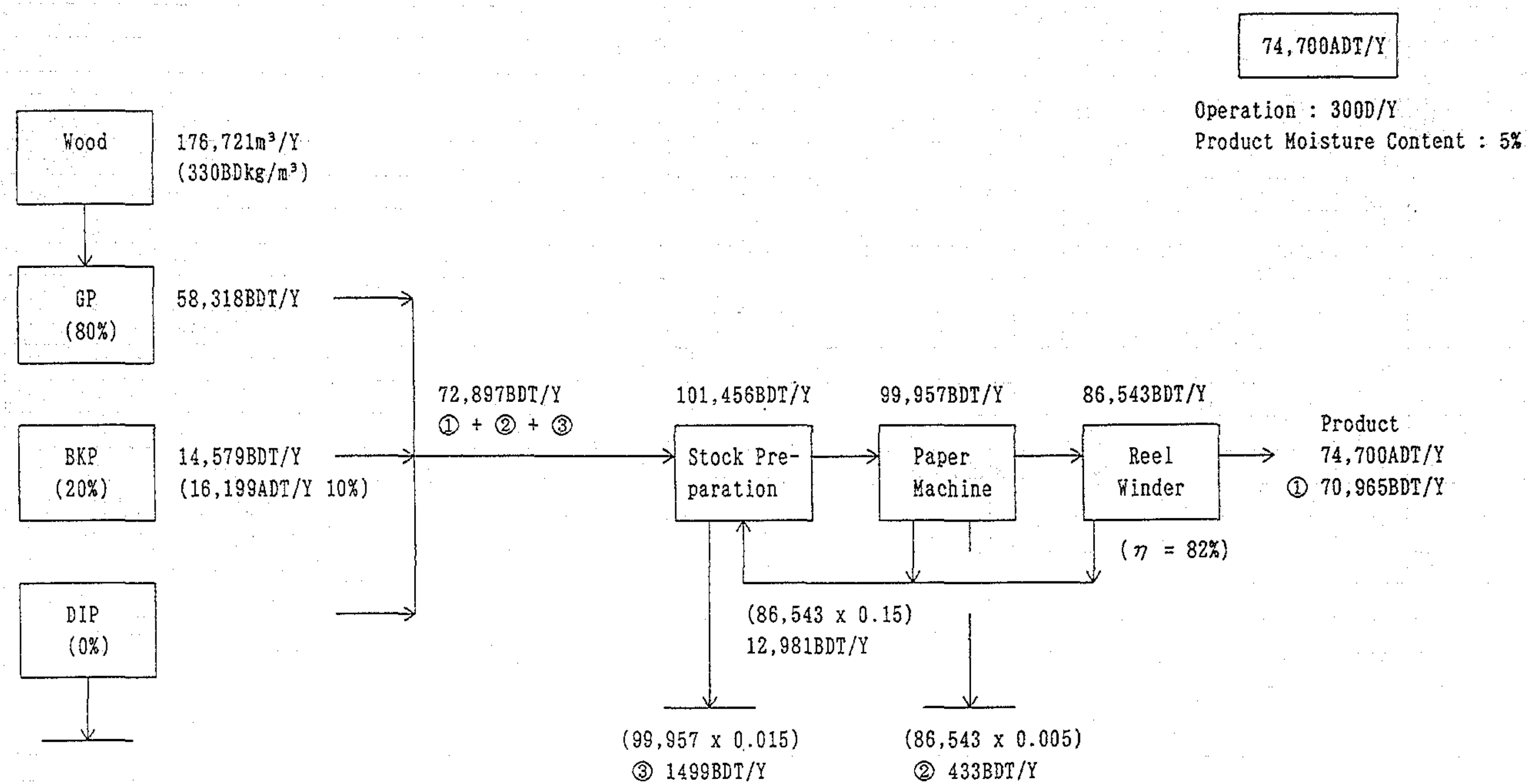


Fig. IV-3-19 Implementation Schedule (Case-1, 2)
(1990-1993)

Project: Aksu Newsprint Mill Renovation

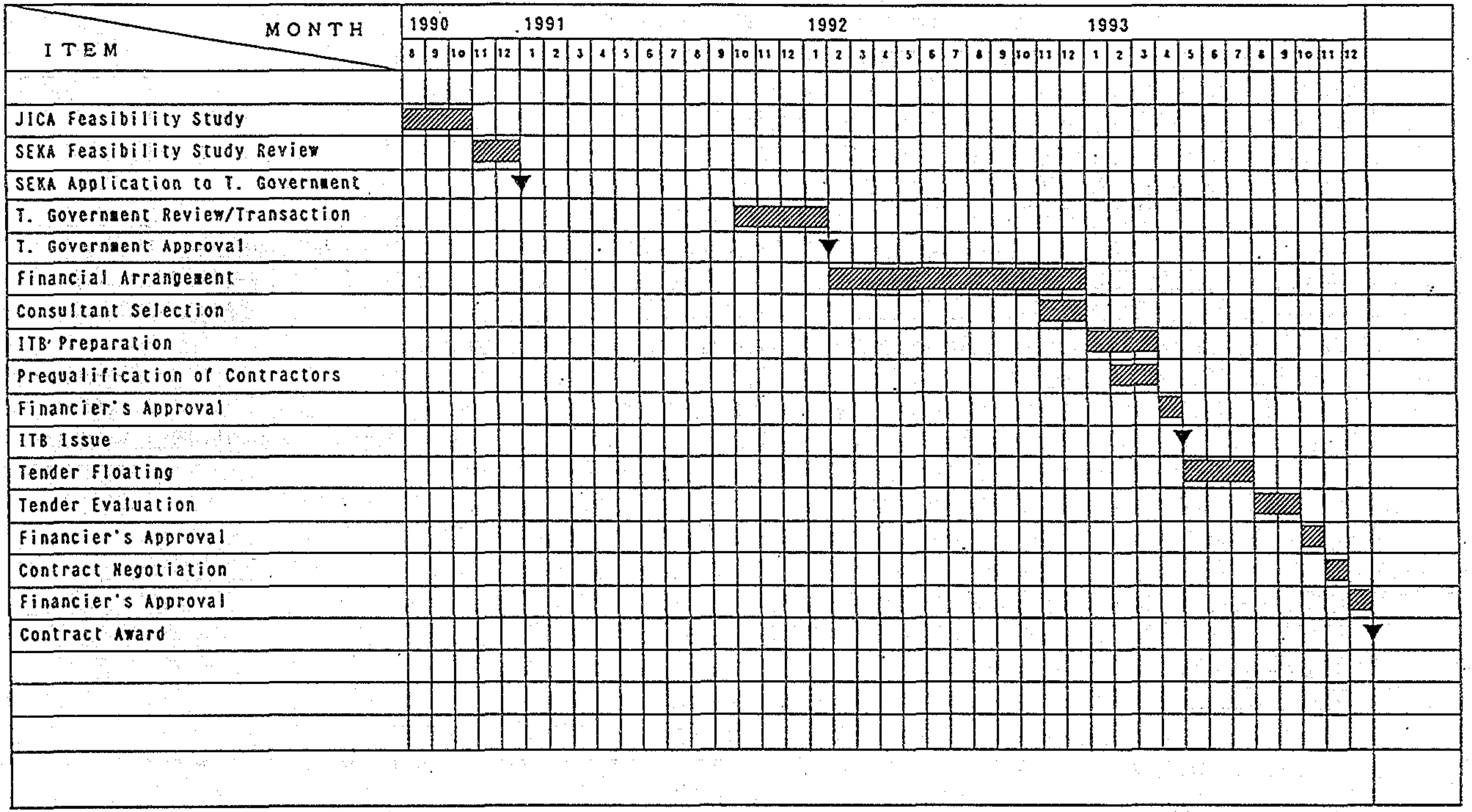


Fig. IV-3-20 (1) Implementation Schedule (Case-1 100,000 T/Y Case)
(1994 Onward)

Project: Aksu Newsprint Mill Renovation

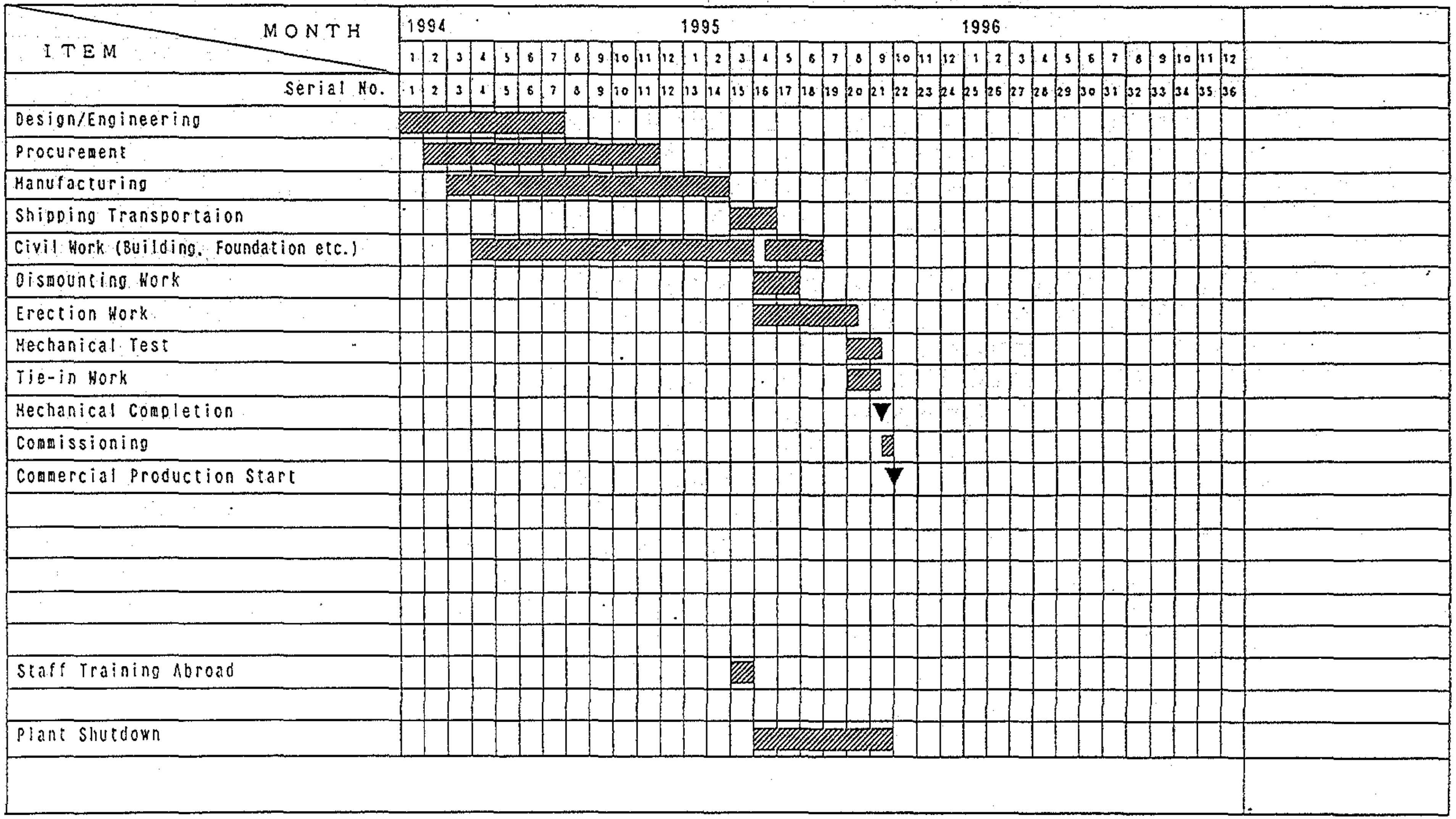


Fig. IV-3-20 (2) Implementation Schedule (Case-2 130,000 T/Y Case)
(1994 Onward)

Project: Aksu Newsprint Mill Renovation

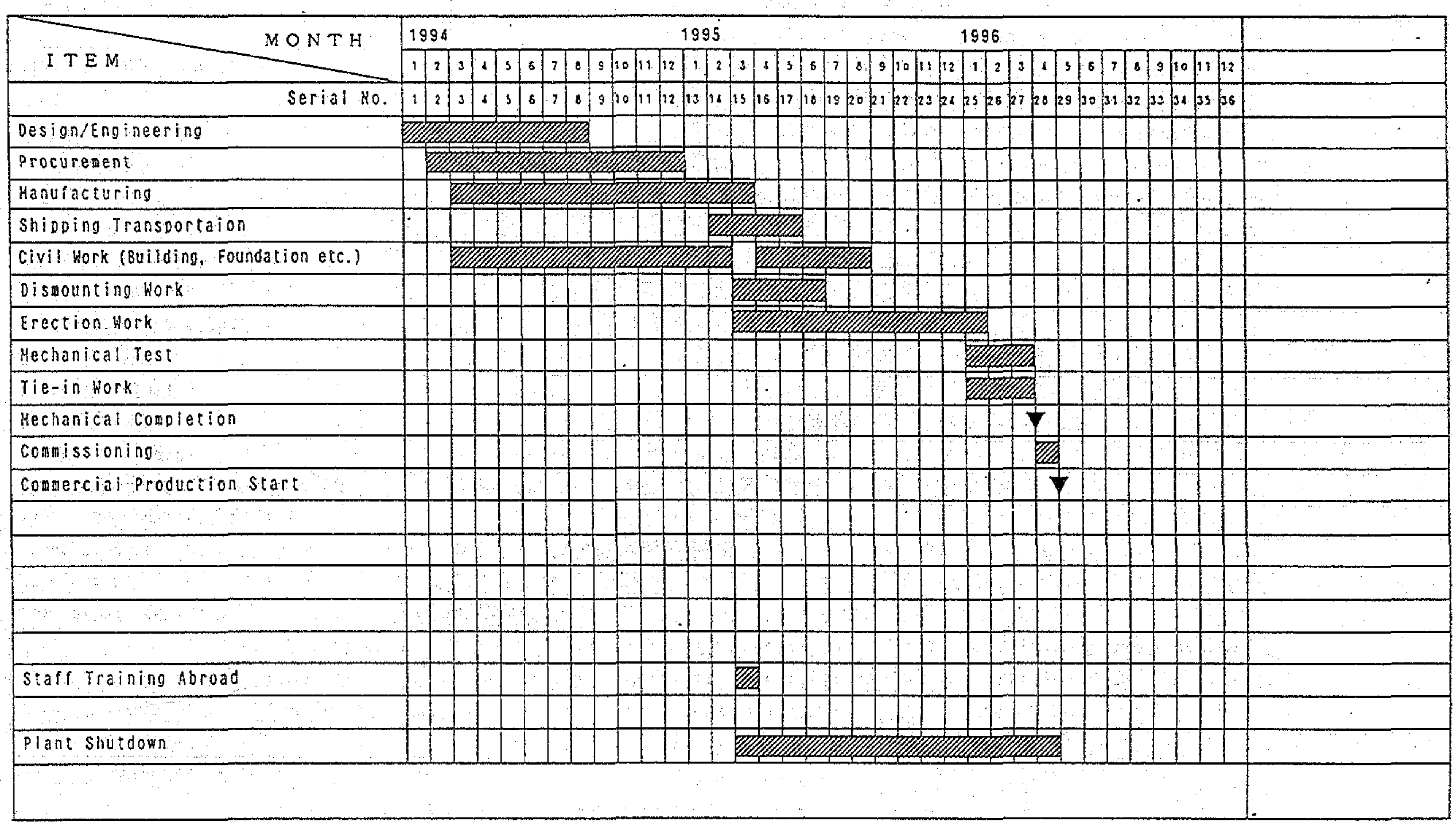
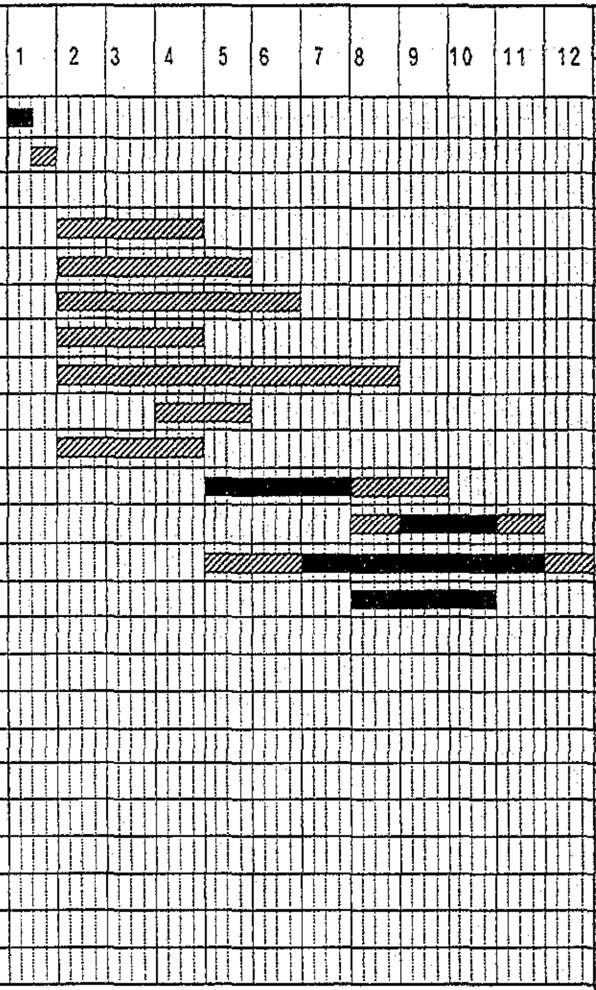


Fig. IV-3-21 TECHNOLOGY TRANSFAR SCHEDULE



	Man-Month Requirement		
	Site	Home Office	Total
Mobilization of Team	-	3.5	3.5
Observation	3.5	0	3.5
Operation Technology Transfer	-	-	-
- Management System	3.0	0	3.0
- Wood Preparation G.P., BKP	4.0	0	4.0
- DIP	5.0	0	5.0
- Stock Preparation	3.0	0	3.0
- Paper Machine	9.0	0	9.0
- Product Handling	2.0	0	2.0
- Offsite Facilities	2.0	0	2.0
Management System	2.0	3.0	5.0
Training System	2.0	2.0	4.0
Operation Mannual	3.0	5.0	8.0
Training in Abroad	-	3.0	3.0
(Total)	(38.5)	(16.5)	(55.0)

: Mill Site Service

: Home Office Service